CE LIVRE A ÉTÉ DONNÉ À LA
BIBLIOTHÈQUE CANTONALE
ET UNIVERSITAIRE
DE LAUSANNE

par Monsieur Georges Bonnard

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Let this Book, Intit'led, *The History of the Royal Society of London, for the Improving of Natural Knowledge*, be Printed.

*WILL. MORRICE.*
Donné par M. le Baron Théodou
de Pechus.
THE HISTORY OF THE Royal-Society OF LONDON, For the Improving of NATURAL KNOWLEDGE.

BY THO. SPRAT.

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TO THE

KING.

SIR,

Of all the Kings of Europe, Your Majesty was the first, who confirm'd this Noble Design of Experiments, by Your own Example, and by a Public Establishment. An Enterprize equal to the
The Epistle Dedicatory.

the most renoun'd Actions of the best Princes. For, to increase the Powers of all Mankind, and to free them from the bondage of Errors, is greater Glory than to enlarge Empire, or to put Chains on the necks of Conquer'd Nations.

What Reverence all Antiquity bad for the Authors of Natural Discoveries, is evident by the Diviner sort of Honor they conferr'd on them. Their Founders of Philosophical Opinions were only admir'd by their own Sects. Their Valiant Men and Generals did seldom rise higher than to Demy-Gods and Heros. But the Gods they Worshipp'd with Temples and Altars, were those who instructed the World to Plow, to Sow, to Plant, to Spin, to build Houses, and to find out New Countries. This Zeal indeed, by which they express'd their Gratitude to
The Epistle Dedicatory.

to such Benefactors, degenerated into Superstition: yet has it taught us, That a higher degree of Reputation is due to Discoverers, than to the Teachers of Speculative Doctrines, nay even to Conquerors themselves.

Nor has the True God himself omitted to show his value of Vulgar Arts. In the whole History of the first Monarchs of the World, from Adam to Noah, there is no mention of their Wars, or their Victories: All that is Recorded is this, They liv'd so many years, and taught their Posterity to keep Sheep, to till the Ground, to plant Vineyards, to dwell in Tents, to build Cities, to play on the Harp and Organs, and to work in Brass and Iron. And if they deserve'd a Sacred Remembrance, for one Natural or Mechanical Invention, your
The Epistle Dedicatory.

Your Majesty will certainly obtain Immortal Fame, for having established a perpetual Succession of Inventors.

I am

(May it please Your Majesty)

Your Majesties most humble, and most obedient Subject, and Servant,

THO. SPRAT.
To the Royal Society.

I.

Philosophy the great and only Heir
Of all that Human Knowledge which has bin
Unforfeited by Man's rebellious Sin,
Though full of years He do appear,
(Philosophy, I say, and call it, He,
For whatsoever the Painters Fancy be,
It a Male Virtu seems to me)
Has still bin kept in Nonage till of late,
Nor manag'd or enjoy'd his vast Estate:
Three or four thousand years one would have thought,
To ripeness and perfection might have brought
A Science so well bred and nurse,
And of such hopeful parts too at the first.
But, oh, the Guardians and the Tutors then,
(Some negligent, and some ambitious men).
Would we're consent to set him Free,
Or his own Natural Powers to let him see,
Left that should put an end to their Autoritie.

II.

That his own business he might quite forget,
They amus'd him with the sports of wanton Wit,
With the Delights of Poetry they fed him,
Instead of solid meats t'encroach his force;
Instead of vigorous exercise, they led him
Into the pleasant Labyrinths of ever-fresh Discours:
Instead of carrying him to see
The Riches which do agree boarded for him lye
In Nature's endless Treasures,
They chose his Eye to entertain
(His curious but not covetous Eye)
With painted Scenes, and Pageants of the Brain.
Some few exalted Spirits this latter Age has shown,
That labour'd to assert the Liberty
(From Guardians, who were now Usurpers grown)
Of this Old Minor still, Captiv'd Philosophy,
But 'twas Rebellion call'd to fight
For such a long opprest Right.
Bacon at last, a mighty Man, arose,
Whom a wise King and Nature chose
Lord Chancellor of both their Laws,
And boldly undertook the injur'd Pupils cause.

III.
Authority, which did a Body boast,
Though 'twas but air condens'd, and stalk'd about,
Like some old Giants wore Gigantic Ghost,
To terrifie the Learned Bout
With the plain Magique of true Reasons Light,
He chag'd out of our sight,
Nor suffer'd Living Men to be misled
By the vain Shadows of the Dead:
(fled)
To Graves, from whence it rose, the conquer'd Phantome.
He broke that Monstrous God which stood
In midst of th' Orchard, and the whole did claim,
Which with a useless Seth of Wood,
And something else not worth a name,
(Both vast for show, yet neither fit
Or to Defend, or to Beget;
Ridiculous and senseless Terrors! made
Children and superstitious Men afraid
The Orchard's open now, and free;
Bacon has broke that Scar-crow Deitie;

Come
Come, enter, all that will,
Behold the rip'ned Fruit, come gather now your Fill.
Yet still, methinks, we fain would be
Catching at the Forbidden Tree,
We would be like the Deitie,
When Truth and Falsehood, Good and Evil, we
Without the Sences aid within our selves would see;
For 'tis God only who can find
All Nature in his Mind.

IV.
From Words, which are but Pictures of the Thought,
(Though we our Thoughts from them perversely drew)
To Things, the Minds right Object, be it brought,
Like foolish Birds to painted Grapes we flew;
He sought and gather'd for our use the True,
And when on heaps the choos'd Bunches lay,
He preft them wisely the Mechanick way,
Till all their Juice did in one Vessel join,
Ferment into a Nourishment Divine,
The thirsty Souls refreshing Wine.
Who to the life an exact Piece would make,
Mufi not from others Work a Copy take;
No, not from Rubens or Vandike;
Much less content himself to make it like
Th' Ideas and the Images which by
In his own Fancy, or his Memory.
No, he before his sight must place
The Natural and Living Face;
The real Object must command
Each Judgment of his Eye, and Motion of his Hand.

V.
From these and all long Errors of the way,
In which our wandring Predecessors went,
And like th'old Hebrews many years did stray
In
In Deserts but of small extent;
Bacon, like Moses, led us forth at last;
The barren Wilderness be past,
Did on the very Border stand
Of the blest promis'd Land,
And from the Mountains Top of his Exalted Wit,
Saw it himself, and shew'd us it:
But Life did never to one Man allow
Time to Discover Worlds, and Conquer too;
Nor can so short a Line sufficient be
To fathom the vast depths of Nature's Sea:
The work he did we ought to admire,
And were unjust if we should more require
From his few years, divided 'twixt the Excess
Of low Affliction, and high Happiness:
For who on things remote can fix his sight,
That's always in a Triumph, or a Fight?

VI.

From you, great Champions, we expect to get
These spacious Countries but discover'd yet,
Countries where yet instead of Nature, we
Her Images and Idols worship'd see:
These large and wealthy Regions to subdue,
Though Learning has whole Armies at command;
Quarter'd about in every Land;
A better Troop she ne're together drew.

Methinks, like Gideon's little Band,
God with Design has pick'd out you,
To do these noble Wonders by a Few:
When the whole Host he saw, They are (said he)
Too many to O'recome for Me;
And now he chooses out his Men,
Much in the way that he did then:
Not those many whom he found.

Idely
Idly extended on the ground,
To drink with their dejected head
The Stream just so as by their Mouths it fled:
No, but those Few who took the Waters up,
And made of their laborious Hands the Cup.

VII.
Thus you prepar'd; and in the glorious Fight
Their wondrous pattern too you take:
Their old and empty Pitchers first they brake,
And with their Hands then lifted up the Light.

"Io! Sound too the Trumpets here!"
Already, your victorious Lights appears,
New Scenes of Heven already we essay,
And Crowds of golden Worlds on high;
Which from the Spacious Plains of Earth and Sea,
Could never yet discover'd be
By Sailors or Chaldeans watchful Eye.
Natures great Works no distance can obscure,
No smallness her near Objects can secure.

I' have taught the curious Sight to press
Into the privatest recess
Of her imperceptible Littleness:
She with much stranger Art than his who put
All th. Iliads in a Nut,
The numerous work of Life does into Atomes shut:
I' have learn'd to Read her Smallest Hand,
And well begin her deepest Sense to Understand:

VIII.
Mischief and true Dishonour fall on those
Who would to laughter or to scorn expose
So Virtuous and so Noble a Design,
So Human for its Use, for Knowledge so Divine.
The things which these proud men despise, and call
Impertinent, and vain, and small,

Those:
Those smallest things of Nature let me know,
Rather than all their greatest Actions Doe.
Whoever would Depose Truth advance
Into the Throne usurp'd from it,
Must feel at first the Blows of Ignorance,
And the sharp Points of Envious Wit.
So when by various turns of the Celestial Dance,
In many thousand years
A Star, so long unknown, appears,
Though Heaven it selfe more beauteous by it grow,
It troubles and alarms the World below,
Does to the Wise a Star, to Fools a Meteor show.

With Courage and Success you the bold work begin;
Your Cradle has not Idle bin:
None e're but Hercules and you could be
At five years Age worthy a History.
And ne're did Fortune better yet
Th' Historian to the Story fit:
As you from all Old Errors free
And purge the Body of Philosophy;
So from all Modern Folies He
Has vindicated Eloquence and Wit.
His candid Stile like a clean Stream does slide,
And his bright Fancy all the way
Does like the Sun-shine in it play;
It does like Thames, the best of Rivers, glide,
Where the God does not rudely overturn,
But gently pour the Crystal Urn,
And with judicious hand does the whole Current guide.
T' has all the Beauties Nature can impart,
And all the comely Dress without the paint of Art.

A. COWLEY.
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Advertisement to the Reader.

The Reader is intreated to take notice, That much of this Discourse was Written and Printed above two years before the rest: For this cause, in the First and Second Books, he may chance to find some Expressions that by reason of the difference of time may seem not well to agree with the last: But those having pass'd the Press so long ago, were out of my power of changing them; and therefore I will refer it to his kindness, to do it for me.

I must also acquaint him, That in the Title of my Book I have taken a liberty, which may be liable to exception: I have call'd it a History of the Royal Society; whereas the First Part wholly Treats of the State of the Ancient Philosophy; and the Third chiefly contains a Defence and Recommendation of Experimental Knowledge in General:
General: So that it is only the Second Book peculiarly describes their Undertaking. But my excuse I may allege the Example of many the Ancients, who have often from the Principal Part of their Works given Title to all the rest: their imitation, though this Book does Treat of many Subjects that are not Historical, yet I have presumed to name the whole a History, because the was the main end of my Design.

The Style perhaps in which it is written, is larger and more contentious than becomes that purity and shortness which are the chief beauties of Historical Writings: But the blame of this ought not so much to be laid upon me, as upon the Detractors of so noble an Institution: For their Objections and Cavils against it, did make it necessary for me to write of it, not altogether in the way of a plain History, but sometimes of an Apology.

THE
THE
HISTORY
OF THE
Institution, Design, and Progress,
OF THE
ROYAL SOCIETY
OF LONDON.
For the Advancement of Experimental
Philosophy.

The FIRST PART.

Shall here present to the World, an Account of the First Institution of the Royal Society; and of the Progress, which they have already made: in hope, that this Learned and Inquisitive Age, will either think their In- deavours, worthy of its Assistance; or else will be thereby provok'd, to attempt some greater Enterprise (if any such can be found out).

Section I. The Preface, and Design of this Discourse.
out) for the Benefit of humane life, by the Advancement of Real Knowledge.

Perhaps this Task, which I have propos'd to my self, will incur the Censure of many Judicious Men, who may think it an over-hasty, and presumptuous Attempt: and may object to me, that the History of an Assembly which begins with so great expectations, ought not to have been made publique so soon; till We could have produced very many considerable Experiments, which they had try'd, and so have given undeniable Proofs, of the usefulness of their undertaking.

In answer to this, I can plead for my self, that what I am here to say, will be far from preventing the labours of others in adorning so worthy a Subject: and is premis'd upon no other account, then as the noblest Buildings are first wont to be represented in a few Shadows, or small Models: which are not intended to be equal to the Chief Structure it self, but onely to shew in little, by what Materials, with what Charge, and by how many Hands, that is afterwards to be rais'd. Although therefore, I come to the performance of this work, with much less deliberation, and ability, then the weightiness of it requires: yet, I trule, that the Greatness of the Design it self, on which I am to speak, and the seal which I have for the Honour of our Nation, which have been the chief reasons, that have mov'd me to this confidence of writing, will serve to make something for my Excuse. For what greater matter can any man desire, about which to employ his thoughts, then the Beginnings of an Illustrious Company, which has already laid such excellent Foundations of so much good to Mankind? Or,
Or, what can be more delightful for an Englishman to consider, then that notwithstanding all the late miseries of his Country; it has been able in a short time so well to recover itself: as not only to attain to the perfection of its former Civility, and Learning, but also to set on foot, a new way of improvement of Arts, as Great and as Beneficial (to say no more) as any the wittiest or the happiest Age has ever invented?

But besides this, I can also add, in my Defence, that though the Society, of which I am to write, is not yet four years old, and has been of necessity hitherto chiefly taken up with Preparatory Affairs: yet even in this time, they have not wholly neglected their principal End; but have had Success, in the trial of many remarkable things; of which I doubt not, but I shall be able, as I pass along, to give instances enough to satisfy the curiosity of all sober Inquirers into Truth. And in short, if for no other end, yet certainly for this, A Relation of their First Original ought to be expos'd to the view of Men: that by laying down, on what course of Discovery they intend to proceed, the Gentlemen of the Society, may be more solemnly engag'd, to prosecute the same. For now they will not be able, handsomely to draw back, and to forfake such honourable Intentions: when the World shall have taken notice, that so many prudent men have gone so far, in a business of this Universal Importance, and have given such undoubted Pledges, of many admirable Inventions to follow.

I shall therefore divide my Discourse into these three general Heads.

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Sect. II.
The Division of the Discourse.
The History of the

The First shall give a short view of the Antient, and Modern Philosophy; and of the most famous Attempts, that have been made for its advancement: that by observing wherein others have excelled, and wherein they have been thought to fail, we may the better shew, what is to be expected, from these new Undertakers; and what mov'd them, to enter upon a way of Inquiry, different from that, on which the former have proceeded.

The Second shall consist of the Narrative itself: and out of their Registers, and Journals, which I have been permitted to peruse, shall relate the first Occasions of their Meetings, the Incouragement, and Patronage, which they have receiv'd; their Patent, their Statutes, the whole Order and Scheme of their Design, and the Manner of their Proceedings.

The Third shall try, to assert the Advantage and Innocence of this work, in respect of all Professions, and especially of Religion; and how proper, above others, it is, for the present temper of the Age wherein we live.

On the First and Last of these Particulars, it is not needfull that I should long insist: because several Great Men have already so much prevented me about them; that there is hardly any thing can be spoken, in which I shall not almost tread in their very Foot-steps. But yet it is requisite, that something be here said to that purpose, though it be only in Repetition: because I perceive, that there is still much prejudice remaining on many mens minds, towards any new Discoveries in Natural Things. This I shall try to remove, not that I imagine, that those Reasons can have any great ef-
RO YAL SOCIETY.

feet in my weak hands, which were not able fully to prevail, when they were inforc'd by the Eloquence of those Excellent Men, who have gone before me in this Argument: But I rather trust to the inclination of the Age itself, wherein I write; which (if I mistake not) is far more prepar'd to be persuaded to promote such Studies, then any other time that has gone before us.

And first, let us observe the Practice of the best, and the civilest Nations, amongst the Antients; and a little trace out the course which they followed, to inrich their Countries, by the introducing of Foreign Arts, or a searching into New.

It is evident, from the universal Testimony of History, that all Learning and Civility were deriv'd down to us, from the Eastern parts of the World. There it was, that Mankind arose: and there they first discovered the ways of living, with safety, convenience, and delight. It is but just, that we should attribute the original of Astronomy, Geometry, Government, and many sorts of Manufactures, which we now enjoy, to the Assyrians, the Chaldeans, and Egyptians. And as to them we owe the Invention; so from them proceeded the first Corruption of knowledge. It was the custom of their Wise men, to wrap up their Observations on Nature, and the Manners of Men, in the dark Shadows of Hieroglyphicks; and to conceal them, as sacred Mysteries, from the apprehensions of the vulgar. This was a sure way to beget a Reverence in the Peoples Hearts towards themselves: but not to advance the true Philosophy of Nature. That stands not in need of such Artificers to uphold its credit; but is then most likely to
The HISTORY of the

to thrive, when the minds, and labours of men of all
Conditions, are join'd to promote it, and when it
becomes the care of united Nations.

Into the East, the first Inquisitive Men amongst the
Grecians traveled: By what they observed there,
they ripened their own imperfect Conceptions, and
so return'd to teach them at home. And that they
might the better insinuate their opinions into their
hearer's minds, they set them off with the mixture
of Fables, and the ornaments of Fancy. Hence it
came to pass, that the first Masters of knowledge
amongst them, were as well Poets, as Philosophers:
For Orpheus, Linus, Musæus, and Homer, first softened
mens natural rudeness, and by the charms of their
Numbers, allure'd them to be instructed by the severer
Doctrines, of Solon, Thales, and Pythagoras.
This was a course, that was useful at first, when men
were to be delightfully deceiv'd to their own good:
But perhaps it left some ill influence, on the whole
Philosophy of their Successors; and gave the Greci-
ans occasion ever after of exercising their wit, and
their imagination, about the works of Nature, more
then was consistent with a sincere Inquiry into
them.

Sect. IV.
The Philosophy of
Greece.

When the fabulous Age was past: Philosophy took
a little more courage; and ventured more to relye
upon its own strength, without the Assistance of
Poetry. Now they began to gather into Assemblies,
and to increase their interest: and, according to
the different temper of the Grecians, from the East-
era Nations; so were their Arts propagated in a
different way from theirs. The Greeks, being of a
vigorous, and active humour, establish't their Philo-

sophy,
sophy, in the \textit{Walks}, and \textit{Porches}, and \textit{Gardens}, and such publick places about their Cities; whereas the Graver, and more reserv'd \textit{Egyptians}, had confin'd it to their \textit{Temples}.

In \textit{Greece}, the most considerable (and indeed almost the onely successful) Tryals, that were made in this way, were at \textit{Athens}. The wit of whose Inhabitants, was ('tis true) admirably fit, for the reducing of Philosophy into \textit{Method}, and for the adornment of it with the noblest words; when once it had been before compleated in its substance: But yet their Genius was not so well made, for the undergoing of the first \textit{drudgery} and \textit{burden} of \textit{Observation}, which is needful for the \textit{Beginning} of so difficult a work. This will appear, if we remember, that they were the Masters of the Arts of \textit{speaking}, to all their Neighbours: and so might well be inclin'd, rather to choose such opinions of Nature, which they might most elegantly express; then such, which were more useful, but could not so well be illustrated by the ornaments of Speech. Besides this, their \textit{City} was the General \textit{Schole}, and Seat of \textit{Education}; and therefore the Epitomes of knowledge best served their turn, to make their Scholars, in a short time, finish the course of their Studies, and go home satisfied with a belief of their own Proficiency, and their Teachers Wisdom. They were also commonly (as most of the other \textit{Grecians}) men of hot, earnest, and hasty minds: and so lov'd rather to make \textit{sudden} Conclusions, and to convince their hearers by argument; then to \textit{delay} long, before they fixt their judgments; or to attend with sufficient patience the labour of Experiments. But to say no more, they had but a \textit{narrow Territory}; and the condition
on of those times, would not allow a very large commerce, with foreign Nations: they were much exercis'd in the civil Affairs of their Country: they had almost a perpetual Warr, at home, or abroad: which kinds of busy, and active life, breed men up indeed for great Employments: but not so well for the diligent, private, and severe examination of those little and almost infinite Curiosities, on which the true Philosophy must be founded.

Sect. V. The Original of the Philosophical Sects.

In that City therefore, the knowledge of Nature had its Original, before either that of Discourse, or of humane Actions: but it was quickly forc'd to give way to them both. For it was not yet come to a sufficient ripeness, in the time of Socrates. And he, by the authority of his admirable wit, made all parts of Philosophy to be taken off from a condition of increasing much farther, that they might be immediately serviceable to the affairs of men, and the uses of life. He was one of the first men, that began to draw into some order, the confus'd, and obscure imaginations, of those that went before him: and to make way for the composing of Arts, out of their scattered Observations. All these various Subjects, the vastness of his Soul comprehended in his casual Disquisitions: but after his death they were divided amongst his Followers, according to their several inclinations. From him most of the succeeding Sects descended: and though every one of them had its different principles, and rendezvous: yet they all laid claim to this one common title of being his Disciples. By this means, there was a most specious appearance of the increase of Learning: all places were fill'd with Philosophical Diff-
disputes: controversies were rais'd: Factions were made: many subtleties of confuting, and defending, were invented: but so instead of joyning all their strength to overcome the secrets of Nature (all which would have been little enough, though never so wisely manag'd) they onely did that, which has undone many such great attempts, before they had yet fully conquer'd her; they fell into an open dissension, to which of them, her spoys did belong.

'Tis true, at the same time, some few men did continue an earnest, and laborious pursuit, after Natural causes, and effects: and took that course, which, if it had met with as much encouraging, as the others had, would without question have produc'd extraordinary things. But these Philosophers, digging deep, out of the sight of men; and studying more, how to conceive things aright, then how to set off, and persuade their conceptions, to others; were quickly almost quite overwhelm'd, by the more plausible and Talkative Sects.

This was the success of that Famous Age of the Grecian Learning, in respect of Natural knowledge. They stay'd not for an information sufficient for such a noble Enterprise: They would not suffer their posterity; to have any share with them, in the honor of performing it: But too suddenly, for present use, they clap'd up an entire Building of Sciences: and therefore it is not to be wonder'd, if the hasty Fabrick, which they rais'd, did not consist of the best materials.

But at last with their Empire; their Arts also were transported to Rome: the great spirit of their Law-givers,
The History of the givers, and Philosophers, in course of time, degenerating into Rhetoricians, and wandering Teachers of the opinions, of their private Sects. Amongst the Romans, the studies of Nature met with little, or no entertainment. They scarce ever dream'd of any other way of Philosophy, then only just reducing into New Method, and eloquently translating into their own Language, the Doctrines, which they had receiv'd from the Greeks. And it was a long time too, before even that could obtain any countenance amongst them. For, in the first warlick and busie Ages of that State, they onely apply'd themselves to a severity of Moral vertue; indeavor'd after no other skill, then that of the Customs, and Laws of their Country, the Ceremonies of their Religion, and the Arts of Government: esteeming every thing that came out of Greece, as an outlandish fashion, which would corrupt the manners of their Youth; and allure them, from that strictness of Discipline, and Integrity of Life, by which they had inlarg'd the Bounds of their Common-wealth. Till at length their power being increas'd, and their minds a little softened by the Greatness of their commands, and having tasted of the pleasures of the East; they were content too, by degrees, to admit their Philosophy. And yet all the use, that they made of it at last, was onely, either that they might thereby make their speech more plentiful; or else, that when they were at leisure from Civil affairs, they might have that as a companion, and comfort of their retirements.

This was the condition of Philosophy, when the Christian Religion came into the World. That maintain'd
tain'd it self in its first Age, by the innocence, and miracles, and sufferings of its Founder, and his Apostles. But after their Deaths, when Christianity began to spread into the farthest Nations, and when the power of working wonders had ceas'd: it was thought necessary, for its increase, that its professors should be able to defend it, against the subtleties of the Heathens; by those same ways of arguing, which were then in use, among the Hethen Philosophers. It was therefore on this account, that the Fathers, and chief Doctors of our Church, apply'd themselves to the Peripatetick, and Platonick Sects: But chiefly to the Platonick: Because that seem'd to speak plainer about the Divine Nature; and also, because the sweetness, and powerfulness of Plato's Writings, did serve as well to make them popular speakers, as disputers. Having thus provided themselves against their adversaries, they easily got the victory over them; and though the Idolatrous Gentiles had kept the instruments of disputing, in their own hands, so many hundred years; yet they soon convinc'd them, of the ridiculousness of their worships, and the purity, and reasonableness of ours.

But now the Christians having had so good success, against the Religions of the Heathens, by their own weapons; instead of laying them down when they had done, unfortunately fell to manage them one against another. So many subtile brains having been set on work, and warm'd against a Foreign enemy: When that was over, and they had nothing else to do (like an Army that returns victorious, and is not presently disbanded) they began to spoil, and quarrel amongst themselves. Hence that Religion, which at first appear'd so innocent, and peaceable,
and fitted for the benefit of humane Society; which consisted in the plain, and direct Rules, of good Life, and Charity, and the Belief in a redemption by one Savior, was miserably divided into a thousand intricate questions, which neither advance true Piety, nor good manners. Hence arose all the Heresies of those times. Against these, besides the force of Disputation, the Church obtain'd the Arm of the Civil Magistrate: and so at last by the help of many General Councils, got them extinguish'd, (if I may say they were extinguish'd, seeing in this age wherein we live, we have seen most of them unhappily reviv'd.) But still by this means, there was no knowledge in request, but the Disputative Philosophy. For while things were in this posture, and so many great Wits ingag'd in the heats of controversy: it was not to be expected, that they should look out for further assistance, then the Arts, which were already prepar'd, or that they should make any considerable endeavors, about new inventions, and the tedious trial of Experiments. Nor can we much blame them for it: seeing in a time of War, every man will rather snatch up that armor which he finds ready made, then stay till men go to the Mine, and digge out new Ore, and refine, and harden it a better way; in hope to have his weapons of a stronger, and nobler Metal at last.

Nor was that Age unfit for such an enterprise, only on the account of these Warrs of the Tongue: But also by reason of the miserable distempers of the civill affairs of the World, about that time: which were chiefly occasion'd by the Roman Armies usurping the Right of choosing Emperors, and by the invasions of Barbarous Nations, which overwhelm'd the greatest part of Europe. Amidst these distractions, it
it was impossible for any thing of this Nature to have prosper'd: and in so vast an inundation of ignorance, which carri'd away with it the very grown and aged Trees themselves (those parts of Learning which had taken root, so many generations past) it would have been in vain, to have committed any new plants to the ground. Such studies as these, as they must receive encouragement from the Sovereign Authority, so they must come up in a peaceful full time, when mens minds are at ease, and their imaginations not disturb'd, with the cares of preserving their Lives, and Fortunes.

To go on therefore with the matter of Fact: Having left that dismal Bloody Age, we come into a Course of Time, which was indeed far quieter: But it was like the quiet of the night, which is dark with all. The Bishops of Rome taking the opportunity of the decay of the Roman Empire, had wrested from it so many privileges, as did at last wholly destroy it; and while it was gasping for life, forc'd it to make what Will, and Testament they pleas'd. Being thus establish'd, and making Rome, whose name was still venerable, the Seat of their Dominion, they soon obtain'd a Supremacy over the Western World. Under them for a long space together men lay in a profound sleep. Of the Universal ignorance of those times; let it suffice to take the Testimony of William of Malmesbury, one of our antient English Historians, who says, That even amongst the Priests themselves, he was a Miracle that could understand Latine. Thus they continued; till at last, that Church adopted, and cherish'd, some of the Peripatetick opinions, which the most ingenious of the Moncks,
Monks, in their solitary, and idle course of life, had lighted upon. This Sect was excellently well made for their turn. For by hovering so much, in general Terms, and Notions, it amused men's minds, in things that had not much difficulty; and so the Laity being kept blind, were forc'd in all things to depend on the Lips of the Roman Clergy. From that time, even down to the Reformation, the Gentlemen of all these Countries, employing themselves, chiefly in arms, and adventures abroad; and the Books of the antients, being either destroy'd by the Goths, and Vandalls; or those which escap'd their fury, lying cover'd with dust in the Libraries of Monasteries: few or none regarded any of the Arts of Wit, and Reason, besides the Church-men.

This, I will take the boldness to say, must needs be very injurious to the increase of Generall Learning. For though I shall justly affirm, to the honor of that sacred profession, that all knowledge has been more search'd into, and promoted by them, then by any other order of men, even from the Egyptians times, (whose Priests in good part invented, or at least preserv'd, the Learning of the East) down to our present Age: yet I must also adde, that whenever all the studious spirits of a Nation, have been reduc'd within the Temples walls, that time is naturally lyable to this danger, of having its Genius more intent, on the different opinions in Religion, and the Rites of Worship, then on the increase of any other Science. Of this I shall give two instances: one, from the Antients: the other, from our selves.

It is manifest, that amongst the Jews, all the men of Letters still appli'd themselves to the understanding of their Law: that being the publick way of
of preferment, to the highest places of Judicature and Authority in the State. For that many Fraternities were erected, and (as I may call them) Judaical Monastries constituted. Hence came all the interpretations on the Writings of their Great Lawgiver: which at last grew so numerous, and various amongst themselves, that Christ, when he came, could hardly find any thing of Moses his mind, in all they had writ: But perform'd more himself towards the explanation of the Law, in two Chapters, then they had done in all their infinite Volumes. But while they were so excessively busy, about such sorts of contemplations, the other parts of Learning were neglected: Little or no footsteps of Philosophy remaining amongst them, except only the memory of that History of Plants, which was not written by any of Aaron's family, but by their wisest King.

But my other instance comes nearer home, and it is of the Scholae-men. Whose works when I consider, it puts into my thoughts, how farre more importantly a good Method of thinking, and a right course of apprehending things, does contribute towards the attaining of perfection in true knowledge, then the strongest, and most vigorous wit in the World, can do without them. It cannot without injustice be deny'd, that they were men of extraordinary strength of mind: they had a great quickness of imagination, and subtilty of distinguishing: they very well understood the consequence of propositions: their natural endowments were excellent: their industry commendable: But they lighted on a wrong path at first, and wanted matter to contrive: and so, like the Indians, onely express'd a wonderful Artifice,
Artifices, in the ordering of the same Feathers into a thousand varities of Figures. I will not insist long on the Barbarousness of their style: though that too might justly be censur'd: for all the ancient Philosophers, though they labor'd not to be full, and adorn'd in their Speech: yet they always strove to be easy, natural, and unaffected. Plato was allow'd by all to be the chief Master of speaking, as well as of thinking. And even Aristotle himself, whom alone these men adore'd, however he has been since us'd by his Commentators, was so careful about his words, that he was esteem'd one of the purest, and most polite Writers of his time. But the want of good Language, not being the Schol-men's worst defect, I shall pass it over: and rather stop a little, to examine the the matter itself, and order in which they proceeded.

The Subjects about which they were most conversant, were either some of those Arts, which Aristotle had drawn into Method, or the more speculative parts of our Divinity. These they commonly handled after this fashion. They began with some generall Definitions of the things themselves, according to their universal Natures: Then divided them into their parts, and drew them out into several propositions, which they layd down as Problems: these they controverted on both sides: and by many niceties of Arguments, and citations of Authorities, confuted their adversaries, and strengthen'd their own dictates. But though this Notional Warre had been carry'd on with farre more care, and calmness amongst them, then it was: yet it was never able to do any great good towards the enlargement of knowledge: Because it rely'd on generall Terms, which
which had not much foundation in Nature, and also because they took no other course, but that of disputing.

That this insisting altogether on established Axioms, is not the most useful way, is not only clear in such airy conceptions, which they managed: but also in those things, which lie before every man's observation, which belong to the life, and passions, and manners of men; which, one would think, might be sooner reduc'd into standing Rules. As for example: To make a prudent man in the affairs of State, it is not enough, to be well vers'd in all the conclusions, which all the Politicians in the World have devis'd, or to be expert in the Nature of Government, and Laws, Obedience, and Rebellion, Peace, and War: Nay rather a man that relies altogether on such universal precepts, is almost certain to miscarry. But there must be a sagacity of judgement in particular things: a dexterity in discerning the advantages of occasions: a study of the humour, and interest of the people he is to govern: The same is to be found in Philosophy; a thousand fine Argumentations, and Fabricks in the mind, concerning the Nature of Body, Quantity, Motion, and the like, if they only hover at a-look, and are not squar'd to particular matters, they may give an empty satisfaction, but no benefit, and rather serve to swell, then fill the Soul.

But besides this, the very way of disputing itself, and inferring one thing from another alone, is not at all proper for the spreading of knowledge. It serves admirably well indeed, in those Arts, where the connexion between the propositions is necessary, as in the Mathematicks, in which a long train of Demonstrations, may be truly collected, from the certainty of the first foundation: But in things of probability only,
It seldom or never happens, that after some little progress, the main subject is not left, and the contenders fall not into other matters, that are nothing to the purpose: For if but one link in the whole chain be loose, they wander far away, and seldom, or never recover their first ground again. In brief, disputing is a very good instrument, to sharpen men's wits, and to make them versatile, and wary defenders of the Principles, which they already know: but it can never much augment the solid substance of science itself: And one thinks compared to Experimenting, it is like Exercise to the Body in comparison of Meat. For running, walking, wrestling, shooting, and other such active sports, will keep men in health, and breath, and a vigorous temper: but it must be a supply of new food that must make them grow: so it is in this case; much contention, and strife of argument, will serve well to explain obscure things, and strengthen the weak, and give a good, sound, masculine colour, to the whole mass of knowledge: But it must be a continued addition of observations, which must nourish, and increase, and give new Blood, and flesh, to the Arts themselves.

But this has been only hitherto spoken, against the Method of the Scholers-men in General; on supposition, that they took the best course, that could be in that kind. I shall now come, to weigh that too. For it may easily be prov'd, that those very Theories, on which they built all their subtle webs, were not at all Collected, by a sufficient information from the things themselves. Which if it can be made out, I hope, it will be granted, that the force and vigour of their Wit did more hurt, then good: and only
only serv’d to carry them the farther out of the right way, when they were once going. The feripateticsticks themselves do all grant, that the first rise of knowledge must be from the sense, and from an induction of their reports: Well then; how could the schol-men be proper for such a business, who were ty’d by their cloysterall life, to such strictness of hours, and had seldom any larger prospects of nature, then the gardens of their monastries? It is a common observation, that men’s studies are various, according to the different courses of life, to which they apply themselves; or the tempers of the places, wherein they live. They who are bred up in commonwealths, where the greatest affairs are managed by the violence of popular assemblies, and those governed by the most plausible speakers:Busy themselves chiefly about eloquence; they who follow a court, especially intend the ornament of language, and poetry, and such more delicate arts; which are usually there in most request: they who retire from humane things, and shut themselves up in a narrow compass, keeping company with a very few; and that too in a solemne way, addict themselves, for the most part, to some melancholy contemplations, or to devotion, and the thoughts of another world: That therefore which was fittest for the schol-men’s way of life, we will allow them. But what sorry kinds of philosophy must they needs produce, when it was a part of their religion, to separate themselves, as much as they could; from the converse of mankind? when they were so far from being able to discover the secrets of nature, that they had scarce opportunity, to behold enough of its common works? If any shall be inclinable to fol-

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low the directions of such men in Natural things, rather then of those, who make it their employment: I shall believe, they will be irrational enough, to think, that a man may draw an exact Description of England, who has never been here, then the most industrious Mr. Camden, who had travell'd over every part of this Country, for that very purpose.

Whoever shall soberly profess, to be willing to put their shoulders, under the burthen of so great an enterprize, as to represent to mankind, the whole Fabrick, the parts, the causes, the effects of Nature: ought to have their eyes in all parts, and to receive information from every quarter of the earth: they ought to have a constant univerfall intelligence: all discoveries should be brought to them: the Treasures of all former times should be laid open before them: the assistance of the present should be allow'd them: so far are the narrow conceptions of a few private Writers, in a dark Age, from being equall to so vast a design. There are indeed some operations of the mind, which may be best perform'd by the simple strength of mens own particular thoughts; such are invention, and judgement, and disposition: For in them a security from noise, leaves the Soul at more liberty, to bring forth, order, and fashion the heap of matter, which had been before supply'd to its use. But there are other works also, which require as much aid, and as many hands, as can be found. And such is this of observation: Which is the great Foundation of Knowledge: Some must gather, some must bring, some separate, some examine: and (to use a Similitude, which the present time of the year, and the ripe fields, that lye before
before my eyes, suggest to me;) it is in Philosophy, as in Husbandry: Wherein we see, that a few hands will serve to measure out, and fill into sacks, that Corn, which requires very many more laborers, to sow, and reap, and bind, and bring it into the Barn.

But now it is time for me to dismiss this subtle generation of Writers: whom I would not have prosecuted so far, but that they are still esteem'd by some men, the only Masters of Reason. If they would be content, with any thing less then an Empire in Learning, we would grant them very much. We would permit them to be great, and profound Wits, as Angelical, and Seraphical, as they pleas'd: We would commend them, as we are wont to do Chaucer; we would confess, that they are admirable in comparison of the ignorance of their own Age: And, as Sir Philip Sidney of him, we would say of them; that it is to be wonder'd, how they could see so clearly then, and we can see no clearer now. But that they should still be set before us, as the great Oracles of all Wit, we can never allow. Suppose, that I should grant, that they are most usefull in the controversies of our Church, to defend us against the Heresies, and Schisms of our times: what will thence follow, but that they ought to be confin'd, within their own Bounds, and not be suffer'd to hinder the enlargement of the territories of other Sciences? Let them still prevail in the Scholes, and let them govern in disputations: But let them not over-spread all sorts of knowledge. That would be as ridiculous, as if, because we see, that Thorns, and Briers, by reason of their sharpness, are fit to stop a gap, and keep out wild Beasts; we should therefore think, they deserv'd to be planted all over every Field. And
The History of the

And yet I should not doubt, (if it were not somewhat improper to the present discourse) to prove, that even in Divinity itself, they are not so necessary, as they are reputed to be: and that all, or most of our Religious controversies, may be as well decided, by plain reason, and by considerations, which may be fetched from the Religion of mankind, the Nature of Government, and humane Society, and Scripture itself, as by the multitudes of Authorities, and subtilties of disputes, which have been heretofore in use.

Sect X.
The Restoration of Learning.

And now I am come to the time within our view, and to the third great Age of the flourishing of Learning. Whether this recovery of knowledge did happen by the benefit of Printing, invented about that time, which shew'd a very easy way of communicating mens thoughts one to another? or whether it came from the hatred, which was then generally conceiv'd against the blindness, and stupidity, of the Roman Fryers? or from the Reformation, which put men upon a stricter inquiry into the Truth of things? whatever the cause was, I will not take much pains to determine: But I will rather observe, what kinds of knowledge have most flourished upon it. If we compare this Age of Learning, with the two former; we shall find, that this does far exceed both the other in its extent: there being a much larger plot of ground, sown with Arts, and civility at this time, then either when the Grecian, or Roman Empires prevail'd. For then (especially under the Romans) so many Nations being united under one Dominion, and reduced into the Form of Provinces: that knowledge which they had was chiefly confin'd to
to the walls of the Imperial Cities themselves. But now (not to insist on the Learning of far remote Countries, of which we have only imperfect Relations; but to contract our observation to Christendom alone) there being so many different States, and Governments in Europe, every Country sets up for itself: almost in every place, the liberal Arts (as they are call'd) are cherisht, and publick allowance is made for their support. And in this compass, the infinite numbers of Wits, which have appear'd so thick for these many years, have been chiefly taken up about some of these three studies: either the Writings of the Antients: or Controversies of Religion: or Affairs of State.

The First thing that was undertaken, was to rescue the excellent works of former Writers from obscurity. To the better performing of this, many things contributed about that time. Amongst which, as to us in England, I may reckon (and that too, it may be, not the least, whatever the action was in itself,) the dissolution of Abbeyes: whereby their Libraries came forth into the light, and fell into industrious Mens hands, who understood how to make more use of them, then their slothfull possessors had done. So that now the Greek, and Latine Tongues began to be in request; and all the ancient Authors, the Heathen Philosophers, Mathematicians, Orators, Historians, Poets, the various Copies, and Translations of the Bible, and the Primitive Fathers were produc'd. All these, by the severall Transcriptions, and the ignorance of the Transcribers, had very many different readings, and many parts wholly lost; and by the distance of times, and change of customs, were
were grown obscure. About the interpreting, explaining, supplying, commenting on these, almost all the first Wits were employed. A work of great use, and for which we ought to esteem our selves much beholding to them. For indeed, if they had not compleated that business, to our hands, we of this age, had not been so much at leisure, as now I hope we are, to prosecute new inventions. If they had not done it, we should: of which we ought not to doubt, seeing we behold, that even now, when the soyl of Criticism is almost quite Barren, and hardly another Crop will come, yet many Learned men cannot forbear spending their whole labour in toyl-ing about it: what then should we have done, if all those Books had come down untouch'd to our hands?

We cannot then, with any Sobriety, detract from the Criticks, and Philologists, whose labors we in-joy. But we ought rather to give them this Testi-mony, that they were men of admirable Diligence: and that the Collections, which they have made, out of the Monuments of the Antients, will be wonder-fully advantageous to us, if the right use be made of them: if they be not set before us, onely that we may spend our whole Lives, in their consideration, and to make the course of Learning more difficult: But if they be impoy'd, to direct us in the ways, that we ought to proceed, in knowledge for the fu-ture; if by shewing us what has been already finish'd, they point out to us, the most probable means, to accomplish what is behind. For methinks, that wis-dom, which they fetch'd from the ashes of the dead, is something of the same nature, with Ashes them-selves: which, if they are kept up in heaps together,
will be useless: But if they are scattered upon Living ground, they will make it more fertile, in the bringing forth of various sorts of Fruits. To these men then we are beholding, that we have a fairer prospect about us: to them we owe, that we are not ignorant of the times that are gone before us: which to be, is (as Tully says) to be always Children. All this, and much more, is to be acknowledg'd: But then we shall also desire of them, that they would content themselves, with what is their due: that by what they have discover'd, amongst the rubbish of the Antients, they would not contemn the Treasures, either lately found out, or still unknown: and that they would not prefer the Gold of Ophir, of which now there is no mention, but in Books, before the present Mountains of the West-Indies.

Thus I pass over this sort of reviv'd Learning. And now there comes into our view another remarkable occasion, of the hinderance of the growth of Experimental Philosophy, within the compass of this bright Age; and that is the great ado which has been made, in raising, and confirming, and refuting so many different Sects, and opinions of the Christian Faith. For whatever other hurt or good comes, by such holy speculative Wars (of which whether the benefit or mischief over-weighs, I will not now examine) yet certainly by this means, the knowledge of Nature has been very much retarded. And (to use that Metaphor, which an excellent Poet of our Nation, turns to another purpose) that showre has done very much injury by falling on the Sea, for which the Shepherd, and the Plough-man, call'd in vain: The Wit of men has been profusely powr'd out on
The HISTORY of the

on Religion, which needed not its help, and which was onely thereby made more tempestuous: while it might have been more fruitfully spent, on some parts of Philosophy, which have been hitherto barren, and might soon have been made fertile.

But besides this, there have been also several other professions, which have drawn away the Inclinations of Men, from prosecuting the naked, and uninterested Truth. And of these I shall chiefly name the affairs of State, the administration of Civil Government, and the execution of Laws. These by their fair dowry of gain, and honor, have always allure'd the greatest part of the men of Art, and reason, to addict themselves to them: while the search into severer knowledge has been look'd on, as a study out of the way, fitter for a melancholy humorist, or a retir'd weak spirit, then to make men equal to business, or serviceable to their Country. And in this, methinks the Experimental Philosophy has met with very hard usage: For it has commonly in Mens Censures, undergone the imputation of those very faults, which it indevours to correct in the Verbal. That indeed may be justly condemn'd for filling mens thoughts, with imaginary Ideas of conceptions, that are no way answerable to the practical ends of Life: But this on the other side (as I shall shortly make out) is the surest guide, against such Notional wandrings: opens our eyes to perceive all the realities of things: and clears the brain, not onely from darkness, but false, or useless Light. This is certainly so, in the thing it self. But the greatest part of men, have still apprehended the contrary. If they can bring such Inquirers under the scornfull Titles of Philosophers, or Scholars, or Virtuosi, it is enough: They pre-
sently conclude them, to be men of another World, only fit companions for the shadow, and their own melancholy whimsies: looking on those who dig in the Mine of Nature, to be in as bad a condition, as the King of Spain's slaves in Peru, condemn'd for ever to that drudgery, and never to be redeem'd to any other employment. And is not this a very unequal proceeding? While some over-zealous Divines do reprobate Natural Philosophy, as a carnal knowledge, and a too much minding worldly things: the men of the World, and business on the other side, esteem it merely as an idle matter of Fancy, and as that which disables us, from taking right measures in humane affairs. Thus by the one party, it is cen-
sur'd, for slopping too low; by the other, for soarin too high: so that methinks, it is a good ground to conclude, that it is guilty of neither of these faults, seeing it is alike condemn'd by both the extremes. But I shall have a fitter occasion, to examine this hereafter. However it be, it is not to be won-
der'd, if men have not been very zealous about those studies, which have been so far mov'd, from present benefit, and from the applause of men. For what should incite them, to bestow their time, and Art, in revealing to mankind, those Mysteries; for which, it may be, they would be onely despis'd at last? How few must there needs be, who will be willing, to be impoverish'd for the common good? which they shall see, all the rewards, which might give life to their Industry, passing by them, and be-
tow'd on the deserts of easier studies? and while they for all their pains, and publick spirit, shall on-
ly perhaps be serv'd as the poor man was in the Fable: who, while he went down into the well, in assurance, that
that he should find a mighty Treasure there, was in the
mean time robb'd by his companions, that stay'd
above, of his Cloak, and all the Booty that he had
before gotten?

And yet, notwithstanding all these unfortunate
hinderances, there have been many commendable at-
ttempts in this way, in the compass of our Memo-
ries, and the Age before us. And though they have
been for the most part carry'd on, by the private Di-
ligence of some few Men, in the mid'ft of a thou-
sand difficulties, yet it will not be unprofitable to
recount some of them: if it were onely to give a fair
ground of hope, how much progress may be made
by a form'd and Regular Assembly, seeing some sin-
gle hands, with so small encouragement, could dis-
patch so much of the work.

There are Five new ways of Philosophy, that come
into my observation.

Sect. XIII. The First is, of those, who, out of a just disdain,
that the Antients should still possess a Tyranny over
our Judgements, began first to put off the reverence,
that men had born to their memories; and handling
them more familiarly, made an exact survey of their
imperfections: But then, having rejected them, they
pursued their success too far, and straight fell to form
and impose new Theories on Mens Reason, with an
usurpation, as great as that of the others: An acti-
on, which we that live in this Age, may resemble to
some things that we have seen acted on the Stage of
the World: For we also have beheld the Pretenders
to publick Liberty, turn the greatest Tyrants them-
selves. The first part of these mens performance
is very much to the prais'd: They have made the
ground
ground open, and clear, for us: they have remov'd the rubbish; which, when one great Fabrick is to be pull'd down, and another to be erect'd in its stead, is always esteem'd well nigh half the whole work: Their adventure was bold, and hazardous: They touch'd men's minds in their tenderest part; when they strov'e to pluck off those opinions, which had, by long custom, been so closely twin'd about them: They freed our understandings from the Charms of vain apparitions, and a slavery to dead Mens names. And we may well guess, that the absolute perfection of the True Philosophy, is not now far off, seeing this first great and necessary preparation for its coming, is already taken off our hands. For methinks there is an agreement, between the growth of Learning, and of Civil Government. The Method of the rise and increase of that, was, this. At first in every Country, there prevail'd nothing, but Barbarism, and Rudeness: All places were terrible with Gyants, and enchantments, and insolent Usurpers: Against these there first arose some mighty Heroes, as Hercules, Theseus, and Jason: These scour'd the World, redress'd injuries, destroy'd Monsters: and for this they were made Demi-gods. But then they gave over, and it was left to the great Men, who succeeded them, as Solon, and Lycurgus, to accomplish the Work, to found Common-weal'th, to give Laws, to put Justice in its course: And why may I not now presume (as many others have done before me) to reduce these stories to a Philosophical sense? First then, the Phantasms, and Fairies, and venerable Images of Antiquity, did long haunt the World: against these we have had our Champions; and without all question, they had the better of the cause.
cause: and now we have good ground to trust, that these Illusions being well over, the last finishing of this great Work, is nigh at hand, and is resolv'd for this undertaking.

So then, thus far they 'did well. But in the second part of their Enterprise, they themselves seem to me to have run into the same mistake, for which we chiefly complain'd against those Antients, whose Authority they destroy'd: The greatest occasion of our dissenting from the Greek Philosophers, and especially from Aristotle, was, that they made too much haste to seize on the prize, before they were at the end of the Race: that they fix'd, and determin'd their judgements, on general conclusions too soon, and so could not afterwards alter them, by any new appearances, which might represent themselves. And may we not suppose, that posterity will have the same quarrel at these men's labors? We do not fall foul upon Antiquity, out of any singularity of opinion, or a presumptuous confidence of the strength of our Wits above theirs. We admire the men, but only dislike the Method of their proceedings. And can we forbear murmuring, if we see our contemporaries disdain them, and yet imitate their failings? If we must constitute a Sovereignty over our Reasons; I know not, why we should not allow this Dominion to the Antients, rather then to any one of the Moderns. They are all dead long since: and though we should be over-reach'd by them in some few falsehoods, yet there is no danger, lest they should increase them upon us: whereas, if we once hang on the lips, of the wisest men now Living; we are still in their Power, and under their Discipline, and subject to be led by all their Dictates for the future. It
is true indeed, a diligent Inquirer of these times, may
gather as much experience, and if probability, con-
clude as rightly, as a whole Academy, or Sect of
their's could: yet I shall still deny, that any one Man,
though he has the nimblest, and most universal observation,
can ever, in the compass of his life, lay up
enough knowledge, to suffice all that shall come
after him to rest upon, without the help of any new
Inquiries.

And if we suppose the best, that some one Man,
by wonderful sagacity, or extraordinary chance,
shall light upon the True Principles of Natural Phi-
losophy: yet what will be the profit, of such uni-
versal Demonstrations, if they are onely fitted for
talk, and the solving of appearances? Will there
be any great matter, whether they are certain, or
doubtful; old, or new; if they must be onely boun-
ded to a syteme, and confin'd to discourse? The
True Philosophy must be first of all begun, on a
scrupulous, and severe examination of particulars:
from them, there may be some general Rules, with
great caution drawn: But it must not rest there, nor
is that the most difficult part of its course: It must ad-
Vance those Principles, to the finding out of new
effects, through all the varieties of Matter: and so
both the courses must proceed orderly together;
from experimenting, to Demonstrating, and from
demonstrating, to Experimenting again. I hope I shall
content my Reader, if I onely give one instance in
this case. It is probable, that he, who first discov-
er'd, that all things were order'd in Nature by Mo-
tion; went upon a better ground, then any before
him. But now if he will onely manage this, by
nicely disputing about the Nature, and Causes of
Motion.
The HISTORY of the

Motion in general; and not prosecute it through all particular Bodies: to what will he at last arrive, but onely to a better sort of Metaphysicks? And it may be, his Followers, some Ages hence, will divide his Doctrine into as many distinctions, as the Schole-men did that of Matter; and Form: and so the whole life of it, will also vanish away, into air, and words, as that of theirs has already done.

Sect. XIV. The ill effects of Dogmatical Philosophy.

But it is time for me to give over this Argument; in which I fear, that what I have already said, will alarm some excellent men, whose abilities I admire: who may perhaps suspect, that it has bin with a particular reflexion. I might say for my self, That first they must pass sentence on themselves, before they can think so, seeing I have nam’d no man. But I will rather sincerely profess, that I had no satirical Sense, but onely declar’d against Dogmatists in general. And I cannot repent my having done it, while I perceive, there are two very dangerous mischiefs, which are caus’d by that way of Philosophy. The one is, that it makes men give over, and believe that they are satisfi’d, too soon. This is of very ill consequence: For thereby mens industry will be slackned, and all the motives to any farther pursuit taken away. And indeed this is an error, which is very natural to mens minds: they love not a long and a tedious doubting, though it brings them at last to a real certainty: but they choose rather to conclude presently, then to be long in suspence, though to better purpose. And it is with most mens understandings, as with their eyes; to which those seem the most delightful prospects, where varieties of Hills, and Woods, do soon bound their wandrings; then where there is one large
large smooth campagne, over which they may see much farther; but where there is nothing to delay, and stop, and divert the sight.

But the other ill effect of which I shall take notice, is, that it commonly inclines such men, who think themselves already resolv'd, and immovable in their opinions, to be more imperious, and impatient of contradiction, then becomes the calmness, and unpassionate evenness of the true Philosophical Spirit. It makes them prone to undervalue other men's labours, and to neglect the real advantage, that may be gotten by their assistance; lest they should seem to darken their own glory. This is a Temper of mind, of all others the most pernicious; to which I may chiefly attribute the slowness of the increase of knowledge amongst men. For what great things can be expected, if men's understandings shall be (as it were) always in the warlike State of Nature, one against another? if every one be jealous of another's inventions, and still ready to put a stop to his conquests? Will there not be the same wild condition in Learning, which had been amongst men, if they had always been dispers'd, still preying upon, and spoiling their neighbors? If that had still continued, no Cities had been built, no Trades found out, no Civility taught: For all these noble productions came from men joyning in compacts, and entering into Society. It is a usual saying, that Where the Natural Philosopher ends, the Physician must begin: and I will also add, that The Natural Philosopher is to begin, where the Moral ends. It is requisite, that he who goes about such an undertaking, should first know himself, should be well-practis'd in all the modest, humble, friendly Vertues: should be willing to
to be taught, and to give way to the Judgement of others. And I dare boldly say, that a plain, industrious Man, so prepar'd, is more likely to make a good Philosopher, then all the high, earnest, insulting Wits, who can neither bear partnership, nor opposition. The Chymists lay it down, as a necessary qualification of their happy Man, to whom God will reveal their ador'd Elixir, that he must be rather innocent, and vertuous, then knowing. And if I were to form the Character of a True Philosopher, I would be sure to make that the Foundation: Not that I believe, God will bestow any extraordinary Light in Nature, on such men more then others: But upon a bare, rational account: For certainly, such men, whose minds are so soft, so yielding, so complying, so large, are in a far better way, then the Bold, and haughty Assertors: they will pass by nothing, by which they may learn: they will be always ready to receive, and communicate Observations: they will not contemn the Fruits of others diligence: they will rejoice, to see mankind benefited, whether it be by themselves, or others.

Sect. XV. The second endeavours, have been of those, who renounc'd the Authority of Aristotle: But then reform'd some one or other of the Antient Selse in his stead. If such mens intentions were onely, that we might have before us, the conceptions of several men, of different Ages, upon the works of Nature, without obliging us to an implicit consent to all that they affirm; then their labors ought to be receiv'd with great acknowledgements: For such a general prospect will very much inlarge, and guide our inquiry: and perhaps also will help to hinder the Age from
ROYAL SOCIETY.

from ever falling back again into a subjection to one usurping Philosopher. But if their purpose was, to erect those Scholes which they reviv'd, into as absolute a power, as the Peripateticks had heretofore: if they strive to make a competition between Aristotle, and Epicurus, or Democritus, or Philolaus: they do not contribute very much, towards the main design. For towards that, it is not enough, that the Tyrant be chang'd; but the Tyranny itself must be wholly taken away.

The Third sort of new Philosophers, have been those, who have not only disagreed from the Antients, but have also propos'd to themselves the right course of flow, and sure Experimenting: and have prosecuted it as far, as the shortness of their own Lives, or the multiplicity of their other affairs, or the narrowness of their Fortunes, have given them leave. Such as these, we are to expect to be but few: for they must devote themselves of many vain conceptions, and overcome a thousand false Images, which lye like Monsters in their way, before they can get as far as this. And of these, I shall onely mention one great Man, who had the true Imagination of the whole extent of this Enterprize, as it is now set on foot; and that is, the Lord Bacon. In whose Books there are every where scattered the best arguments, that can be produc'd for the defence of Experimental Philosophy; and the best directions, that are needful to promote it. All which he has already adorn'd with so much Art; that if my desires could have prevail'd with some excellent Friends of mine, who engag'd me to this Work: there should have been no other Preface to the History of the Royal Society,
ciety, but some of his Writings. But methinks, in
this one Man, I do at once find enough occasion, to
admire the strength of humane Wit, and to bewail
the weakness of a Mortal condition. For is it not
wonderful, that he, who had run through all the de-
grees of that profession, which usually takes up mens
whole time; who had studied, and practis'd, and
govern'd the Common Law: who had always liv'd in
the crowd, and born the greatest Burden of Civil
business: should yet find leisure enough for these re-
tir'd Studies, to excel all those men, who separate
themselves for this very purpose? He was a Man of
strong, clear, and powerful Imaginations: his Geni-
us was searching, and inimitable: and of this I need
give no other proof, than his Style itself; which as,
for the most part, it describes mens minds, as well as
Pictures do their Bodies; so it did his above all men:
living. The course of it vigorous, and majestical:
The Wit Bold, and Familiar: The comparisons fetch'd
out of the way, and yet the most easie: in all, ex-
pressing a soul, equally skill'd in Men, and Nature.
All this, and much more is true of him: But yet his
Philosophical Works do shew, that a single, and busie
hand can never grasp all this whole Design, of which
we treat. His Rules were admirable: yet his His-
tory not so faithful, as might have been wish'd in many
places, he seems rather to take all that comes, then
to choose; and to heap, rather, then to register.
But I hope this accusation of mine can be no great
injury to his Memory; seeing, at the same time,
that I say he had not the strength of a thousand
men; I do also allow him to have had as much as
twenty.
The next Philosophers, whom I shall touch upon, are the Chymists, who have been more numerous, in this later Age, than ever before. And without question, they have lighted upon the right Instrument of great productions, and alterations: which must for the most part be perform'd by Fire. They may be divided into three ranks: Such, as look after the knowledge of Nature in general: Such, as seek out, and prepare Medicines: and such, as search after riches, by Transmutations, and the great Elixir. The two first, have been very successful, in separating, compounding, and changing the parts of things: and in shewing the admirable powers of Nature, in the raising of new consistencies, figures, colors, and virtues of Bodies. And from their labors, the true philosophy is like to receive the noblest Improvements. But the pretensions of the Third kind, are not onely to indow us, with all the benefits of this life, but with Immortality itself. And their success has been as small, as their design was extravagant. Their Writers involve them in such darkness; that I scarce know, which was the greatest task, to understand their meaning, or to effect it. And in the chase of the Philosopher's Stone, they are so earnest, that they are scarce capable of any other thoughts: so that if an Experiment lye never so little out of their rode, it is free from their discovery: as I have heard of some creatures in Africk, which still going a violent pace straight on, and not being able to turn themselves, can never get any prey, but what they meet just in their way. This secret they prosecute so imputuously, that they believe they see some footsteps of it, in every line of Moses, Solomon, or Virgil. The truth is, they are downright Enthusiasts about
about it. And seeing we cast Enthusiasm out of Divin
ity itself, we shall hardly persuade be persuaded, to
admit it into Philosophy. It were perhaps a vain at
tempt, to try to cure such Men of their groundless
hopes. It may be they are happier now, as they are.
And they would only cry out with the Man in Horace,
that their Friends, who had restor'd them to a perfect sense, had murder'd them. But
certainly, if they could be brought to content them-
selves with moderate things, to grow rich by de-
grees, and not to imagine, they shall gain the Indies,
out of every Crucible: there might be wonderful
things expected from them. And of this we have
good assurance, by what is come abroad from di-
vers eminent Persons; amongst whom some are mem-
bers of the Royal Society. And, if it were not alrea-
dy excellently perform'd by others, I might here
speak largely, of the advantages that accrue to Phy-
sick, by the industrious labors of such Chymists, as
have only the discreet, and sober flame, and not the
wild lightning of the others Brains.

Sect XVIII.

Those that have handled particular Subjects.

But the last kind, that I shall name, has been of
those, who, conscious of humane frailty, and of the
vastness of the Design of an universal Philosophy; have
separated, and chosen out for themselves, some par-
ticular Subjects, about which to bestow their dili-
gence. In these, there was less hazard of failing:
these by one man's Industry, and constant in Endeavors,
might probably at last be overcome. And indeed
they have generally reap'd the fruits of their mode-
ity. I have but one thing to except against some
few of them: that they have been sometimes a little
too forward to conclude upon Axioms, from what
they
they have found out, in some particular Body. But that is a fault, which ought to be overwhelm'd by their other praises. And I shall boldly affirm, that if all other Philosophical Matters had been as well, and as thoroughly sifted, as some admirable Men of this Age have manag'd some parts of Astronomy, Geometry, Anatomy, &c. there would scarce any burden have remain'd, on the shoulders of our Posterity: But they might have fatter quietly down, and enjoy'd the pleasure of the true Speculative Philosophy, and the profit of the Practical.

To all these proceedings, that I have mention'd, there is as much honor to be pay'd, as can be due to any one single humane Wit; But they must pardon us, if we still prefer the joynt force of many men.

And now it is much to be wonder'd, that there was never yet such an Assembly erected, which might proceed, on some standing constitutions of Experimenting. There have, 'tis true, of late, in many parts of Europe, some Gentlemen met together, submitted to Common Laws, and form'd themselves into Academies. But it has been, for the most part, to a far different purpose: and most of them only aim'd at the smoothing of their Style, and the Language of their Country. Of these, the first arose in Italy; where they have since so much abounded, that there was scarce any one great City without one of these combinations. But that, which excell'd all the other, and kept it self-longer untainted from the corruptions of Speech, was the French Academy at Paris. This was compos'd of the noblest Authors of that Nation: and had for its Founder, the Great Cardinal de Richelieu: who, amongst all his cares, whereby he esta-

Sec. XIX.

Modern Academies for Language.
The HISTORY of the

blish'd, and enlarg'd that Monarchy so much, did often refresh himself by directing, and taking an account of their progress. And indeed in his own life, he found so great success of this Institution, that he saw the French Tongue abundantly purify'd, and beginning to take place in the Western World; almost as much, as the Greek did of old, when it was the Language of Merchants, Souldiers, Courtiers, and Travellers. But I shall say no more of this Academy; that I may not deprive my Reader of the delight of perusing their own History, written by Monsieur de Pelisson: which is so masculinely, so chastly, and so unaffectedly done, that I can hardly forbear envying the French Nation this honor: that while the English Royal Society has so much out-gone their Illustrious Academy, in the greatness of its undertaking, it should be so far short of them in the abilities of its Historian. I have onely this to allege in my excuse; that as they undertook the advancement of the Elegance of Speech, so it became their History, to have some resemblance to their enterprize: Whereas the intention of ours, being not the Artifice of Words, but a bare knowledge of things; my fault may be esteem'd the less, that I have written of Philosophers, without any ornament of Eloquence.

Sect. XX.
A proposal for erecting an English Academy.

I hope now, it will not be thought a vain digression, if I step a little aside, to recommend the forming of such an Assembly, to the Gentlemen of our Nation. I know indeed, that the English Genius is not so airy, and discoursive, as that of some of our neighbors, but that we generally love to have Reason set out in plain, undeceiving expressions; as much, as they to have it deliver'd with colour, and beauty. And besides
ROYAL SOCIETY.

fides this, I understand well enough, that they have one great assistance, to the growth of Oratory, which to us is wanting: that is, that their Nobility live commonly close together in their Cities, and ours for the most part scattered in their Country Houses. For the same reason, why our streets are not so well built as theirs, will hold also, for their exceeding us in the Arts of Speech: They prefer the Pleasures of the Town; we, those of the Field: whereas it is from the frequent conversations in Cities, that the Humour, and Wit, and Variety, and Elegance of Language, are chiefly to be fetch’d. But yet, notwithstanding these discouragements, I shall not stick to say, that such a project is now reasonable to be set on foot, and may make a great Reformation in the manner of our Speaking, and Writing. First, the thing itself is no way contemptible. For the purity of Speech, and greatness of Empire have in all Countries, still met together. The Greeks spoke best, when they were in their glory of conquest: The Romans made those times the Standard of their Wit, when they subdued, and gave Laws to the World: And from thence, by degrees, they declin’d to corruption; as their valour, their prudence, and the honor of their Arms did decay; and at last, did even meet the Northern Nations half way in Barbarism, a little before they were over-run by their Armies.

But besides, if we observe well the English Language; we shall find, that it seems at this time more then others, to require some such aid, to bring it to its last perfection. The Truth is, it has been hither-to a little too carelessly handled; and I think, has had less labor spent about its polishing, then it deserves.
The HISTORY of the

serves. Till the time of King Henry the Eighth, there was scarce any man regarded it, but Chancer; and nothing was written in it, which one would be willing to read twice, but some of his Poetry. But then it began to raise itself a little, and to sound tolerably well. From that Age, down to the beginning of our late Civil Wars, it was still fashioning, and beautifying itself. In the Wars themselves (which is a time, wherein all Languages use, if ever, to increase by extraordinary degrees; for in such busy, and active times, there arise more new thoughts of men, which must be signified, and varied by new expressions) then I say, it receiv’d many fantastical terms, which were inducti’d by our Religious Sects; and many outlandish phrases, which several Writers, and Translators, in that great hurry, brought in, and made free as they pleas’d, and with all it was inlarg’d by many found, and necessary Forms, and Idioms, which it before wanted. And now, when men’s minds are somewhat settled, their Passions allai’d, and the peace of our Country gives us the opportunity of such diversions: if some sober and judicious Men, would take the whole Mass of our Language into their hands, as they find it, and would set a mark on the ill Words; correct those, which are to be retain’d; admit, and establish the good; and make some emendations in the Accent, and Grammar: I dare pronounce, that our Speech would quickly arrive at as much plenty, as it is capable to receive; and at the greatest smoothness, which its derivation from the rough German will allow it.

Nor would I have this new English Academy, confin’d only to the weighing Words, and Letters: But there may be also greater Works found out for it. By many
many signs we may guess, that the Wits of our Nation, are not inferior to any other; and that they have an excellent mixture of the Spirit of the French, and the Spaniard: and I am confident, that we only want a few more standing Examples, and a little more familiarity with the Antients, to excel all the Moderns. Now the best means, that can be devise’d to bring that about, is to settle a fixt, and Impartial Court of Eloquence; according to whose Censure, all Books, or Authors should either stand or fall. And above all, there might be recommended to them one Principal Work, in which we are yet defective; and that is, the compiling of a History of our late Civil Wars. Of all the labors of men’s Wit, and Industry, I scarce know any, that can be more useful to the World, then Civil History: if it were written, with that sincerity, and majesty, as it ought to be, as a faithful Idea of humane Actions. And it is observable, that almost in all civiliz’d Countries, it has been the last thing, that has come to perfection. I may now say, that the English can already shew many industrious, and worthy Pieces in this kind: But yet, I have some Prophetical imagination in my thoughts, that there is still behind, something Greater, than any we have yet seen, reserv’d for the Glory of this Age. One Reason of this my strong persuasion, is a comparison, that I make, between the condition of our State, and that of the Romans. They at first writ, in this way, not much better then our Monks: onely Registering in an undigested manner, some few naked Breviaries of their Wars, and Leagues, and Acts, of their City Magistrates. And indeed they advanc’d forward by very slow degrees: For I remember, that Tully somewhere complains, in these Words:
The HISTORY of the

Words: Histriana nondum latinis literis illustrata. But it was in the peaceful reign of Augustus, after the conclusion of their long Civil Wars, that most of their perfect Historians appear'd. And it seems to me, that we may expect the same progress amongst us. There lyeth now ready in Bank, the most memorable Actions of Twenty years: a Subject of as great Dignity, and Variety, as ever pass'd under any Man's hands: the peace which we enjoy, gives leisure and encouragement enough: The effects of such a Work would be wonderfully advantageous, to the safety of our Country, and to His Majesty's Interest: for there can be no better means to preserve his Subjects in obedience for the future, than to give them a full view of the miseries, that attended rebellion. There are only therefore wanting, for the finishing of so brave an undertaking, the united endeavors of some publick minds, who are conversant both in Letters and Business: and if it were appointed to be the labor of one or two men to compose it, and of such an Assembly, to revise and correct it, it might certainly challenge all the Writings of past, or present Times.

But I see, I have already transgress'd: For I know it will be thought unadvisedly done, while I was enforcing a weightier Design, to start, and to follow another of less moment. I shall therefore let it pass as an extravagant conceit: only I shall affirm, that the Royal Society is so far from being like to put a stop to such a business, that I know many of its Members, who are as able as any others, to assist in the bringing it into practice.

Thus I have dispatch'd my first general Head; in which, it may be, it was not needful to have stay'd so long:
long: seeing, I am confident, I have said nothing, but what was before very well known, and what passes about in common discourse.

I did on purpose omit the Learned Age of the Arabians, in its proper place: because I was resolv’d, as I came down, to keep myself as near as I could, within the Bounds of Christendom. But I shall now add, concerning them, that their Studies also were principally bent, upon expounding Aristotle, and the Greek Physicians. They were, without question, men of a deep, and subtile Wit: which is a Character that it may be in all Ages has belong’d more justly to the Tempers of the Southern, than of the Northern Countries: of this they have left many noble Testimonies behind them; so many, that (if we believe some worthy and industrious Men of our own Nation, who have search’d into their Monuments) they might even almost be compar’d to Rome, and Athens themselves. But they injoy’d not the light long enough. It brake forth upon the point of their greatest conquests: It mainly consisted, in understanding the Antients: and what they would have done, when they had been weary of them, we cannot tell: For that Work was not fully over, before they were darkned by that, which made even Greece itself Barbarous, the Turkish Monarchy. However, that knowledge, which they had, is the more remarkable, because it sprung up, in that part of the World, which has been almost always pervertly unlearned. For methinks, that small Spot of Civil Arts, compar’d to their long course of ignorance, before, and after, bears some resemblance with that Country itself; where there are some few little Vallies, and Wells,
Wells, and pleasant Shades of *Palm-Trees*; But those lying in the midst of Deserts, and impassable Tracts of Sands.

**Sect. XXII.**

A defence of the Royal Society, in respect of the Antients.

But now it being a fit time to stop, and breathe a while, and to take a review of the ground, that we have pass'd. It will be here needful for me, to make an Apology for my self, in a matter, which, if it be not before-hand remov'd, may chance to be very prejudicial to mens good opinion of the *Royal Society* it self, as well as of its *Historian*. I fear, that this Assembly will receive disadvantage enough, from my weak management of their cause, in many other particulars: so that I must not leave them, and myself unjustify'd, in this, wherein we have so much right on our sides. I doubt not then, but it will come into the thoughts of many *Criticks*, (of whom the World is now full) to urge against us', that I have spoken a little too sparingly of the Merits of former Ages; and that this Design seems to be promoted, with a malicious intention of disgracing the Merits of the Antients.

But First, I shall beseech them, calmly to consider; whether they themselves do not more injure those great Men, whom they would make the Masters of our Judgments, by attributing all things to them so absolutely; then we, who do them all the Justice we can, without adoring them? It is always esteem'd the greatest mischief, a man can do those whom he loves, to raise mens expectations of them too high, by undue, and imperient commendations. For thereby not only their enemies, but indifferent men, will be secretly inclin'd to be more watchful over their failings, and to conspire in beating down their fame.
Fame. What then can be more dangerous to the honor of Antiquity; then to set its value at such a rate, and to extol it so extravagantly, that it can never be able to bear the tryal, not onely of envious, but even of impartial Judges? It is natural to Mens minds, when they perceive others to arrogate more to themselves, then is their share; to deny them even that, which else they would confess to be their Right. And of the Truth of this, we have an instance of far greater concernment, than that which is before us. And that is, in Religion it self. For while the Bishops of Rome did assume an infallibility, and a sovereign Dominion over our Faith: the reformed Churches did not onely justly refuse to grant them that, but some of them thought themselves obilig'd to forbear all communion with them, and would not give them that respect, which possibly might belong to so antient, and so famous a Church; and which might still have been allowed it, without any danger of Superstition.

But to carry this Dispute a little farther: What is this, of which they accuse us? They charge us with immodesty in neglecting the guidance of wiser, and more discerning Men, then our selves. But is not this rather the greatest sign of Modesty, to confess, that we our selves may err, and all mankind besides? To acknowledge the difficulties of Science? and to submit our minds, to all the least Works of Nature? What kind of behavior do they exact from us in this case? That we should reverence the Footsteps of Antiquity? We do it most unanimously. That we should subscribe to their sense, before our own? We are willing, in probabilities; but we cannot, in matters of Fact: for in them we follow the most antient Author
The HISTORY of the

Author of all others, even Nature itself. Would they have us make our eyes behold things, at no farther distance, than they saw? That is impossible; seeing we have the advantage of standing upon their shoulders. They say, it is insolence, to prefer our own inventions before those of our Ancestors. But do not even they the very same thing themselves, in all the petty matters of life? In the Arts of War, and Government; In the making, and abolishing of Laws; nay even in the fashion of their Cloaths, they differ from them, as their humour, or Fancy leads them. We approach the Antients, as we behold their Tombs, with veneration: but we would not therefore be confined to live in them altogether: nor would (I believe) any of those, who profess to be most addicted to their Memories. They tell us, that in this corruption of Manners, and sloth of Mens Minds, we cannot go beyond those, who search’d so diligently, and concluded so warily before us. But in this they are confuted by every days experience. They object to us Tradition, and the consent of all Ages. But do we not yet know the deceitfulness of such Words? Is any man, that is acquainted with the craft of founding Selves, or of managing Votes in popular Assemblies, ignorant, how easie it is to carry things in a violent stream? And when an opinion has once master’d its first opposers, and settled itself in Mens Passions, or Interests: how few there be, that coldly consider, what they admit for a long time after? So that when they say, that all Antiquity is against us; ’tis true, in shew, they object to us, the Wisdom of many Ages; but in reality, they onely confront us, with the Authority of a few leading Men. Nay, what if I should say, that this honor for the
ROYAL SOCIETY.

the dead, which such men pretend to, is rather a worshiping of themselves, than of the Ancients? It may be well prov'd, that they are more in love with their own Commentaries, then with the Texts of those, whom they seem to make their Oracles: and that they chiefly doat on those Theories, which they themselves have drawn from them: which, it is likely, are almost as far distant from the Original meaning of their Authors, as the Positions of the New Philosophers themselves.

But to conclude this Argument (for I am weary of walking in a roade so trodden,) I think I am able to confute such men by the practice of those very Ancients, to whom they stoop so low. Did not they trust themselves, and their own Reason? Did not they busie themselves in inquiry, make new Arts, establish new Tenets, overthrow the old, and order all things as they pleas'd, without any servile Regard to their Predecessors? The Grecians all, or the greatest part of them, fetch'd their Learning from Egypt. And did they blindly assent to all, that was taught them by the Priests of Isis, and Osiris? If so; then why did they not, together with their Arts, receive all the infinite Idolatries, which their Masters embrac'd? seeing it is not to be question'd, but the Egyptians deliver'd the rites of their Religion to strangers, with as much Solemnity at least, as they did the Mysteries of their Hieroglyphicks or Philosophy. Now then, let Pythagoras, Plato, and Aristotle, and the rest of their wise Men, be our examples, and we are safe. When they travell'd into the East, they collected what was fit for their purpose, and suitable to the Genius of their Country; and left the superfluities behind them: They brought home some
of their useful Secrets: but still counted their wor-
shiping a Dog, or an Onion, a Cat, or a Crocodile,
ridiculous. And why shall not we be allow’d the
same liberty, to distinguish, and choose, what we
will follow? Especially, seeing in this, they had a
more certain way of being instructed by their Te-
chers, then we have by them: They were present on
the place: They learn’d from the Men themselves,
by word of mouth; and so were in a likely course to
apprehend all their Precepts aright: whereas we are
to take their Doctrines, so many hundred years after
their death, from their Books only, where they are
for the most part so obscurely express’d, that they are
scarce sufficiently understood by the Grammarians,
and Linguists themselves, much less by the Philo-
osophers.

In few words therefore, let such men believe, that
we have no thought of detracting from what was
good in former times: But, on the contrary, we have
a mind to bestow on them, a solid praise, instead of a
great, and an empty. While we are raising new Ob-
servations upon Nature, we mean not to abolish the
Old, which were well, and judiciously establish’d by
them: No more, then a King, when he makes a new
Coyn of his own, does presentely call in that, which
bears the Image of his Father: he only intends there-
by to increase the current Money of his Kingdom,
and still permits the one to pass, as well as the other.
It is probable enough, that upon a fresh survey, we
may find many things true, which they have before
asserted: and then will not they receive a greater
confirmation, from this our new and severe appro-
bation, then from those men, who resign up their opi-
nions to their Words only? It is the best way of ho-
nozing them, to separate the certain things in them,
from the doubtful: For that shews, we are not so much carri'd towards them, by rash affection, as by an unbyas'd Judgement. If we would do them the most right; it is not necessary we should be perfectly like them in all things. There are two principal Ways of preserving the Names of those, that are pass'd: The one, by Pictures; the other, by Children: The Pictures may be so made, that they may far neerer resemble the Original, then Children do their Parents: and yet all Mankind choose rather to keep themselves alive by Children, then by the other. It is best for the Philosophers of this Age to imitate the Antients as their Children: to have their blood deriv'd down to them; but to add a new Complexion, and Life of their own: While those, that endeavor to come neer them in every Line, and Feature, may rather be call'd their dead Pictures, or Statues, then their Goyine Off-spring.

The End of the First Part.
Hus I am, at length, arriv'd at the second Part of my Method, The Narration itself. This I shall divide into three Periods of Time, according to the several Degrees of the preparation, growth, and compleat Constitution of the Royal Society.

The First shall consist of the first occasions of this Model, and the Men, who first devis'd to put it in execution: and shall end, where they began to make it a form'd, and Regular Assembly.

The Second shall trace out their first attempts, till they receiv'd the publick assistance of Royal Authority.

The Third shall deliver what they have done, since they were made a Royal Corporation.

It may seem perhaps, that in passing through the first of these, I go too far back, and treat of things, that may appear to be of too private, and Domestick concernment, to be spoken in this publick way. But if this Enterprise, which is now so well establish'd, shall be hereafter advantageous to Mankind, (as I make no scruple to foretel, that it will)
ROYAL SOCIETY.

it is but just, that future times should hear the names, of its first Promoters: That they may be able to render particular thanks to them, who first conceiv'd it in their minds, and practis'd some little draught of it long ago. And besides, I never yet saw an Historian that was clear from all Affections: that, it may be, were not so much to be call'd Integrity, as a stoical insensibility: Nor can I, more then others, resist my inclinations, which strongly force me to mention that, which will be for the honor of that place, where I receiv'd a great part of my Education. It was therefore, some space after the end of the Civil Wars at Oxford, in Dr. Wilkins his Lodgings, in Wadham College, which was then the place of Resort for Vertuous, and Learned Men, that the first meetings were made, which laid the foundation of all this that follow'd. The University had, at that time, many Members of its own, who had begun a free way of reasoning; and was also frequented by some Gentlemen, of Philosophical Minds, whom the misfortunes of the Kingdom, and the security and ease of a retirement amongst Gown-men, had drawn thither.

Their first purpose was no more, than onely the satisfaction of breathing a freer air, and of conversing in quiet one with another, without being ingag'd in the passions, and madness of that dismal Age. And from the Institution of that Assembly, it had been enough, if no other advantage had come, but this: That by this means there was a race of yong Men provided, against the next Age, whose minds receiving from them, their first Impressions of sober and generous knowledge, were invincibly arm'd against all the enchantments of Enthusiasm. But what is more, I may
venture to affirm, that it was in good measure, by the influence, which these Gentlemen had over the rest, that the University itself, or at least, any part of its Discipline, and Order, was sav’d from ruine. And from hence we may conclude, that the same Men have now no intention, of sweeping away all the honor of Antiquity in this their new Design: seeing they imploy’d so much of their labor, and prudence, in preserving that most venerable Seat of antient Learning, when their shrinking from its defence, would have been the speediest way to have destroy’d it. For the Truth of this, I dare appeal to all uninterested men, who knew the Temper of that place; and especially to those who were my own contemporaries there: of whom I can name very many, whom the happy restoration of the Kingdom’s peace, found as well inclin’d, to serve their Prince, and the Church, as if they had been bred up in the most prosperous condition of their Country. This was undoubtedly so. Nor indeed could it be otherwise: for such spiritual Frenzies, which did then bear Rule, can never stand long, before a clear, and a deep skill in Nature. It is almost impossible, that they, who converse much with the subtility of things, should be deluded by such thick deceits. There is but one better charm in the world, then Real Philosophy, to allay the impulses of the false spirit: and that is, the blessed presence, and assistance of the True.

Nor were the good effects of this conversation, onely confin’d to Oxford: But they have made themselves known in their printed Works, both in our own, and in the learned Language: which have much conduc’d to the Fame of our Nation abroad, and to the spreading of profitable Light, at home. This I trust
ROYAL SOCIETY.

trust will be universally acknowledg'd, when I shall have nam'd the Men. The principal, and most constant of them, were Doctor Seth Ward, the present Lord Bishop of Exeter, Mr. Boyle, Dr. Wilkins, Sir William Petty, Mr. Mathew Wren, Dr. Wallis, Dr. Goddard, Dr. Willis, Dr. Bishurst, Dr. Christopher Wren, Mr. Rook: besides several others, who joyn'd themselves to them, upon occasions. Now I have produc'd their Names, I am a little at a stand, how to deal with them. For, if I should say what they deserve; I fear it would be interpreted flattery, instead of justice. And yet I have now lying in my sight, the example of an Elegant Book, which I have profess'd to admire: whose Author sticks not, to make large Panegyricks, on the Members of that Assembly, whose Relation he writes. But this President is not to be follow'd by a young Man; who ought to be more jealous of public censure, and is not enough confirm'd in the good liking of the world; to think, that he has such a weighty, and difficult work, as the making of Characters, committed to him. I will therefore pass by their praises in silence; though I believe, that what I might say of them, would be generally confess'd: and that if any ingenuous man, who knows them, or their writings, should contradict me, he would also go neer to gainsay himself, and to retract the applauses, which he had sometime, or other, bestow'd upon them.

For such a candid, and unpassionate company, as that was, and for such a gloomy season, what could have been a fitter Subject to pitch upon, then Natural Philosophy? To have been always toasting about some Theological question, would have been, to have made that their private diversion, the excess of which,
which they themselves dislik’d in the publick: To have been eternally musing on civil business, and the distresses of their Country, was too melancholy a reflection: It was Nature alone, which could pleasantly entertain them, in that estate. The contemplation of that, draws our minds off from past, or present misfortunes, and makes them conquerers over things, in the greatest publick unhappiness: while the consideration of Men, and humane affairs, may affect us, with a thousand various disquiets; that never separates us into mortal factions; that gives us room to differ, without animosity; and permits us, to raise contrary imaginations upon it, without any danger of a civil war.

Their meetings were as frequent, as their affairs permitted: their proceedings rather by action, than discourse; chiefly attending some particular trials, in chymistry, or mechanics: they had no rules nor method fix’d: their intention was more, to communicate to each other, their discoveries, which they could make in so narrow a compass, than an united, constant, or regular inquisition. And me thinks, their constitution did bear some resemblance, to the academy lately begun at Paris: where they have at last turn’d their thoughts, from words, to experimental philosophy, and perhaps in imitation of the royal society. Their manner likewise, is to assemble in a private house, to reason freely upon the works of nature; to pass conjectures, and propose problems, on any mathematical, or philosophical matter, which comes in their way. And this is an omen, on which I will build some hope, that as they agree with us in what was done at Oxford, so they will go on farther, and come by the same degrees, to erect another
another Royal Society in France. I promise for these Gentlemen here (as well I know the generosity of their Design) that they will be most ready to accept their assistance. To them, and to all the Learned World besides, they call for aid. No difference of Country, Interest, or profession of Religion, will make them backward from taking, or affording help in this enterprize. And indeed all Europe at this time, have two general Wars, which they ought in honor to make: The one a holy, the other a philosophical: The one against the common Enemy of Christendom, the other also against powerful, and barbarous Foes, that have not been fully subdued almost these six thousand years, Ignorance, and False Opinions. Against these, it becomes us, to go forth in one common expedition: All civil Nations joyning their Armies against the one, and their Reason against the other; without any petty contentions, about privileges, or precedence.

Thus they continued without any great Intermissions, till about the year 1658. But then being call'd away to several parts of the Nation, and the greatest number of them coming to London, they usually met at Gresham College, at the Wednesdays, and Thursdays Lectures of Dr. Wren, and Mr. Hook: where there joyn'd with them several eminent persons of their common acquaintance: The Lord Viscount Brownlow, the now Lord Beresford, Sir Paul Neil, Mr. John Evelyn, Mr. Henshaw, Mr. Slingsby, Dr. Timothy Clark, Dr. Ent, Mr. Ball, Mr. Hill, Dr. Crone: and divers other Gentlemen, whose inclinations lay the same way. This Custom was observ'd once, if not twice a week, in Term time; till they were scat-
The HISTORY of the

tired by the miserable distractions of that Fatal years, till the continuance of their meetings there might have made them run the hazard of the fate of Archimedes: For then the place of their meeting was made a Quarter for Soldiers. But, (to make haste through those dreadful revolutions, which cannot be beheld upon Paper, without horror; unless we remember, that they had this one happy effect, to open mens eyes to look out for the true Remedy) upon this follow'd the King's Return; and that, wrought by such an admirable chain of events, that if we either regard the easiness, or speed, or blessed issue of the Work; it seems of itself to contain variety, and pleasure enough, to make recompence, for the whole Twenty years Melancholy, that had gone before. This I leave to another kind of History to be describ'd. It shall suffice my purpose, that Philosophy had its share, in the benefits of that glorious Action: For the Royal Society had its beginning in the wonderful pacifick year, 1660. So that, if any conjectures of good Fortune, from extraordinary Nativities, hold true; we may presage all happiness to this undertaking. And I shall here joyne my solemn wishes, that as it began in that time, when our Country was freed from confusion, and slavery: So it may, in its progress, redeem the minds of Men, from obscurity, uncertainty, and bondage.

Sect. IV.
The beginning of the Royal Society.

These Gentlemen therefore, finding the hearts of their Countrymen inlarg'd by their Joys, and fitted for any noble Proposition: and meeting with the concurrence of many Worthy Men, who, to their immortal Honor, had follow'd the King in his banishment, Mr. Erskine, Sir Robert Moray, Sir Gilbert Talb,
bot, &c. began now to imagine some greater thing; and to bring out experimental knowledge, from the retreats, in which it had long hid it self, to take its part in the triumphs of that universal Jubilee. And indeed Philosophy did very well deserve that reward: having been always Loyal in the worst of times: For though the Kings enemies had gain'd all other advantages; though they had all the Garrisons, and Fleets, and Ammunitions, and Treasures, and Armies on their side: yet they could never, by all their Victories, bring over the Reason of Men to their Party.

While they were thus ord'ring their platform; there came forth a Treatise, which very much haft'en'd its contrivance: and that was a Proposal by Master Cowley, of erecting a Philosophical College. The intent of it was, that in some place neer London, there should liberal Salaries be bestow'd, on a competent number of Learned Men, to whom should be committed the operations of Natural Experiments. This Model was every way practicable: unless perhaps, in two things, he did more consult the generolity of his own mind, than of other mens. the one was the largeness of the Revenue, with which he would have his College at first indow'd: the other, that he impos'd on his Operators, a Second task of great pains, the Education of youth.

The last of these is indeed a matter of great weight: The Reformation of which ought to be seriously examin'd by prudent Men. For it is an undeniable Truth, which is commonly said; that there would be need of fewer Laws, and less force to govern Men, if their Minds were rightly inform'd, and set straight, while they were young, and pliable. But
perhaps this labor is not so proper, for Experimenters to undergo: For it would not only devour too much of their Time: but it would go neer, to make them a little more magisterial in Philosophy; then became them; by being long accusom'd to command the opinions, and direct the manners, of their Scholars. And as to the other particular, the large estate, which he requir'd to the maintenance of his College: It is evident, that it is so difficult a thing, to draw men in, to be willing to divert an antient Revenue, which had long run in another stream, or to contribute out of their own purses, to the supporting of any new Design, while it shews nothing but promises, and hopes: that, in such cases, it were (it may be) more advizable, to begin upon a small stock, and so to rise by degrees; then to profess great things at first, and to exact too much benevolence, all in one lump together. However, it was not the excellent Author's fault, that he thought better of the Age, then it did deserve. His purpose in it was like himself, full of honor, and goodness: most of the other particulars of his draught, the Royal Society is now putting in practice.

I come now to the Second Period of my Narration: wherein I promis'd, to give an account of what they did, till they were publickly own'd, encourag'd, and confirm'd by Royal Favor. And I trust, that I shall here produce many things, which will prove their attempts to be worthy of all Mens encouragment: though what was perform'd in this interval, may be rather styl'd the Temporary Scaffold, about the building, then the Frame itself. But in my entrance upon this Part, being come to the top of the Hill, I begin to tremble, and to apprehend the greatness of
my Subject. For I perceive that I have led my Readers Minds on, by so long, and so confident a Speech, to expect some wonderful Model, which shall far exceed all the former, that I have acknowledg'd to have been imperfect. Now, though this were really so, as I believe it is; yet I question, how it will look, after it has been disfigur'd by my unskilful hands. But the danger of this ought to have deter'd me in the beginning. It is now too late to look back; and I can only apply my self to that good Nature, which a Great Man has observ'd to be so peculiar to our Nation, that there is scarce an expression to signifie it, in any other Language. To this I must flye for succor, and most affectionately intreat my Countrymen, that they would interpret my failings to be onely errors of obedience to some, whose commands, or desires, I could not resist: and that they would take the measure of the Royal Society, not so much from my lame description of it; as from the honor, and reputation, of many of those Men, of whom it is compos'd.

I will here, in the first place, contract into few Words, the whole summe of their Resolutions; which I shall often have occasion, to touch upon in parcels. Their purpose is, in short, to make faithful Records, of all the Works of Nature, or Art, which can come within their reach: that so the present Age, and posterity, may be able to put a mark on the Errors, which have been strengthened by long prescription: to restore the Truths, that have lain neglected: to push on those, which are already known, to more various uses: and to make the way more passable, to what remains unreveal'd. This is the compass of their Design.
Design. And to accomplish this, they have点儿
ed, to separate the knowledge of \textit{Nature}, from
the colours of \textit{Rhetorick}, the devices of \textit{Fancy}, or the
delightful deceit of \textit{Fables}. They have labor'd to
inlarge it, from being confin'd to the custody of a
few; or from servitude to private interests. They
have striven to preserve it from being over-press'd by
a confus'd heap of vain, and useless particulars; or
from being straitned and bounded too much up by
General \textit{Doctrines}. They have try'd, to put it into a
condition of perpetual increasing; by settling an in-
violable correspondence between the hand, and the
brain. They have studi'd, to make it, not onely an
Enterprise of one season, or of some lucky opportu-
nity; but a business of time, a lasting, a
popular, an uninterrupted Work. They have at-
tempted, to free it from the \textit{Artisice}, and Humors,
and Passions of Sects; to render it an Instrument,
whereby Mankind may obtain a Dominion over
\textit{Things}, and not onely over one anothers \textit{Judgements}.
And lastly, they have begun to establish these Reforma-
tions in Philosophy, not so much, by any solemnni-
ty of Laws, or ostentation of Ceremonies; as by so-
lid Practice, and examples: not, by a glorious pomp
of Words; but by the silent, effectual, and unan-
swerable Arguments of real Productions.

This will more fully appear, by what I am to say on
these four particulars, which shall make up this part
of my Relation, the \textit{Qualifications} of their \textit{Members}:
the manner of their \textit{Inquiry}: their weekly \textit{Assemblies}:
and their \textit{way of Registering}.

As for what belongs to the \textit{Members} themselves,
that are to constitute the \textit{Society}: It is to be noted,
that they have freely admitted Men of different Religions, Countries, and Professions of Life. This they were oblig'd to do, or else they would come far short of the the largeness of their own Declarations. For they openly profess, not to lay the Foundation of an English, Scotch, Irish, Popish, or Protestant Philosophy; but a Philosophy of Mankind.

That the Church of England ought not to be apprehensive, of this free converse of various Judgments, I shall afterwards manifest at large. For the present, I shall frankly assert; that our Doctrine, and Discipline, will be so far from receiving damage by it; that it were the best way to make them universally embrac'd, if they were oftner brought to be canvas'd amidst all sorts of dissenters. It is dishonorable, to pass a hard Censure on the Religions of all other Countries: It concerns them, to look to the reasonableness of their Faith; and it is sufficient for us, to be establish'd in the Truth of our own. But yet: this comparison I may modestly make; that there is no one Profession, amidst the several denominations of Christians, that can be expos'd to the search and scrutiny of its adversaries, with so much safety as ours. So equal it is, above all others, to the general Reason of Mankind: such honorable security it provides, both for the liberty of Men's Minds, and for the peace of Government: that if some Men's conceptions were put in practice, that all wise Men should have two Religions; the one, a publick, for their conformity with the people; the other, a private, to be kept to their own Breasts: I am confident, that most considering Men, whatever their first were, would make ours their second, if they were well acquainted with it. Seeing therefore, our Church would be in,
so fair a probability of gaining very much, by a frequent contention, and encounter, with other Sects: It cannot be indanger'd by this Assembly; which proceeds no farther, then to an unprejudic'd mixture with them.

By their naturalizing Men of all Countries, they have laid the beginnings of many great advantages for the future. For by this means, they will be able, to settle a constant Intelligence, throughout all civil Nations; and make the Royal Society the general Banck, and Free-port of the World: A policy, which whether it would hold good, in the Trade of England, I know not: but sure it will in the Philosophy. We are to overcome the mysteries of all the Works of Nature; and not onely to prosecute such as are confin'd to one Kingdom, or beat upon one shore. We should not then refuse to list all the aids, that will come in, how remote soever. If I could fetch my materials whence I pleas'd, to fashion the Idea of a perfect Philosopher: he should not be all of one clime, but have the different excellencies of several Countries. First, he should have the Industry, Activity, and Inquisitive humor of the Dutch, French, Scotch, and English; in laying the ground Work, the heap of Experiments: And then he should have added the cold, and circumspect, and wary disposition of the Italians, and Spaniards, in meditating upon them, before he fully brings them into speculation. All this is scarce ever to be found in one single Man: seldom in the same Countrymen: It must then be supply'd, as well as it may, by a Publick Council, where-in the various dispositions of all these Nations, may be blended together. To this purpose, the Royal Society has made no scruple, to receive all inquisitive strangers.
strangers of all Countries, into its number. And this they have constantly done, with such peculiar respect, that they have not oblig'd them to the charge of contributions: they have always taken care, that some of their Members, should assist them in interpreting all that pass'd, in their publick Assemblies: and they have freely open'd their Registers to them; thereby inviting them, to communicate foreign Rarities, by imparting their own discoveries. This has been often acknowledg'd, by many Learned Men, who have travell'd hither; who have been introduced to their meetings, and have admir'd the decency, the gravity, the plainness, and the calmness of their debates. This they have publish'd to the world: and this has rous'd all our neighbors to fix their eyes upon England. From hence they expect the great improvements of knowledge will flow: and though, perhaps, they send their Youth into other parts, to learn Fashion, and Breeding: yet their Men come hither for nobler ends; to be instructed, in the masculine, and the solid Arts of Life: which is a matter of as much greater Reputation, as it is more honorable, to teach Philosophers, than Children.

By their admission of Men of all professions, these two Benefits arise: The one, that every Art, and every way of life already establish'd, may be secure of receiving no damage by their Counsels. A thing which all new Inventions ought carefully to consult. It is in vain, to declare against the profit of the most, in any change that we would make. We must not always deal with the violent current of popular passions; as they do with the furious Eager in the Severn: Where the safest way is, to set the head of the Boat directly against its force. But here Men must follow
follow the shore; wind about leisurely; and insinuate their useful alterations, by slow, and unperceivable degrees. From the neglect of this Prudence, we often see men of great Wit, to have been overborn by the multitude of their opposers; and to have found all their subtile projects too weak, for custom, and interest. While being a little too much heated with a love of their own fancies; they have rais'd to themselves more Enemies than they needed to have done; by defying at once, too many things in use. But here, this danger is very well prevented. For what suspicion can Divinity, Law, or Physick, or any other course of life have, that they shall be impair'd by these mens labours: when they themselves are as capable of sitting amongst them as any others? Have they not the fame security that the whole Nation has for its lives and fortunes? of which this is esteem'd the Establishment, that men of all sorts, and qualities, give their voice in every law that is made in Parliament. But the other benefit is, that by this equal Balance of all Professions, there will no one particular of them over-weigh the other, or make the Oracle onely speak their private sense: which else it were impossible to avoid. It is natural to all Ranks of men, to have some one Darling, upon which their care is chiefly fix'd. If Mechanicks alone were to make a Philosophy, they would bring it all into their Shops; and force it wholly to consist of Springs and Wheels, and Weights: if Physicians, they would not depart far from their Art; scarce any thing would be consider'd, besides the Body of Man, the Causes, Signs, and Cures of Diseases. So much is to be found in Men of all conditions, of that which is call'd Pedantry in Scholars: which is nothing else but an obstinate addiction, to the
the forms of some private life, and not regarding general things enough. This freedom therefore, which they use, in embracing all assistance, is most advantageous to them: which is the more remarkable, in that they diligently search out, and join to them, all extraordinary men, though but of ordinary Trades. And that they are likely to continue this comprehensive temper hereafter, I will shew by one Instance: and it is the recommendation which the King himself was pleased to make, of the judicious Author of the Observations on the Bills of Mortality. In whose Election, it was so far from being a prejudice, that he was a Shop-keeper of London; that His Majesty gave this particular charge to His Society, that if they found any more such Tradesmen, they should be sure to admit them all, without any more ado. From hence it may be concluded, what is their inclination towards the manual Arts; by the careful regard which their Founder, and Patron, has engag'd them to have, for all sorts of Mechanick Artists.

But though the Society entertains very many men of particular professions; yet the far greater Number are Gentlemen, free, and unconfin'd. By the help of this, there was hopeful Provision made against two corruptions of Learning, which have been long complain'd of, but never remov'd: The one, that Knowledge still degenerates to consult present profit too soon; the other, that Philosophers have bin always Masters, & Scholars; some imposing, & all the other submitting; and not as equal observers without dependence.

The first of these may be call'd, the marrying of Arts too soon; and putting them to generation, before they come to be of Age; and has been the cause of much
much inconvenience. It weakens their strength; It makes an unhappy disproportion in their increase; while not the best, but the most gainful of them flourish: But above all, it diminishes that very profit for which men strive. It busies them about pos sessing some petty prize; while Nature itself, with all its mighty Treas ures, slips from them: and so they are serv'd like some foolish Guards; who, while they were earnest in picking up some small Money, that the Prisoner drop'd out of his Pocket, let the Prisoner himself escape, from whom they might have got a great ransom. This is easily declam'd against, but most difficult to be hindred. If any caution will serve, it must be this; to commit the Work to the care of such men, who, by the freedom of their education, the plenty of their estates, and the usual generosity of Noble Blood, may be well suppos'd to be most averse from such for did considerations.

The second Error, which is hereby endeavour'd to be remedied, is, that the Seats of Knowledge have been for the most part heretofore, not Laboratories, as they ought to be; but onely Scholes, where some have taugh't, and all the rest subscrib'd. The consequences of this are very mischiefous. For first, as many Learners as there are, so many hands, and brains may still be reckon'd upon, as useless. It being onely the Master's part, to examine, and observe; and the Disciples, to submit with silence, to what they con clude. But besides this, the very inequality of the Titles of Teachers, and Scholars, does very much sup press, and tame mens Spirits; which though it should be proper for Discipline and Education; yet is by no means consistent with a free Philosophical Consulta tion. It is undoubtedly true; that scarce any man's
mind, is so capable of thinking strongly, in the presence of one, whom he fears and reverences; as he is, when that restraint is taken off. And this is to be found, not only in these weightier matters; but also (to give a lighter instance) in the Arts of Discourse, & raillery themselves. For we have often seen men of bold tempers, that have over-aw'd and govern'd the Wit of most Companies; to have been disturb'd, and dumb, & bashful as children, when some other man has been near, who us'd to out-talk them. Such a kind of natural sovereignty there is, in some men's minds over others, which must needs be farr greater, when it is advanc'd by long use, & the venerable name of a Master. I shall only mention one prejudice more, & that is this; That from this onely teaching, and learning, there does not onely follow a continuance, but an increase of the yoak upon our Reasons. For those who take their opinions from others Rules, are commonly stricter Imposters upon their Scholars, than their own Authors were on them, or than the first Inventors of things themselves are upon others. Whatever the cause of this be; whether the first men are made meek, and gentle, by their long search, and by better understanding all the difficulties of Knowledg; while those that learn afterwards, onely hastily catching things in small Systems, are soon satisfi'd, before they have broken their pride, & so become more imperious: or, whether it arises from hence, that the same meanness of Soul, which made them bound their thoughts by others Precepts, makes them also insolent to their inferiors; as we always find cowards the most cruel: or whatever other cause may be alleg'd; the observation is certain, that the successors are usually more positive, and Tyrannical, than the beginners of Sects.
If then there can be any cure devis'd for this; it must be no other, than to form an Assembly at one time, whose privileges shall be the same; whose gain shall be in common; whose Members were not brought up at the feet of each other. But after all, even this cannot be free from prevarication in all future Ages. So apt are some to distrust, and others to confide too much in themselves: so much sweetness there is, in leading parties: so much pride, in following a Faction; such various artifices there are, to ensnare mens Passions, and soon after their Understandings. All these hazards, and many more, are to be suppos'd; which it is impossible, for mortal Wit, wholly to foresee, much less to avoid. But yet we have less ground of jealousy from this Institution, than any other, not only, because they only deal in matters of Fact, which are not so easily perverted; but also upon Security of the Inclinations of the greatest part of the Members of the Society itself. This, I hope, most men will acknowledge, and I will take the permission, to say in general of them, that in all past and present times, I am confident, there can never be shewn, so great a Number of Contemporaries, in so narrow a space of the World, that lov'd truth so zealously; sought it so constantly; and upon whose labours, mankind might so freely rely. This I speak, not out of Bravery to Foreigners (before whose eyes, I believe this negligent Discourse will never appear) but to the learned Men of this Nation, who are better Judges of what I say. And this too, I dare affirm, in an Age, wherein I expect to be condemn'd of faldhood, or partiality, for this Character, which I have given. For so it happens, that we are now arriv'd at that excessive cenfuring humor, that he who takes upon him to commend any thing,
thing, though never so worthy, will raise to himself far more Enemies than Friends. And indeed this
scurrility of Criticism, which now bears all down be-
fore it, is very injurious to the honour of our Coun-
trey. For by despising men, for not being absolutely excellent; we keep them from being so: while ad-
monitions, join'd with praises; and reproofs, with di-
rections; would quickly bring all things to a higher perfection. But the rudeness of such Criticks, I do
not so much regard; as the objections of soberer men,
who have a real good will to the promotion of this
design, and yet may be a little dissatisfy'd in this place.
For here especially they may doubt of two things.
The first, whether the Royal Society, being so numerous as it is, will not in short time be diverted from its pri-
mitive purpose; seeing there will be scarce enough men of Philosophical temper always found, to fill it up;
and then others will crowd in, who have not the same bent of mind; and so the whole business will insen-
sibly be made, rather a matter of noise and pomp, than of real benefit? The second, Whether their number
being so large, will not at length private men, from im-
parting many profitable secrets to them; left they
should thereby become common, and so they be de-
priv'd of the gain, which else they might be sure of,
if they kept them to themselves.

To the first, I shall reply, That this scruple is of no
force, in respect of the Age wherein we live. For now
the Genius of Experimenting is so much dispers'd, that
even in this Nation, if there were one, or two more such Assemblies settl'd; there could not be wanting
able men enough, to carry them on. All places and
corners are now busie; and warm about this Work:
and we find many Noble Rarities to be every day given in, not onely by the hands of Learned and profess'd Philosophers; but from the Shops of Mechnicks; from the Voyages of Merchants; from the Ploughs of Husbandmen; from the Sports, the Fishponds, the Parks, the Gardens of Gentlemen; the doubt therefore will onely touch future Ages. And even for them too, we may securely promise; that they will not, for a long time, be barren of a Race of Inquisitive minds, when the way is now so plainly trac'd out before them; when they shall have tasted of these first Fruits, and have been excited by this Example. There was scarce ever yet, any the meanest Sect, or the most contemptible Opinion, that was utterly extinguish'd in its Cradle. Whether they deserv'd to live, or not, they all had their course; some longer, some shorter; according as they could combine with the Interests, or affections, of the Countreys where they began. What reason then have we to bode ill alone to this Institution; which is now so earnestly embrac'd; and which, the older it grows, cannot but still appear more inoffensive? If we onely requir'd perfect Philosophers, to manage this employment, it were another case. For then I grant it were improbable, that threescore, or an hundred such should meet in one time. But here it is far otherwise. If we cannot have a sufficient choice of those that are skil'd in all Divine and human things (which was the antient definition of a Philosopher) it suffices, if many of them be plain, diligent, and laborious observers: such, who, though they bring not much knowledge, yet bring their hands, and their eyes uncorrupted: such as have not their Brains infected by false Images; and can honestly assist in the examining, and Registering what
what the others represent to their view. It seems strange to me, that men should conspire, to believe all things more perplex'd, and difficult, than indeed they are. This may be shown in most other matters; but in this particular in hand, it is most evident. Men did generally think, that no man was fit to meddle in matters of this consequence, but he that had bred himself up in a long course of Discipline for that purpose; that had the habit, the gesture, the look of a Philosopher. Whereas experience on the contrary tells us, that greater things are produc'd, by the free way, than the formal. This mistake may well be compar'd, to the conceit we had of soldiers, in the beginning of the civil Wars. None was thought worthy of that name, but he that could shew his wounds, and talk aloud of his exploits in the Low-Country's. Whereas the whole business of fighting, was afterwards chiefly perform'd by untravel'd Gentlemen, raw Citizens, and Generals, that had scarce ever before seen a Battel. But to say no more, it is so far from being a blemish; that it is rather the excellency of this Institution, that men of various Studies are introduc'd. For so there will be always many sincere witnesses standing by, whom self-love will not persuade to report fallly, nor heat of invention carry to swallow a deceit too soon; as having themselves no hand in the making of the Experiment, but only in the Inspection. So cautious ought men to be, in pronouncing even upon Matters of Fact. The whole care is not to be trusted to single men: not to a Company all of one mind; not to Philosophers; not to devout, and religious men alone: By all these we have been already deluded; even by those whom I last nam'd, who ought most of all to abhor falsity, of whom yet many have multi-
tiply'd upon us, infinite Stories, and false Miracles, without any regard to Conscience, or Truth.

To the second Objection I shall briefly answer; that if all the Authors, or Possessors of extraordinary inventions, should conspire to conceal all, that was in their power, from them; yet the Method, which they take, will quickly make abundant reparation for that defect. If they cannot come at Nature in its particular Streams, they will have it in the Fountain. If they could be shut out from the Closets of Physicians, or the Work-houses of Mechanicks, yet with the same, or with better sorts of Instruments, on more materials, by more hands, with a more rational light, they would not only restore again the old Arts, but find out, perhaps, many more of far greater importance. But I need not lay much stress upon that hope; when there is no question at all, but all, or the greatest part of such Domestick Receipts, and Curiosities, will soon flow into this publick Treasure. How few secrets have there been, though never so gainful, that have been long conceal'd from the whole World by their Authors? Were not all the least Arts of life at first private? Were not Watches, or Locks, or Guns, or Printing, or lately the Bow-dye, devis'd by particular men, but soon made common? If neither chance, nor friendship, nor Treachery of servants, have brought such things out; yet we see ostentation alone, to be every day powerful enough to do it. This desire of glory, and to be counted Authors; prevails on all, even on many of the dark and reserv'd Chymists themselves: who are ever printing their greatest mysteries; though indeed they seem to do it, with so much reluctance, and with a willingness to hide still; which makes their style to resemble the smoke, in which they deal.
deal. Well then, if this disposition be so universal; why should we think, that the Inventors, will be only tender, and backward to the Royal Society? From which they will not only reap the most solid honor; but will also receive the strongest assurances, of still retaining the greatest part of the profit? But if all this should fail; there still remains a refuge, which will put this whole matter out of dispute: and that is, that the Royal Society will be able by degrees, to purchase such extraordinary inventions, which are now close lock'd up in Cabinets; and then to bring them into one common Stock, which shall be upon all occasions expos'd to all mens use. This is a most heroick Invention: For by such concealments, there may come very much hurt to mankind. If any certain remedy should be found out against an Epidemical disease; if it were suffer'd to be ingross'd by one man, there would be great swarms swept away, which otherwise might be easily sav'd. I shall instance in the Sweating-Sickness. The Medicine for it was almost infallible: But, before that could be generally publish'd, it had almost dispeopled whole Towns. If the same disease should have return'd, it might have been again as destructive, had not the Lord Bacon taken care, to set down the particular course of Physick for it, in his History of Henry the Seventh, and so put it beyond the possibility of any private man's invading it. This ought to be imitated in all other sovereign cures of the like nature, to avoid such dreadful casualties. The Artificers should reap the common crop of their Arts: but the publick should still have Title to the miraculous productions. It should be so appointed, as it is in the profits of mens Lands: where the Corn, and Grains, and Timber, and some couther Metals belong to the owner.
The HISTORY of the

owner: But the Royal Mines, in whose ground forever they are discover'd, are no man's propriety, but still fall to the Crown.

These therefore are the qualities, which they have principally required, in those, whom they admitted: still referring to themselves a power of increasing, or keeping to their number, as they saw occasion. By this means, they have given assurance of an eternal quietness, and moderation, in their experimental progress; because they allow themselves to differ in the weightiest matter, even in the way of salvation itself. By this they have taken care, that nothing shall be so remote, as to escape their reach: because some of their Members are still scattered abroad, in most of the habitable parts of the Earth. By this, they have provided, that no profitable thing shall seem too mean for their consideration, seeing they have some amongst them, whose life is employ'd about little things, as well as great. By this they have broken down the partition wall, and made a fair entrance, for all conditions of men to engage in these Studies, which were heretofore affrighted from them, by a groundless apprehension of their chargeableness, and difficulty. Thus they have form'd that Society, which intends a Philosophy, for the use of Cities, and not for the retirements of Schools, to resemble the Cities themselves: which are compounded of all sorts of men, of the Crown, of the Sword, of the Shop, of the Field, of the Court, of the Sea; all mutually assisting each other.

Sect. IX. Their course of Inquiry. Let us next consider what course of Inquiry they take, to make all their Labours unite for the service of man-kind: And here I shall insist on their Expense,
Their Ex-

Of the Stock, upon which their Expençe has been hitherto defraied, I can say nothing, that is very magna-

cient: seeing they have rely'd upon no more than some small Admission-money, and weekly Contributions

amongst themselves. Such a Revenue as this, can make no great sound, nor amount to any vast Sums. But

yet, I shall say this for it, that it was the only way, which could have been begun, with a security of suc-
cess, in that condition of things. The publick Faith of

Experimental Philosophy, was not then strong enough,
to move Men and Women of all conditions, to bring in their Bracelets and Jewels, towards the carrying of it on. Such affections as those may be ralis'd by a mis-guided zeal; but seldom, or never, by calm and

unpassionate Reason. It was therefore well ordain'd,

that the first Benevolence should come from the Expe-

riements themselves. If they had speedily at first call'd

for mighty Treasures; and laid alound, that their Enter-

prise requir'd the Exchequer of a Kingdom; they

would onely have been condemn'd, as vain Projects. So ready is man-kind, to suspect all new undertakings
to be Cheats, and Chimeras; especially, when they

seem chargeable: that it may be, many excellent things
have been lost by that Jealousie. Of this we have a

fatal Instance amongst our selves. For it was this fear
of being circumvented, that made one of our wisest

Kings delay Columbus too long, when he came with
the promise of a new World: whereas a little more

confidence in his Art, and a small charge in furnishing out some few Ships, would have yearly brought all
the Silver of the West-Indies to London, which now
arrives at Sevill.

This suspicion, which is so natural to mens breasts,
could not any way harm the Royal Societies establishment: seeing its first claims, and pretensions were so modest. And yet I shall presume to assure the World; that what they shall raise on these mean Foundations, will be more answerable to the largeness of their intentions, than to the narrowness of their beginnings. This I speak so boldly, not only because it is almost generally found true; that those things, which have been small at first, have oftener grown greater, than those which have begun upon a wider bottom, which have commonly stood at a stay: But also in respect of the present prevailing Genius of the English Nation. It is most usually found, that every People, has some one study or other in their view, about which their minds are most intent, and their Purposes readier to open. This is sometimes a profusion in Habit, and Dyet; sometimes Religious Buildings; and sometimes the Civil Ornaments of their Cities, and Country. The first of these will shortly vanish from amongst us, by the irresistible correction of the King's own example: the next is of late years very sensibly abated: and it is the last of the three towards which mens desires are most propense. To evidence this; I think it may be calculated, that since the King's Return, there have been more Acts of Parliament, for the clearing and beautifying of Streets, for the repaying of Highways, for the cutting of Rivers, for the increase of Manufactures, for the setting on foot the Trade of Fishing, and many other such Publick Works, to adorn the State; than in divers Ages before. This General Temper being well weigh'd; it cannot be imagin'd, that the Nation will withdraw its assistance from the Royal Society alone; which does not intend to stop at some particular benefit, but goes to the root of
of all noble Inventions, and proposes an infallible course to make England the glory of the Western world.

This my Love, and my Hopes prompt me to say. But besides this, there is one thing more, that persuades me, that the Royal Society will be Immortal. And that is, that if their Stock should still continue narrow, yet even upon that, they will be able to free themselves from all difficulties, and to make a constant increase of it, by their managing. There is scarce any thing, has more hindered the True Philosophy; than a vain opinion, that men have taken up, that nothing could be done in it; to any purpose, but upon a vast charge, and by a mighty Revenue. Men commonly think, that the pit, in which (according to Democritus) Truth lies hid, is bottomless: and that it will devour, whatever is thrown into it, without being the fuller. This false conception had got so much ground, that as soon as a man began to put his hands to Experiments, he was presently given over, as impoverish't and undone. And indeed the Enemies of Real Knowledge, had some appearance of Reason to conclude this heretofore: because they had seen the great Estates of some Chymists melted away, without any thing left behind, to make recom pense. But this imagination can now no longer prevail. Men now understand, that Philosophy needs not so great a prodigality to maintain it: that the most profitable Tryals are not always the most costly: that the best Inventions have not been found out by the violent, but by the most prudent, and Industrious Observers: that the right Art of Experimenting, when it is once set forward, will go near to sustain it self. This I speak, not to stop mens future Bounty, by a Philosophical Boast, that
that the Royal Society has enough already: But rather to encourage them to cast in more help; by shewing them, what return may be made from a little, by a wise administration.

Of the variety, and excellence of the Instruments, which it lyes in their power to use; I will give no other proof, than the wonderfull perfection to which all Manual Arts have of late years arriv'd. Men now generally understand, to employ those very Tools which the Antients lent us, to infinite more Works, than formerly: they have also of late devis'd a great multitude of all sorts, which were before unknown: and besides, we may very well expect, that time will every day bring forth more. For, according as the matter to work upon does abound, the greater plenty of Instruments, must by consequence follow: such a connexion there is between Inventions, and the means of Inventing, that they mutually increase each other.

I might be as large, as I pleas'd, in this particular; in running through some part of all the Innumerable Arts of the Western world; and it were not difficult to shew, that the ordinary shops of Mechanicks, are now as full of rarities, as the Cabinets of the former noblest Mathematicians. But I will leave that subject, which is so familiar to all; and choose rather, to fetch a confirmation of this, even from those Countreys, which (after the manner of the Antients) we call Barbarous. And in going thither for an example, I have a farther end. In my foregoing discourse, I try'd to make out the advantages of the Moderne Times, above the antients; by following the progress of Learning, down through their tracks, to which Scholars
ROYAL SOCIETY.

Iars usually confine it; I will now also strengthen that argument; by briefly comparing the skill, and the works of the unlearned parts of the present world, with those that are past. The antient Barbarians then, those Nations I mean, who lay without the circle of those Arts which we admire; the Gaules, the Britains, the Germans, the Scythians, have scarce left any foot-steps behind them, to shew that they were rational men. Most of them were savage in their practices; gross in their contrivances; ignorant of all, that might make life either safe, or pleasant. Thus it was with them, and this all History speaks with one voice: whereas the Barbarians of our Times (if I may take the liberty still to use that word, which the pride of Greece first brought into fashion) the Turks, the Moors, the East-Indians, and even the Americans, though they too are utterly unacquainted with all our Sciences; yet by the help of an Universal Light, which seems to overspread this Age, are in several Handicrafts most ready, and dextrous: insomuch that in some, they can scarce be imitated by the Europeans themselves. I shall leave it to any man, to conjecture from hence, which of these two times has the Prerogative; and how much better helps are probably to be found at this day, in the most Civil Countries: when we now find so much artifice, amongst those our Contemporaries, who only follow rude, and untaught Nature.

Of the extent of the matter, about which they have been already conversant, and intend to be hereafter; there can be no better measure taken, than by giving a general prospect of all the objects of mens thoughts: which can be nothing else, but either God, or Men, or Nature.
As for the First, they meddle no otherwise with Divine things, than onely as the Power, and Wisdom, and Goodness of the Creator, is display'd in the admirable order, and workmanship of the Creatures. It cannot be deny'd, but it lies in the Natural Philosophers hands, best to advance that part of Divinity: which, though it fills not the mind, with such tender, and powerful contemplations, as that which shews us Man's Redemption by a Mediator; yet it is by no means to be pass'd by unregarded: but is an excellent ground to establish the other. This is a Religion, which is confirm'd by the unanimous agreement of all sorts of Worships: and may serve in respect to Christianity, as Solomon's Porch to the Temple; into the one the Heathens themselves did also enter; but into the other, onely God's peculiar People.

In men, may be consider'd the Faculties, and operations of their Souls; the constitution of their Bodies, and the works of their Hands. Of these, the first they omit: both because the knowledge and direction of them have been before undertaken, by some Arts, on which they have no mind to intrench, as the Politicks, Morality, and Oratory: and also because the Reason, the Understanding, the Tempers, the Will, the Passions of Men, are so hard to be reduc'd to any certain observation of the senses; and afford so much room to the observers to falsifie or counterfeit: that if such discourses should be once entertain'd; they would be in danger of falling into talking, instead of working, which they carefully avoid. Such subjects therefore as these, they have hitherto kept out. But yet, when they shall have made more progress, in material things, they will be in a condition, of pronouncing more boldly on them too. For, though Man's Soul, and
and Body are not only one natural Engine (as some have thought) of whose motions of all sorts, there may be as certain an account given, as of those of a Watch or Clock: yet by long studying of the Spirits, of the Blood, of the Nourishment, of the parts, of the Diseases, of the Advantages, of the accidents which belong to humane bodies (all which will come within their Province) there, without question, be very near guesses made, even at the more exalted, and immediate Actions of the Soul; and that too, without destroying its Spiritual and Immortal Being.

These two Subjects, God, and the Soul, being only forborn: In all the rest, they wander, at their pleasure: In the frame of Mens bodies, the ways for strong, healthful, and long life: In the Arts of Mens Hands, those that either necessity, convenience, or delight have produc'd: In the works of Nature, their helps, their varieties, redundancies, and defects: and in bringing all these to the uses of humane Society.

In their Method of Inquiring, I will observe, how they have behav'd themselves, in things that might be brought within their own Touch and Sight: and how in those, which are so remote, and hard to be come by, that about them, they were forc'd to trust the reports of others.

In the first kind: I shall lay it down, as their Fundamental Law, that whenever they could possibly get to handle the subject, the Experiment was still perform'd by some of the Members themselves. The want of this exactness, has very much diminish'd the credit of former Naturalists. It might else have seem'd strange, that so many men of Wit, setting so many hands on work; being so watchful to catch up all relations,
lations, from Woods, Fields, Mountains, Rivers, Seas, and Lands; and scattering their Pensions so liberally; should yet be able to collect so few Observations, that have been judicious or useful. But the Reason is plain; for while they thought it enough, to be only Receivers of others Intelligence; they have either employ'd Ignorant searchers, who knew not how to digest or distinguish what they found: or frivolous, who always lov'd to come home laden, though it were but with trifles: or (which is worst of all) crafty, who having perceiv'd the humours of those that paid them so well, would always take care to bring in such collections as might seem to agree with the Opinions and Principles of their Masters, however they did with Nature itself.

This Inconvenience, the Royal Society has escap'd, by making the whole process pass under its own eyes. And the Task was divided amongst them, by one of these two ways. First, it was sometimes refer'd to some particular men, to make choice of what Subject they pleas'd, and to follow their own humour in the Trial; the expence being still allow'd from the general Stock. By which liberty, that they afforded, they had a very necessary regard to the power of particular Inclinations: which in all sorts of Knowledge is so strong; that there may be numberless Instances given of men, who in some things have been altogether useless, and yet in others have had such a vigorous, and successful faculty, as if they had been born, and form'd for them alone.

Or else secondly, the Society itself made the distribution, and deputed whom it thought fit for the prosecution of such, or such Experiments. And this they did, either by allotting the same Work to several men,
men, separated one from another; or else by joyning them into Committees (if we may use that word in a Philosophical sense, and so in some measure purge it from the ill found, which it formerly had). By this union of eyes, and hands there do these advantages arise. Thereby there will be a full comprehension of of the object in all its appearances; and so there will be a mutual communication of the light of one Science to another: whereas single labours can be but as a prospect taken upon one side. And also by this fixing of several mens thoughts upon one thing, there will be an excellent cure for that defect, which is almost unavoidable in great Inventors. It is the custom of such earnest, and powerful minds, to do wonderful things in the beginning; but shortly after, to be overborn by the multitude, and weight of their own thoughts; then to yield, and cool by little and little; and at last grow weary, and even to loath that, upon which they were at first the most eager. This is the woe said composition of great Wits: such tender things, are those exalted Actions of the mind; and so hard it is, for those imaginations, that can run swift, and mighty Races, to be able to travel a long, and a constant journey. The effects of this infirmity have been so remarkable, that we have certainly lost very many Inventions, after they have been in part fashion’d, by the meer languishing, and negligence of their Authors. For this, the best provision must be, to join many men together; for it cannot be imagin’d, that they should be all so violent, and fiery: and so by this mingling of Tempers, the Impetuous men, not having the whole burthen on them, may have leisure for intervals to recruit their first heat; and the more judicious, who are not so soon possesse’d with such raptures, may carry on
on the others strong conceptions, by soberer degrees, to a full accomplishment.

This they have practis'd in such things, whereof the matter is common; and wherein they may repeat their labours as they please. But in foreign, and remote affairs, their Intentions, and their Advantages do farr exceed all others. For these, they have begun to settle a correspondence through all Countreys; and have taken such order, that in short time, there will scarce a Ship come up the Thames, that does not make some return of Experiments, as well as of Merchandize.

This their care of an Universal Intelligence, is befriended by Nature itself, in the situation of England: For, lying so, as it does, in the passage between the Northern parts of the World, and the Southern; its Ports being open to all Coasts, and its Ships spreading their Sails in all Seas; it is thereby necessarily made, not only Mistress of the Ocean, but the most proper Seat, for the advancement of Knowledge. From the positions of Countreys, arise not only their several shapes, manners, customs, colours, but also their different Arts, and Studies. The Inland and Continent, we see do give Laws, to Discourse, to Habits, to Behaviour: but those that border upon the Seas, are most properly seated, to bring home matter for new Sciences, and to make the same proportion of Discoveries above others, in the Intellectual Globe, as they have done in the Material.

Upon this advantage of our Island, there is so much stress to be laid, towards the prosperity of this Design; that if we should search through all the World, for a perpetual habitation, wherein the Universal Philosophy might settle itself; there can none be found, which
ROYAL SOCIETY.

which is comparable to London, of all the former, or present Seats of Empire. Babylon, that was the Capital City of the first Monarchy, was situated in a Champion Countrey, had a clear, and uncloudy air; and was therefore fit enough to promote one part of Natural Knowledge, the Observations of the Heavens: But it was a Mid-land Town, and regarded not the Traffique of Foreriners; abounding with its own luxury, and riches. Memphis was improper, upon the same account; for Egypt was a Land content with its own plenty; admitting strangers, rather to instruct them, than to learn any thing from them. Carthage stood not so well for a resort for Philosophers, as for Pirates; as all the African shore continues at this day. As for Rome, its Fortune was read by Virgil; when he said, that it only ought to excel in the Arts of Ruling. Constantinople, though its present Masters were not Barbarous, yet is too much shut up by the Straits of Hellespont. Vienna is now a Frontier Town, and has no communication with the Ocean, but by a long compass about. Amsterdam is a place of Trade, without the mixture of men of freer thoughts. And, even Paris itself, though it is far to be preferr’d before all the others for the resort of Learned and Inquisitive men to it, yet is less capable, for the same reasons, for which Athens was, by being the Seat of Gallantry, the Arts of Speech, and education. But it is London alone, that enjoys most of the others advantages, without their inconveniences. It is the head of a mighty Empire, the greatest that ever commanded the Ocean: It is compos’d of Gentlemen, as well as Traders: It has a large intercourse with all the Earth: It is, as the Poets describe their House of Fame, a City, where all the noises and business in the World do meet: and therefore this honour.
honor is justly due to it, to be the constant place of residence for that Knowledge, which is to be made up of the Reports, and Intelligence of all Countreys.

To this I will add; That we have another help in our hands, which almost forces this Crown on the head of the English Nation: and that is, the Noble and Inquisitive Genus of our Merchants. This cannot be better shewn, than by comparing them, with those of that one Countrey; which only stands in competition with us for Trade. The Merchants of England live honourably in foreign parts; those of Holland meanly, minding their gain alone: ours converse freely, and learn from all; having in their behaviour, very much of the Gentility of the Families, from which so many of them are descended: The others, when they are abroad, shew, that they are onely a Race of plain Citizens; keeping themselves most within their own Cells, and Ware-houses; scarce regarding the acquaintance of any, but those, with whom they traffick. This largeness of ours, and narrowness of their living, does, no doubt, conduce very much to enrich them; and is, perhaps, one of the Reasons, that they can so easily under-face us: But withall, it makes ours the most capable, as theirs unfit, to promote such an Enterprise, as this of which I am now speaking. For indeed, the effects of their several ways of life, are as different: of the Hollanders, I need say no more: But of the English Merchants I will affirm, that in all sorts of Politeness, and skill in the World, and humane affairs, they do not onely excel them, but are equal to any other sort of men amongst us.

This I have spoken, not to lessen the reputation of that Industrious People: But, that I might (if it were possible) inflame their minds to an emulation of this Design.
Design. They have all things imaginable to stirr them up: they have the Examples of the greatest Wits of other Countreys, who have left their own homes, to retire thither, for the freedom of their Philosophical Studies: they have one place (I mean the Hague) which may be soon made the very Copy of a Town in the New Atlantis; which for its pleasantness, and for the concourse of men of all conditions to it, may be counted above all others (except London) the most advantageously seated for this service.

These have been the privileges and practices of the Royal Society, in things foreign, & Native. It would now be needless to set down all the steps of their progress about them; how they observ'd all the varieties of Generations, and corruptions, natural, and artificial; all the increasings, and lessenings; agreements, and oppositions of things; how, having found out a cause, they have apply'd it to many other effects; and the effects to different causes; how they are wont to change the Instruments and places, and quantities of matter, according to occasions; and all the other subtilties, and windings of Trial, which are almost infinite to express. I shall only, in passing, touch on these two things, which they have most carefully consulted.

The one is, not to prescribe to themselves, any certain Art of Experimenting, within which to circumscribe their thoughts: But rather to keep themselves free, and change their course, according to the different circumstances, that occur to them in their operations; and the several alterations of the Bodies, on which they work. The true Experimenting has this one thing inseparable from it, never to be a fix'd and settled Art, and never to be limited by constant Rules. This, perhaps, may be shewn too in other Arts; as in
The HISTORY of the
that of Invention, of which, though in Logick, and
Rhetorick, so many bounds, and helps are given: yet
I believe very few have argued ordiscoursed by
those Topicks. But whether that be unconfin’d, or no,
it is certain, that Experimenting is; like that which
is call’d Decence in humane life; which, though it be
that, by which all our Actions are to be fashion’d;
and though many things may be plausibly said upon
it; yet it is never wholly to be reduc’d to standing
Precepts; and may almost as easily be obtain’d, as
defin’d.

Their other care has been, to regard the least, and
the plainest things; and those that may appear at first
the most inconsiderable; as well as the greatest Curiosi-
ties. This was visibly neglected by the Antients. The
Histories of Pliny, Aristotle, Solinus, Ælian, abounding
more with pretty Tales, and fine monstrous Sto-
ries; than sober, and fruitful Relations. If they could
gather together some extraordinary Qualities of
Stones, or Minerals, some Rarities of the Age, the food,
the colour, the shapes of Beasts, or some virtues of
Fountains, or Rivers: they thought, they had perf-
torm’d the chiefest part of Natural Historians. But
this course is subject to much corruption. It is not
the true following of Nature; For that still goes on in
a steady Rode, nor is it so extravagant, and so ar-
tificial in its contrivances, as our admiration, proceed-
ing from our ignorance, makes it. It is also a way that
of all others, is most subject to be deceiv’d: For it
will make men inclinable to bend the Truth much
awry, to raise a specious Observation out of it. It stops
the severe progress of Inquiry: Infecting the mind,
and making it averse from the true Natural Philosophy:
It is like Romances, in respect of True History; which,
by multiplying varieties of extraordinary Events, and surprizing circumstances, makes that seem dull, and taftless. And, to say no more, the very delight which it raises, is nothing so solid: but, as the satisfaction of Fancy, it affects us a little, in the beginning, but soon wearies, and surfeits: whereas a just History of Nature, like the pleasure of Reason, would not be, perhaps, so quick and violent, but of far longer continuance, in its contentment.

Their Matter, being thus collected, has been brought before their weekly meetings, to undergo a just and a full examination. In them their principal endeavours have been, that they might enjoy the benefits of a mix'd Assembly, which are largeness of Observation, and diversity of Judgments, without the mischiefs that usually accompany it, such as confusion, unrestedness, and the little animosities of divided Parties. That they have avoided these dangers for the time past; there can be no better proof, than their constant practice; wherein they have perpetually preserv'd a singular sobriety of debating, flowness of consenting, and moderation of dissenting. Nor have they been onely free from Faction, but from the very Causes, and beginnings of it. It was in vain for any man amongst them to strive to preferr himself before another; or to seek for any great glory from the subtility of his Wit; seeing it was the inartificial processes of the Experiment, and not the Acuteness of any Commentary upon it, which they have had in veneration. There was no room left, for any to attempt, to heat their own, or others minds, beyond a due temper; where they were not allow'd to expatiate, or amplifie, or connect specious arguments together. They
They could not be much exasperated one against another in their disagreements, because they acknowledged, that there may be several Methods of Nature, in producing the same thing, and all equally good: whereas they that contend for truth by talking, do commonly suppose that there is but one way of finding it out. The differences which should chance to happen, might soon be compos'd; because they could not be grounded on matters of speculation, or opinion, but only of fence; which are never wont to administer so powerful occasions of disturbance, and contention, as the other. In brief, they have escap'd the prejudices that use to arise from Authorit y, from inequality of Persons, from insinuations, from friendships; But above all, they have guarded themselves against themselves, lest the strength of their own thoughts should lead them into error; lest their good Fortune in one Discovery, should presently confine them only to one way of trial; lest their failings should discourage, or their success abate their diligence. All these excellent Philosophical Qualities, they have by long custom, made to become the peculiar Genius of this Society: and to descend down to their successors; not only as circumstantial Laws, which may be neglected, or alter'd in the course of time; but as the very life of their constitution; to remain on their minds, as the laws of Nature do in the hearts of Men; which are so near to us, that we can hardly distinguish, whether they were taught us by degrees, or rooted in the very foundation of our Being.

It will not be here seasonable, to speak much, of the Ceremonies which they have hitherto observ'd in these Meetings; because they are, almost, the same, which.
ROYAL SOCIETY.

which have been since establish'd by their Council, which we shall have a more proper occasion to produce hereafter. Let this only be said in brief, to satisfy the curious.

The Place where they hitherto assembled, is Gresham-College; where, by the munificence of a Citizen, there have been Lectures for several Arts indow'd so liberally, that if it were beyond Sea, it might well pass for an University. And indeed, by a rare happiness in the constitution (of which I know not where to find the like example) the Professors have been from the beginning, and chiefly, of late years, of the most Learned Men of the Nation; though the choice has been wholly in the disposal of Citizens. Here the Royal Society has one publick Room to meet in, another for a repository to keep their Instruments, Books, Rarities, Papers, and whatever else belongs to them: making use besides, by permission, of several of the other Lodgings, as their occasions do require. And, when I consider the place itself, I think it bears some likeness to their Design; it is now a College, but was once the Mansion-house of one of the greatest Merchants, that ever was in England: And such a Philosophy they would build; which should first wholly consist of Action, and Intelligence, before it be brought into Teaching, and Contemplation.

There Time is every Wednesday after the Lecture of the Astronomy Professor; perhaps, in memory of the first occasions of their Rendezvous.

Their Elections, perform'd by Balloting; every member having a Vote; the Candidates being nam'd at one meeting, and put to the Scrutiny at another.

Their Chief Officer, is the President; to whom it belongs to call, and dissolve their meetings; to propose the
the Subject; to regulate the Proceedings; to change the Inquiry from one thing to another; to admit the Members who are elected.

Besides him, they had at first a Register, who was to take Notes of all that pass'd; which were afterwards to be reduc'd into their Journals, and Register Books. This Task was first perform'd by Dr. Croone. But they since thought it more necessary, to appoint two Secretaries, who are to reply to all Addresses from abroad, and at home; and to publish whatever shall be agreed upon by the Society. These are at present, Dr. Wilkins, and Mr. Oldenbourgh, from whom I have not usurp'd this first employment of that kind; for it is onely my hand that goes, the substance and direction came from one of them.

This is all that I have to say concerning their Ceremonial part. In most other things, they bounded themselves to no standing Orders, there being nothing more intended in such circumstances, than convenience and order. If any shall imagine, they have not limited themselves to Forms enough, to keep up the gravity, and solemnity of such an Enterprise, they are to consider, that so much exactness and curiosity of observances, does not so well befit Inquirers, as Sects of Philosophy, or places appointed for Education, or those who submit themselves to the severity of some religious Order. The Work which the Society proposes to itself, being not so fine, and easy, as that of teaching is; but rather a painful digging, and toiling in Nature; It would be a great incumbrance to them, to be straightned to many strict pantalioes; as much as it would be to an Artificer, to be loaded with many cloaths, while he is labouring in his Shop.

But
ROYAL SOCIETY.

But having made so much haste through the Formal part of these their Meetings, I shall not so soon dispatch the substantial, which consists in Directing, Judging, Conjuring, Improving, Discouraging upon Experiments.

Towards the first of these ends, it has been their usual course, when they themselves appointed the Trial, to propose one week, some particular Experiments, to be prosecuted the next; and to debate before hand, concerning all things that might conduce to the better carrying them on. In this Preliminary Collection, it has been the custom, for any of the Society, to urge what came into their thoughts, or memories concerning them; either from the observations of others, or from Books, or from their own Experience, or even from common Fame itself. And in performing this, they did not exercise any great rigour of choosing, and distinguishing between Truths and Falsehoods: but as all together as they came; the certain Works, the Opinions, the Gesses, the Inventions, with their different Degrees and Accidents, the Probabilities, the Problems, the general Conceptions, the miraculous Stories, the ordinary Productions, the changes incident to the same Matter in several places, the Hindrances, the Benefits, of Airs, or Seasons, or Instruments; and whatever they found to have been begun, to have fail'd, to have succeeded, in the Matter which was then under their Disquisition.

This is a most necessary preparation, to any that resolve to make a perfect search. For they cannot but go blindly, and lamely, and confusedly about the business, unless they have first laid before them a full Account of it. I confess the excellent Monsieur des Cartes
Cartes recommends to us another way in his Philosophical Method; where he gives this Relation of his own progress; that after he had run through the usual Studies of youth, and spent his first years in an active life; when he retir'd to search into Truth, he at once rejected all the Impressions, which he had before receiv'd, from what he had heard, and read; and wholly gave himself over to a reflexion on the naked Ideas of his own mind. This he profiss'd to do, that he might lay aside all his old imaginations, and begin anew to write on a white and unblotted soul. This, perhaps, is more allowable in matters of Contemplation, and in a Gentleman, whose chief aim was his own delight; and so it was in his own choice, whether or no, he would go farther to seek it, than his own mind: But it can by no means stand with a practical and universal Inquiry. It is impossible, but they, who will only transcribe their own thoughts, and disdain to measure or strengthen them by the assistance of others, should be in most of their apprehensions too narrow, and obscure; by setting down things for general, which are only peculiar to themselves. It cannot be avoided, but they will commit many gross mistakes; and bestow much useless pains, by making themselves wilfully ignorant of what is already known, and what conceal'd. It was try'd amongst the Antients, to find out the pure, and Primitive Language of the World, by breeding up a child so, that he might never hear any man speak. But what was the event of that trial? Instead of obtaining that end, the child was made absolutely dumb thereby. And the like success will that Philosopher find, who shall expect, that, by the keeping his mind free from the Tincture of all others' Opinions, it will give him the original, and un-
infected Truths of things. All Knowledge is to be got the same way that a Language is, by Industry, Use, and Observation. It must be receiv'd, before it can be drawn forth. 'Tis true, the mind of Man is a Glass, which is able to represent to itself, all the Works of Nature: But it can onely shew those Figures, which have been brought before it: It is no Magical Glass, like that with which Astrologers use to deceive the Ignorant; by making them believe, that therein they may behold the Image of any Place, or Person in the World, though never so farremov'd from it. I know it may be here suggested; that they, who busie themselves much abroad, about learning the judgments of others, cannot be unprejudic'd in what they think. But it is not the knowing, but the peremptory addition to others Tenents, that lowers and perverts the Understanding. Nay, to go farther; that man, who is throughly acquainted with all sorts of Opinions, is very much more unlikely, to adhere obstinately to any one particular, than he whose head is onely fill'd with thoughts, that are all of one colour.

It being now so requisite, to premisse this general collection: It could not be better made, than by the joint labours of the whole Society. It were an intolerable burthen, if it were wholly cast on the Experimenters themselves. For, it is not onely true, that those who have the best faculty of Experimenting, are commonly most averse from reading Books; and so it is fit, that this Defect should be supply'd by others pains: But also it would too much tire, and waste, or at least divert their spirits, before they came to the main Work. Whereas the Task being shar'd amongst so great a number, will become not much more than a business of delight. Well then, by this
this first Comment, and Discourse upon the Experiment; he, that is to try it, being present; and having so good an opportunity, of comparing so many other mens conceptions with his own, and with the thing itself; must needs have his thoughts more enlarg'd, his judgment confirm'd, his eyes open'd to discern, what most compendious helps may be provided; what part of it is more or less useful; and upon what side it may be best attempted: The Truths, which he learns this way, will be his Pattern; the Errors will be his Seemarks, to teach to avoid the same dangers; the very falshoods themselves will serve to enlarge, though they do not inform his Understanding. And, indeed, a thousand more advantages will hereby come into the minds of the most Sagacious, and acute Inquirers, which they would never have compass'd, if they had been only left to themselves. I remember, my Lord Bacon some where says; That it is one of the greatest secrets of Nature, that mens Passions are more capable of being rais'd to higher degrees in company, than in solitude; and that we sooner grieve, fear, rejoice, love, admire, when we behold many others so mov'd, than when we are alone. This is true; and the same may be as well affirm'd, of most other actions of the mind. In Assemblies, the Wits of most men are sharper, their Apprehensions readier, their Thoughts fuller, than in their Closets. Of this there is an undoubted proof in the Art of speaking. For, let the Wittiest, and most eloquent men think as largely as they can, on any subject in private; yet, when they come into the publick; and especially, when they have heard others speak before them; their Argument appears quite another thing to them; their former expressions seem too flat, and cold for their present thoughts; their minds swell, and
and are enlightened, as if at that time they were poss'd with the souls of the whole multitude, before whom they stand.

Those, to whom the conduct of the Experiment is committed, being dismiss'd with these advantages, do (as it were) carry the eyes, and the imaginations of the whole company into the Laboratory with them. And after they have perform'd the Trial, they bring all the History of its process back again to the test. Then comes in the second great Work of the Assembly; which is to judge, and resolve upon the matter of Fact. In this part of their employment, they us'd to take an exact view of the repetition of the whole course of the Experiment; here they observ'd all the chances, and the regularities of the proceeding; what Nature does willingly, what constrain'd; what with its own power, what by the succours of Art; what in a constant rode, and what with some kind of sport and extravagance; industriously marking all the various shapes into which it turns itself, when it is persus'd, and by how many secret passages it at last obtains its end; never giving it over till the whole Company has been fully satisfi'd of the certainty and constancy; or, on the other side, of the absolute impossibility of the effect. This critical, and reiterated scrutiny of those things, which are the plain objects of their eyes; must needs put out of all reasonable dispute, the reality of those operations, which the Society shall positively determine to have succeeded. If any shall still think it a just philosophical liberty, to be jealous of resting on their credit: they are in the right; and their dissentings will be most thankfully receiv'd, if they be establish'd on solid works, and not onely on prejudices, or suspicions.
The History of the

suspicions. To the Royal Society it will be at any time almost as acceptable, to be confused, as to discover: seeing, by this means, they will accomplish their main Design: others will be inflam'd: many more will labour; and so the Truth will be obtain'd between them: which may be as much promoted by the contestations of hands, and eyes; as it is commonly injur'd by those of Tongues. However, that men may not hence undervalue their authority, because they themselves are not willing to impose, and to usurp a dominion over their reason; I will tell them, that there is not any one thing, which is now approv'd and practis'd in the World, that is confirm'd by stronger evidence, than this, which the Society requires; except onely the Holy Mysteries of our Religion. In almost all other matters of Belief, of Opinion, or of Science; the assurance, whereby men are guided, is nothing near so firm, as this. And I dare appeal to all sober men; whether, seeing in all Countreys, that are govern'd by Laws, they expect no more, than the consent of two, or three witnesses, in matters of life, and estate; they will not think, they are fairly dealt withall, in what concerns their Knowledge, if they have the concurring Testimonies of threescore or an hundred?

Sect. XVII. Their conjecturing on the Causes.

The History, of the Trial perform'd, being thus secure, I will next declare, what room they allow'd for conjecturing upon the Causes; about which they also took some pains, though in a farr different way from the antient Philosophers; amongst whom, scarce any thing else was regarded, but such general contemplations. This indeed, is the Fatal point, about which so many of the greatest Wits of all Ages have miscarried;
ried; and commonly, the greater the Wit, the more 
has been the danger: so many wary steps ought to be 
trav'd in this uncertain path: such a multitude of 
pleasing Errors, false Lights, disguised Lies, deceitful 
Fancies must be escap'd: so much care must be taken, 
to get into the right way at first: so much, to continue 
in it; and at last, the greatest caution still remaining 
to be us'd; lest when the treasure is in our view, we 
undo all, by catching at it too soon, with too greedy, 
and rash a hand. These, and many more are the diff-
culties, to be pass'd; which I have here with less 
apprehension reckon'd up, because the remedy is so nigh.
To this Work, therefore the Society approaches, with 
as much circumspection, and modesty, as humane coun-
sels are capable of: They have been cautious, to shun 
the overweening dogmatizing on causes on the one 
hand: and not to fall into a speculative Scepticism on 
the other: and whatever causes they have with just 
deliberation found to hold good; they still make 
them increase their benefits, by farther experiment-
ing upon them; and will not permit them to rust or 
corrupt; for want of use. If after all this, they shall 
not seem wholly to have remov'd the mischiefs, that 
attend this hazardous matter; they ought rather to 
be judg'd, by what they have done towards it above 
others, than by what they have not provided against: 
seeing the thing itself is of that nature; that it is 
impossible to place the minds of men beyond all con-
dition of erring about it.

The first Danger that I shall observe in this kind, is 
an over-hasty, and precipitant concluding upon the 
Causes, before the Effects have been enough search'd 
into: a finishing the roof, before the foundation has 
been well laid. For this, I shall first allege this cure;

that,
The HISTORY of the

ing subject to diseases: the aggravating of which common infirmities, can never be esteem'd by any private man, as an effect of malice, or ill nature.

But now, on the other side, this doubtfulness of thoughts, this slowness of concluding, which is so useful in this case, is so natural to a multitude of Counsellors, that it is frequently urg'd against them, as their inseparable Imperfection. Every man has this Argument in his mouth, wherewith to condemn a great and mixt number of advisers; that their deliberations are so tedious, that commonly the seasons of Action are lost, before they can come to any result. 'Tis true, this unwieldiness, and want of dispatch, is most destructive in matters of State, and Government; as Christendom lately felt: But it has a quite contrary influence on Philosophy. It is not here the most speedy, or the swiftest determination of thoughts, that will do the business: here, many delays are requir'd: here, he that can make a solid objection, or ask a seasonable question, will do more good, than he, who shall boldly fix on a hundred ill-grounded resolutions. Every rubb is here to be smooth'd: every scruple to be plain'd: every thing to be foreseen: the satisfaction of the reason of all past, present, and future times to be design'd: so that here, that which is so much cry'd down in policy, a striving still to do better, can never be too much regarded.

Nor is the Society only fore-arm'd against this great inconvenience, this rashness of settling upon causes, by the multitude of Judges that are to be satisfy'd: but also by their indifferent hearing of all conjectures, that may be made from the Tenents of any Sect of Philosophy; and by touching every effect that comes before them; upon all the varieties of opinions,
pinions, that have been either of late found out, or reviv'd. By this equality of respect to all parties, it has allow'd a sufficient time, to ripen whatever it debated: By this too, it has made it self the common Cherisher, and Umpire of them all; and has taken the right way of finding out, what is good in any one of them. A course, which if the Antients had more follow'd, their Sects would not so soon have destroy'd each other. It was a most perverse custom amongst their Disciples, not to make any strict choice; to leave some, and embrace others of their Masters Doctrines, but to swallow all at once. He that became a Stoick, an Epicurean, a Peripatetick, in Logick, or Moral Philosophy, or Physicks; never stick, presently to assent to whatever his Founder had said in all the other Sciences: though there was no kind of connexion between his Doctrines in the one, and the other. Thus was the whole image of Philosophy form'd in their minds altogether: And what they receiv'd so carelessly, they defended the same way; not in parcels, but in gross. Of this the Errors are apparent; for by so partially believing all sorts of Tenents, they had no time to be fully convinc'd: and so became rather formal Asserters of them, than judicious. And by thus adhering to all; without making any distinction between the Truths, and falsehoods; weaknesses, and strengths of their Sects; they deny'd to themselves a farr more calm, and safe knowledge; which might have been compounded out of them all, by fetching something from one, and something from another.

This the Royal Society did well foresee: and therefore did not regard the credit of Names, but Things; rejecting or approving nothing, because of the title, which it bears: preserving to it self the liberty of re-
The HISTORY of the

fusing, or liking, as it found: and so advancing its stock, by a sure and a double increase; by adding new Discoveries; and retaining ancient Truths. A largeness, and generosily, which certainly is an excellent Omen of its establishment. In this, me-thinks, it excels any other State; as the Roman Common-wealth, did that of Venice. The later began upon a small stock, and has been careful to preserve it self unmingled, bestowing the freedom of its City very sparingly: And we see, it has been still on the defensive; making no great progress in the World: whereas the Romans, by a far more frank, and honourable counsel, admitted all, that desir'd to be their confederates; gave the liberty of Roman Citizens to whole Towns, and Countreys; excluded none, but those that would obstinately stand out: and so deservedly extended their Empire, as far as the bounds of the civil World did reach.

The second mischief in this great matter of causes, is an eternal instability, and aversion from assigning of any. This arises, from a violent, and imprudent hast to avoid the first. So ease is the passage from one extreme to another; and so hard it is, to stop in that little point, wherein the right does consist. The truth is, they are both almost equally pernicious: nothing sound is to be expected from those, who wil fix blindly on whatever they can lay hold on: and nothing great from them, who will always wander; who will never leave disputing, whether they dream, or wake; whether there is any motion; whether they have any being, or no: the one can produce nothing, but unwholesome, and rotten fruits: and the other, for fear of that, will endeavour to have no Harvest, nor Autumn at all.

To this fault of Sceptical doubting, the Royal Society
ROYAL SOCIETY.

ciety may perhaps be suspected, to be a little too much inclin’d: because they always professed, to be so backward from setting of Principles, or fixing upon Doctrines. But if we fairly consider their intentions, we shall soon acquit them. Though they are not yet very daring, in establishing conclusions; yet they lay no injunctions upon their successors not to do the same, when they shall have got a sufficient store for such a work. It is their study, that the way to attain a solid speculation, should every day be more and more persued: which is to be done, by a long forbearing of speculation at first, till the matters be ripe for it; and not, by madly rushing upon it in the very beginning. Though they do not contemplate much on the general agreements of things; yet they do on the particular: from whence the others allo will in time be deduc’d. They are therefore as farr from being Scepticks, as the greatest Dogmatists themselves. The Scepticks deny all, both Doctrines, and Works. The Dogmatists determine on Doctrines, without a sufficient respect to Works: and this Assembly, (though we should grant, that they have wholly omitted Doctrines) yet they have been very positive and affirmative in their Works. But more than this, It must also be confess’d, that sometimes after a full inspection, they have ventur’d to give the advantage of probability to one Opinion, or Cause, above another: Nor have they run any manner of hazard by thus concluding. For first, it is likely, they did hit the right, after so long, so punctual, and so gradual an examination: or if we suppose the worst, that they should sometimes judg amiss (as we cannot but allow they may; seeing it will not be just to bestow infallibility on them alone; while we deny it to all others)
yet they have taken care, that their weaker reasonings, and even their Errors, cannot be very prejudicial to Posterity. The causes, upon which they have agreed, they did not presently extend, beyond their due strength, to all other things, that seem to bear some resemblance to what they try'd. Whatever they have resolv'd upon; they have not reported, as unalterable Demonstrations, but as present appearances: delivering down to future Ages, with the good success of the Experiment, the manner of their progress, the Instruments, and the several differences of the matter, which they have apply'd: so that, with their mistake, they give them also the means of finding it out. To this I shall add, that they have never affirm'd anything, concerning the cause, till the trial was past: whereas, to do it before, is a most venomous thing in the making of Sciences: for whoever has fix'd on his Cause, before he has experimented, can hardly avoid fitting his Experiment, and his Observations, to his own Cause, which he had before imagin'd; rather than the Cause to the truth of the Experiment itself. But, in a word, they have hitherto made little other benefit of the causes, to which they have consented; than that thereby they might have a firm footing, whereon new operations may proceed. And for this Work, I mean a continuation, and variation of the Inquiry; the tracing of a false Cause, doth very often so much conduce, that, in the progress, the right has been discover'd by it. It is not to be question'd, but many inventions of great moment, have been brought forth by Authors, who began upon suppositions, which afterwards they found to be untrue. And it frequently happens to Philosophers, as it did to Columbus: who first believ'd the clouds, that hover'd about the Continent, to be
the firm Land: But his mistake was happy; for, by failing towards them, he was led to what he sought: to by prosecuting of mistaken Causes, with a resolution of not giving over the persuite; they have been guided to the truth it self.

The last Defect is, the rendering of Causes barren; that when they have been found out, they have been suffer’d to lye idle; and have been onely us’d, to increase thoughts, and not works. This negligence is of all others the most dangerous: It is a Shipwrack in the end of the voyage, and thence the more to be pitied: It is a corruption, that both hinders additions, and eats out the knowledge that has been already obtain’d: It is the fault of Philosophers; and not of meer Inquirers; of those that have been successful, and not of the unfortunate in their search: and therefore it is, as the miscarriages of those, that are prosperous in humane actions; which are always observ’d to be more destructive, and harder to be cur’d, than the failings of the afflicted, or those that are still in persuite.

To this the Royal Society has apply’d a double prevention; both by endeavouring to strike out new Arts, as they go along; and also, by still improving all to new experiments.

Of the possibility of their performing the first; and the Method, which is to be taken about it; I shall shortly speak in another place. It is enough here, to say; that by this, they have taken care, to satisfie the hopes of the present times; which else might justly languish, and grow cold about this enterprise: if they once saw, that nothing would be ripe in their days; but that all was to come up hereafter, for the advantage of those, that are yet unborn. They consulted the

Sec XIX. Their way of Improving.
the good of future times; but have not neglected their own; they have practis'd both the parts of good husbandry; planting Trees, and sowing Corn. This later, for their own speedy benefit, and support; and the other, for the profit, and ornament of after-Ages.

Nor have they suffer'd their diligence to be swallow'd up, by the pleasures, and enjoyments of present discoveries; but have still submitted their noblest Inventions, to be made Instruments, and means, for the finding out of others. This certainly is the most comprehensive, and unerring Method; at once to make use of that assistance, they give, and to force them, to be farther helpfull to greater ends. There is nothing of all the works of Nature, so inconsiderable, so remote, or so fully known; but, by being made to reflect on other things, it will at once enligten them, and shew it self the clearer. Such is the dependance amongst all the orders of creatures; the inanimate, the sensitive, the rational, the natural, the artificial: that the apprehension of one of them, is a good step towards the understanding of the rest: And this is the highest pitch of humane reason; to follow all the links of this chain, till all their secrets are open to our minds; and their works advanc'd, or imitated by our hands. This is truly to command the world; to rank all the varieties, and degrees of things, so orderly one upon another; that standing on the top of them, we may perfectly behold all that are below, and make them all serviceable to the quiet, and peace, and plenty of Man's life. And to this happiness, there can be nothing else added: but that we make a second advantage of this rising ground, thereby to look the nearer into heaven: An ambition, which
which though it was punish'd in the old World, by an
universal Confusion; when it was manag'd with im-
piety, and insolence: yet, when it is carried on by that
humility and innocence, which can never be separated
from true knowledge; when it is design'd, not to
brave the Creator of all things, but to admire him the
more: it must needs be the utmost perfection of hu-
mane Nature.

Thus they have directed, judg'd, conjectur'd upon,
and improved Experiments. But lastly, in these, and
all other business, that have come under their care;
there is one thing more, about which the Society has
been most solicitous; and that is, the manner of their
Discourse: which, unless they had been very watchful
to keep in due temper, the whole spirit and vigour of
their Design, had been soon eaten out, by the luxury
and redundance of speech. The ill effects of this super-
fluity of talking, have already overwhelm'd most
other Arts and Professions; insomuch, that when I
consider the means of happy living, and the causes of
their corruption, I can hardly forbear recanting
what I said before; and concluding, that eloquence
ought to be banish'd out of all civil Societies, as a
thing fatal to Peace and good Manners. To this opi-
ion I should wholly incline; if I did not find, that it is a
Weapon, which may be as easily procur'd by bad men,
as good: and that, if these should only cast it away,
and those retain it; the naked Innocence of vertue,
would be upon all occasions expos'd to the armed
Malice of the wicked. This is the chief reason, that
should now keep up the Ornaments of speaking, in
any request: since they are so much degenerated from
their original usefulness. They were at first, no doubt,
an admirable Instrument in the hands of Wise Men: when they were only employ'd to describe Goodness, Honesty, Obedience; in larger, fairer, and more moving Images: to represent Truth, cloth'd with Bodies; and to bring Knowledge back again to our very senses, from whence it was at first deriv'd to our understandings. But now they are generally chang'd to worse uses: They make the Fancy disgusting the best things, if they come found, and unadorn'd: they are in open defiance against Reason; professing, not to hold much correspondence with that; but with its Slaves, the Passions: they give the mind a motion too changeable, and bewitching, to consort with right practice. Who can behold, without indignation, how many mists and uncertainties, these specious Tropes and Figures have brought on our Knowledge? How many rewards, which are due to more profitable, and difficult Arts, have been still snatch'd away by the ease of vanity of fine speaking? For now I am warm'd with this just Anger, I cannot with-hold my self, from betraying the shallowness of all these seeming Mysteries; upon which, we Writers, and Speakers, look so bigg. And, in few words, I dare say; that of all the Studies of men, nothing may be sooner obtain'd, than this vicious abundance of Phrase, this trick of Metaphors, this volatility of Tongue, which makes so great a noise in the World. But I spend words in vain; for the evil is now so inveterate, that it is hard to know whom to blame, or where to begin to reform. We all value one another so much, upon this beautiful deceipt; and labour so long after it, in the years of our education: that we cannot but ever after think kinder of it, than it deserves. And indeed, in most other parts of Learning, I look on it to be a thing al-
most utterly desperate in its cure: and I think, it may be placed amongst those general mischiefs; such, as the dissension of Christian Princes, the want of practice in Religion, and the like; which have been so long spoken against, that men are become insensible about them; every one shifting off the fault from himself to others; and so they are only made bare common places of complaint. It will suffice my present purpose, to point out, what has been done by the Royal Society, towards the correcting of its excesses in Natural Philosophy; to which it is, of all others, a most prolific enemy.

They have therefore been most rigorous in putting in execution, the only Remedy, that can be found for this extravagance: and that has been, a constant Resolution, to reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many things, almost in an equal number of words. They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars.

And here, there is one thing, not to be pass'd by; which will render this established custom of the Society, well nigh everlasting: and that is, the general constitution of the minds of the English. I have already often insisted on some of the prerogatives of England, whereby it may justly lay claim, to be the Head of a Philosophical league, above all other Countries in Europe: I have urg'd its situation, its present Genius, and the disposition of its Merchants; and...
many more such arguments to incourage us, still remain to be us'd: But of all others, this, which I am now alledging, is of the most weighty, and important consideration. If there can be a true character given of the Universal Temper of any Nation under Heaven: then certainly this must be ascrib'd to our Countrymen: that they have commonly an unaffected sincerity; that they love to deliver their minds with a sound simplicity; that they have the middle qualities, between the reserv'd subtle Southern, and the rough unhewn Northern people: that they are not extremely prone to speak: that they are more concern'd, what others will think of the strength, than of the fineness of what they say: and that an universal modesty possessest them. These Qualities are so conspicuous, and proper to our Soil; that we often hear them objected to us, by some of our neighbour Satyristes, in more disgraceful expressions. For they are wont to revile the English, with a want of familiarity; with a melancholy lumpishness; with slowness, silence, and with the unrefin'd fullness of their behaviour. But these are only the reproaches of partiality, or ignorance: for they ought rather to be commended for an honourable integrity; for a neglect of circumstances, and flourishes; for regarding things of greater moment, more than less; for a scorn to deceive as well as to be deceiv'd: which are all the best endowments, that can enter into a Philosophical Mind. So that even the position of our climate, the air, the influence of the heaven, the composition of the English blood; as well as the embraces of the Ocean, seem to joyn with the labours of the Royal Society, to render our Country, a Land of Experimental knowledge. And it is a good sign, that Na-
ture will reveal more of its secrets to the English, than to others; because it has already furnish'd them with a Genius so well proportion'd, for the receiving, and retaining its mysteries.

And now, to come to a close of the second part of Sect. II. the Narration: The Society has reduc'd its principal observations, into one common-stock; and laid them up in publique Registers, to be nakedly transmitted to the next Generation of Men; and so from them, to their Successors. And as their purpose was, to heap up a mixt Mass of Experiments, without digesting them into any perfect model: so to this end, they confin'd themselves to no order of subjects; and whatever they have recorded, they have done it, not as compleat Schemes of opinions, but as bare unfi-
nish'd Histories.

In the order of their Inquisitions, they have been so free; that they have sometimes committed them-
selves to be guided, according to the seasons of the year: sometimes, according to what any foreiner, or English Artificer, being present, has suggested: sometime, according to any extraordinary accident in the Nation, or any other casualty, which has hapned in their way. By which roving, and unsettled course, there being seldom any reference of one matter to the next; they have prevented others, nay even their own hands, from corrupting, or contracting the work: they have made the raising of Rules, and Propositions, to be a far more difficult task, than it would have been, if their Registers had been more Methodical. Nor ought this neglect of consequence, and order, to be only thought to proceed from their carelesnesse; but from a mature, and well grounded premeditation.
For it is certain, that a too sudden striving to reduce the Sciences, in their beginnings, into Method, and Shape, and Beauty; has very much retarded their increase. And it happens to the Invention of Arts, as to children in their younger years: in whose Bodies, the same applications, that serve to make them strait, slender, and comely; are often found very mischievous, to their ease, their strength, and their growth.

By their fair, and equal, and submissive way of Registering nothing, but Histories, and Relations; they have left room for others, that shall succeed, to change, to augment, to approve, to contradict them, at their discretion. By this, they have given posterity a far greater power of judging them, than ever they took over those, that went before them. By this, they have made a firm confederacy, between their own present labours, and the Industry of Future Ages; which how beneficial it will prove hereafter, we cannot better guess, than by recollecting, what wonders it would in all likelihood have produc’d ere this; if it had been begun in the Times of the Greeks, or Romans, or Scholemen; nay even in the very last resurrection of learning. What depth of Nature, could by this time have been hid from our view? What Faculty of the Soul would have been in the dark? What part of human infirmities, not provided against? if our Predecessors, a thousand, nay even a hundred, years ago, had begun to add by little, and little to the store: if they would have indued to be Benefactors; and not Tyrants over our Reasons; if they would have communicated to us, more of their Works, and less of their Wit.

This complaint, which I here take up, will appear the
the juster; if we consider that the first learned Times of the Antients, and all those, that follow'd after them, down to this day, would have receiv'd no prejudice at all; if their Philosophers had chiefly bestow'd their pains in making Histories of Nature, and not in forming of Sciences: perhaps indeed the names of some particular men, who had the luck to compile those Systems, and Epitomes which they gave us, would have been less glorious, than they are. Though that too may be doubted; and (if we may conclude any thing surely, upon a matter so changeable, as Fame is) we have reason enough to believe, that these later Ages would have honour'd Plato, Aristotle, Zeno, and Epicurus, as much, if not more, than now they do; if they had only set things in a way of propagating Experiences down to us; and not imposed their imaginations on us, as the only Truths. This may be well enough suppos'd; seeing it is common to all mankind, still to esteem dearer the memories of their Friends, than of those that pretend to be their Masters.

But this matter of reputation, was only the private concernment of five, or six. As for the Interest of those Times in general, I will venture to make good, that in all effects of true knowledge, they might have been as happy, without those Bodies of Arts, as they were with them; Logick, and the Mathematicks only excepted. To instance in their Physick: they were utterly useless, in respect of the good of mankind; they themselves did almost confess so much, by reserving all their Natural Philosophy, for the retirements of their Wisemen. What help did it ever bring to the vulgar? What visible benefit to any City, or Country in the World? Their Mechanicks, and Artificers (for whom the
the True Natural Philosophy should be principally inteneded) were so far from being assisted by those abstruse Doctrines; that perhaps scarce any one of those Professions, and Trades, has well understood Aristotle's Principles of Bodies, from his own Time down to ours. Hence then we may conclude, that those first Times, wherein these Arts were made, had been nothing dammag'd; if, instead of raising so many speculative Opinions, they had only minded the laying of a solid ground-work, for a vast Pile of Experiments, to be continually augmenting through all Ages.

And I will also add; that, if such a course had been at first set on foot, Philosophy would by this means have been kept closer to material things; and so, in probability, would not have undergone so many Eclipses, as it has done ever since. If we reckon from its first setting forth in the East; we shall find, that in so long a Tract of Time, there have not been above four, or five hundred years, at several intervals, wherein it has been in any request in the World. And if we look back on all the alterations, and subversions of States, that have hapned in Civil Nations, these three thousand years: we may still behold, that the Sciences of mens brains, have been always subject to be far more injur'd by such vicissitudes, than the Arts of their hands. What cause can be assign'd for this? Why was Learning the first thing, that was constantly swept away, in all destructions of Empire, and foreign inundations? Why could not that have weather'd out the storm, as well as most sorts of Manufactures: which, though they began as soon, or before the other, yet they have remain'd, through all such changes, unalter'd; except for the better? The Reason of this is evident. It is, because Philosophy had been spun out,
out, to so fine a thread, that it could be known but
only to those, who would throw away all their whole
Lives upon it. It was made too subtile, for the com-
mon, and gross conceptions of men of business. It had
before in a measure been banish’d, by the Philosophers
themselves, out of the World; and shut up in the
shades of their walks. And by this means, it was first
look’d upon, as most useless; and so fit, soonest to be
neglected. Whereas if at first it had been made to
converse more with the senses, and to assist familiarly
in all occasions of human life; it would, no doubt,
have been thought needful to be preserv’d, in the
most Active, and ignorant Time. It would have escap’d
the fury of the Barbarous people; as well as the Arts
of Ploughing, Gard’ning, Cookery, making Iron and
Steel, Fishing, Sailing, and many more such necessary
handicrafts have done.
But it is too late to lament this error of the Anti-
ents; seeing it is not now to be repair’d. It is enough,
that we gather from hence; that by bringing Philo-

dphy down again to mens sight, and practice, from
whence it was flown away to high: the Royal Society
has put it into a condition of standing out, against the
Invasions of Time, or even Barbarism it self: that by
establishing it on a firmer foundation, than the airy
Notions of men alone, upon all the works of Nature;
by turning it into one of the Arts of Life, of which
men may see there is daily need; they have provided,
that it cannot hereafter be extinguish’d, at the los of
a Library, at the overthrowing of a Language, or at
the death of some few Philosophers: but that men must
lose their eyes, and hands, and must leave off desiring
to make their Lives convenient, or pleasant; before
they can be willing to destroy it.

Thus
Thus far I was come in my intended work, when my hand was stop'd, and my mind disturb'd from writing, by the two greatest disasters, that ever befell our Nation, the fatal Infection, which overspread the City of London in Sixty five; and the dreadful firing of the City itself, in the year ensuing. These two calamities may well be sufficient, to excuse the delay of publishing this Book: when the one of them devour'd as many Men, and the other as many Books, as the cruellest incursion of the Goths, and Vandals, had ever done.

The Plague was indeed an irreparable damage to the whole Kingdom: but that which chiefly added to the misery, was the time, wherein it happen'd. For what could be a more deplorable accident, than that so many brave men should be cut off by the Arrow, that flies in the dark, when our Country was ingag'd in a foreign War, and when their Lives might have been honourably ventur'd on a glorious Theater in its defence? And we had scarce recover'd this first misfortune, when we receiv'd a second, and a deeper wound, which cannot be equal'd in all History, if either we consider the obscurity of its beginning, the irresistible violence of its progress, the horror of its appearance, or the wideness of the ruine, it made, in one of the most renown'd Cities of the World.

Yet when on the one side, I remember, what desolation these scourges of mankind have left behind them; and on the other when I reflect on the magnanimity, wherewith the English Nation did support the mischiefs: I find, that I have not more reason to bewail the one, than to admire the other.

Upon
Upon our return after the abating of the Plague, what else could we expect, but to see the streets unfrequented, the River forsaken, the fields deform'd with the Graves of the Dead, and the Terrors of Death still abiding on the faces of the living? But instead of such dismal lights, there appear'd almost the same throngs in all publick places, the same noise of business, the same freedom of conuers, and with the return of the King, the same cheerfulness returning on the minds of the people as before.

Nor was their courage less, in sustaining the second calamity, which destroy'd their houses, and estates. This the greatest losers indur'd with such undaunted firmness of mind, that their example may incline us to believe, that not only the best Natural, but the best Moral Philosophy too, may be learn'd from the Shops of Mechanicks. It was indeed an admirable thing to behold, with what constancy, the meanest Artificers saw all the labours of their lives, and the support of their families devour'd in an instant. The affliction 'tis true, was widely spread over the whole Nation: every place was fill'd with signs of pity, and commiseration: But those who had suffer'd most, seem'd the least affected with the loss: no unmanly bewailings were heard in the few streets, that were preserv'd; they beheld the Ashes of their Houses, and Gates, and Temples, without the least expression of Pufillanimity. If Philosophers had done this, it had well become their profession of Wisdom: if Gentlemen, the nobleness of their breeding, and blood would have requir'd it. But that such greatness of heart should be found amongst the poor Artizans, and the obscure multitude, is no doubt one of the most honourable events, that ever happen'd. Yet still there is one circumstance behind,
hind, which may raise our wonder higher: and that is, that amidst such horrible ruins, they still prosecuted the War with the same vigour, and courage, against three of the most powerful States of all Europe. What Records of Time, or Memory of past Ages, can shew us a greater testimony of an invincible and heroic Genius, than this, of which I now speak? that the sound of the Heralds proclaiming new Wars, should be pleasant to the people, when the sad voice of the Bell-man was scarce yet gone out of their ears? that the increase of their Adversaries Confederates, and of their own calamities, should be so far from affrighting them, that they rather seem’d to receive from thence a new vigour, and resolution? and that they should still be eager upon Victories, and Triumphs, when they were thought almost quite exhausted, by so great destructions?

 Sect. XXII. From this observation my mind begins to take comfort, and to presage, that as this terrible Disease, and Conflagration were not able to darken the honour of our Princes Armies; so they will not hinder the many noble Arts, which the English have begun under his Reign on the strength of these hopes, and encouragements. I will now return to my former thoughts, and to the finishing of my interrupted design. And I come with the more earnestness to perfect it, because it seems to me, that from the sad effects of these disasters, there may a new, and a powerful Argument be rais’d, to move us to double our labours, about the Secrets of Nature.

A New City is to be built, on the most advantageous Seat of all Europe, for Trade, and command. This therefore is the fittest Season for men to apply their thoughts,
thoughts, to the improving of the materials of building, and to the inventing of better models, for Houses, Roofs, Chimneys, Conduits, Wharfs, and Streets: all which have been already under the consideration of the Royal Society: and that too, before they had such a sad occasion of bringing their observations into practice. The mortality of this Pestilence exceeded all others of later Ages. But the remembrance of it should rather enliven than damp our Industry. When mankind is overrun with such horrible invasions of Death, they should from thence be universally alarm'd, to use more diligence about preventing them for the future.

It is true, that terrible evil has hitherto in all Countries, been generally too strong, for the former remedies of Art. But why should we think that it will continue so for ever? Why may we not believe, that in all the vast compass of natural virtues of things yet conceal'd, there is still reserv'd an Antidote, that shall be equal to this poison? If in such cases we only accuse the Anger of Providence, or the Cruelty of Nature: we lay the blame, where it is not justly to be laid. It ought rather to be attributed to the negligence of men themselves, that such difficult Cures are without the bounds of their reasons power.

If all men had desponded at first, and sunk under the burden of their own infirmities, almost every little wound, or pain of the least member, had been as deadly, as the Plague at this time. It was by much Inquiry, and use, that most of the mildest diseases became curable. And every first success of this kind, should always strengthen our assurance of further conquests, even over this greatest Terror of mankind, Distrust, and despair of our own endeavours, is as great

Q.2
great a hindrance in the progress of the True Philosophy, as it is wont to be in the rise of mens private fortunes. Whoever aims not at the greatest things, will seldom proceed much farther, than the least. Whoever will make a right, and a fortunate Courtship to Nature, he cannot enterprise, or attempt too much: for she (as it is said of other Mistresses) is also a Mistress, that soonest yields to the forward, and the Bold.

I have hitherto describ'd the first Elements, on which the Royal Society arose, and supported its beginnings: I have trac'd its progress from the first private indeavours of some of its members, till it became united into a Regular constitution: and from thence I have related their first conceptions, and practices, towards the setting of an universal, constant, and impartial survey of the whole Creation. There now remains to be added in this Third part of my Narration, an Account of the Encouragements they have receiv'd from abroad, and at home; and a Particular Enumeration of the Principal Subjects, about which they have been employ'd since they obtain'd the Royal Confirmation.

Sec. XXIII. The Reputation, and Correspondence of the R.S. abroad.

I will first begin with the essence, which all the Civil world abroad has conceiv'd of their Enterprise. And I mention this with the more willingness, because I believe, that our Nation ought justly to be reprov'd, for their excess of Natural bashfulness, and for their want of care, to have their most excellent things represented to Strangers with the best advantage. This silent, and reserved humour has no doubt been very prejudicial to us, in the judgment, that our Neighbours have often made, not only concerning the condition.
dition of our Learning, but also of our Political affairs. I will therefore trespass a little on this disposition of my Countrymen, and affirm, that as the English name does manifestly get ground, by the bravery of their Arms, the Glory of their Naval strength, and the spreading of their Commerce: so there has been a remarkable addition to its renown, by the success, which all our Neighbours expect from this Assembly.

It is evident, that this searching Spirit, and this affection to sensible Knowledge, does prevail in most Countries round about us. 'Tis true, the conveniences for such labours, are not equal in all places. Some want the assistance of others hands; some the contribution of others purses: some the benefit of excellent Instruments; some the Patronage of the Civil Magistrates: But yet according to their several powers, they are everywhere intent on such practical Studies. And the most considerable effects of such attempts throughout Europe, have been still recommended to this Society, by their Authors, to be examin'd, approved, or corrected.

The Country, that lies next to England in its situation is France: and that is also nearest to it, in its zeal for the promotion of Experiments. In that Kingdom, the Royal Society has maintained a perpetual intercourse, with the most eminent men of Art of all conditions: and has obtain'd from them, all the help which might justly be hop'd for, from the vigour, and activity, and readiness of mind, which is natural to that people. From their Physicians, Chirurgeons, and Anatomists, it has receiv'd many faithful Relations of extraordinary Cures: from their most judicious Travellers the Fruits of their Voyages: from their most fa-
mous Mathematicians, divers Problems, which have been solv'd many different ways: from their Chymists the effects of their Fires: and from others of their best Observers, many rarities, and discourses, of their Fruits, Silk, Wine, Bread, Plants, Salt, and such Natural productions of their Soil. And, to instance once for all, it has been affectionately invited to a mutual correspondence by the French Academy of Paris.

In which invitation, there is one expression, that ought not to be pass'd over in silence: that they acknowledge the English Nation, to have many advantages, for the propagating of Real Philosophy, which are wanting to all others. This Confession is true. Yet these advantages, unless they had been improv'd by this institution, had been only as those, that we have for fishing, objections, and arguments of our cloth.

In Italy.

In Italy the Royal Society has an excellent privilege of receiving, and imparting Experiments, by the help of one of their own Fellows, who has the opportunity of being Resident there for them, as well as for the King. From thence they have been earnestly invited to a mutual intelligence, by many of their most Noble Wits, but chiefly by the Prince Leopoldo, Brother to the Great Duke of Tuscany; who is the Patron of all the Inquisitive Philosophers of Florence: from whom there is coming out under his Name an account of their proceedings call'd Ducat Experiments. This application to the Royal Society I have mention'd, because it comes from that Country, which is seldom wont to have any great regard, to the Arts of these Nations, that lye on this side of their mountains.

In Germany. In Germany, and its neighbouring Kingdoms, the
Royal Society has met with great veneration: as appears by several Testimonies, in their late Printed Books, which have been submitted to its Censure: by many Curiosities of Mechanick Instruments, that have been transmitted to it: and by the Addresses which have been sent from their Philosophical Enquirers. For which kinds of Enterprises the temper of the German Nation, is admirably fit, both in respect of their peculiar dexterity in all sorts of manual Arts, and also in regard of the plain, and unaffected sincerity of their manners: wherein they so much resemble the English, that we seem to have deriv'd from them the composition of our minds, as well as to have descended from their Race.

In the Low-Countries, their Interest, and Reputation has been establish'd, by the Friendship of some of their chief Learned men, and principally of Huguenus. This Gentleman has bestow'd his pains, on many parts of the speculative, and practical Mathematicks, with wonderful successess. And particularly his applying the Motion of Pendulums to Clocks, and Watches, was an excellent Invention. For thereby there may be a means found out, of bringing the measures of Time, to an exact Regulation: of which the benefits are infinite. In the prosecution of such Discoveries, he has often requir'd the aid of this Society; he has receiv'd: the light of their Trials, and a confirmation of his own, and has freely admitted their alterations, or amendments. And this learned correspondence with him, and many others, is still continued, even at this present time; in the breach between our Countries: Their Great Founder, and Patron still permitting them to maintain the Traffick of Sciences, when all other
other Commerce is intercepted. Whence we may guess, what may be expected from the peaceful part of our Kings Reign, when his very Wars are manag'd, without injury to the Arts of Civil Knowledge.

But not to wander any farther in particulars, it may perhaps in general be safely computed, that there has been as large a communication of Foreign Arts, and Inventions, to the Royal Society, within this small compass of time, as ever before did pass over the English Channel since the very first transportation of Arts into our Island. And that this benefit will still increase by the length of time is indubitable, from the Reception, which has been given to the Scholars, Nobility, Embassadors, and Foreign Princes, who of late years have travell'd hither, to behold a Country, which had been the Stage of so famous a War, and so miraculous a Peace. All these have still visited the Royal Society, as one of the first, and Noblest Fruits of our restoration. From hence they have return'd home, with a free engagement of their assistance: the men of learning affuring it of a contribution of their Labours, and the Statesmen, and Princes of their Authority, and indevours, in satisfying all Philosophical Queries, with which they have been plentifully furnish'd.

It would be a useless pomp to reckon up a Catalogue of their Names: especially seeing they are already recorded with gratitude, in a more lasting Monument, The Register of the Society. Only it will not, I think, be amis, if I mention the visit of one Prince, because it may afford us a profitable observation. When the Duke of Brunswick, and Lunenbourgh was introduc'd into their weekly Assembly, and had subscrib'd his name to their Statutes: there was accor-
ding to the Custom, one of the Fellows appointed, to interpret to him, what Experiments were produc'd, and examin'd at that meeting. But his Highness told them, that it was not necessary, they should put themselves to that trouble: for he well understood our Language, having been drawn to the study of it, out of a desire of reading our Philosophical Books. From whence there may this conclusion be made, that if ever our Native Tongue shall gain any ground in Europe, it must be by augmenting its Experimental Treasure. Nor is it impossible, but as the Feminine Arts of Pleasure, and Gallantry have spread some of our Neighbouring Languages, to such a vast extent: so the English Tongue may also in time be more enlarg'd, by being the Instrument of conveying to the World, the Masculine Arts of Knowledge.

I now come to relate, what encouragements this design has receiv'd at home in its Native soyl. And I will assure my Reader, that the Original of the Royal Society has found a general approbation within our selves, and that the most prudent men of all Professions, and Interests, have shewn by their respects to these hopeful beginnings, that there is a Reverence due to the first trials, and intentions, as well as to the last accomplishment of generous attempts.

Of our chief, and most wealthy Merchants, and Citizens, very many have assisted it with their presence: and thereby have added the industrious, punctual, and active Genius of men of Trafick, to the quiet, sedentary, and reserv'd temper of men of Learning. They have contributed their labours: they have help'd their correspondence: they have employ'd their...
their Factors abroad, to answer their Inquiries; they have laid out in all Countries for observations: they have bestowed many considerable gifts on their Treasury, and Repository. And chiefly there is one Bounty to be here inserted, which for the singular benefit that may be expected from it, deserves the applause and imitation of this, and future times. It is the establishment made by Sir John Cutler, for the reading on Mechanicks, in the place where the Royal Society shall meet. This is the first Lecture that has been founded of this kind, amidst all the vast munificence of so many Benefactors to Learning, in this later Age. And yet this was the most necessary of all others. For this has chiefly caus'd the slow progress of manual Arts; that the Trades themselves have never serv'd apprentices, as well as the Tradesmen: that they have never had any Masters set over them, to direct and guide their works, or to vary, and enlarge their operations.

Of our Physicians, many of the most judicious, have contributed their purses, their hands, their judgments, their writings. This they have done, though they have also in London, a College peculiar to their Profession; which ever since its first foundation, for the space of a hundred and fifty years, has given the world a succession of the most eminent Physicians of Europe. In that they confine themselves to the advancement of Physick: But in this, they have also with great zeal, and ability, promoted this universal inspection, into all Natural knowledge. For without danger of flattery, I will declare of the English Physicians, that no part of the world exceeds them, not only in the skill of their own Art, but in general Learning: and of very many of that profession I will affirm, that All Apollo:
Apollo is their own, as it was said by the best Poet of this Age, one of the most excellent of their number.

Of our Nobility, and Gentry, the most Noble and Illustrious have condescended to labour here with their hands, to impart their discoveries, to propose their doubts, to assist, and defray the charge of their Trials. And this they have done with such a universal agreement, that it is almost the only thing, wherein the Nobility of all the three Kingdoms are united. In their Assemblies for making Laws they are separated: in their customs, and manners of life they differ: And in their humours too, they are thought not much of kin to each other. But in the Royal Society the Scotch, the Irish, the English Gentry do meet, and communicate, without any distinction of Countries, or affections. From hence no doubt very much Political, as well as Philosophical benefit will arise. By this means, there is a good foundation laid, for the removing of that aversion, which the English are sometimes observ'd to express to the Natives of those Kingdoms: which though perhaps it arises from the Knowledge of their own advantages above the other, yet it is a great hindrance to the growth of the British power. For as a Kingdom divided against itself, cannot stand; so three Kingdoms divided from each other, in Tempers, Studies, and Inclinations, can never be great, upon one common interest.

Of our Ministers of State at home, and our Embassadors abroad, there have been very few employ'd, who are not Fellows of the Royal Society: and especially these latter, have bestow'd their pains in foreign Courts, to collect Relations, and Secrets of Nature, as well as...
of State: For, which service their way of life is most convenient; by the generality of their converse, the privileges, and freedom of their dispatches; and the usual Resort of the most knowing, and inquisitive men to their company.

Our Greatest Captains, and Commanders have insoll'd their Names in this number, and have regarded these Studies: which are not, as other parts of Learning, to be call'd the Studies of the Gown, for they do as well become the profession of a Soldier, or any other way of life. Nor have our most renowned Generals neglected the opportunities of Philosophical Inquiries, even in the midst of their greatest Enterprizes, on which the fate of Kingdoms has depended. They have been furnish'd with Instruments, and directions by the Royal Society, and amidst the Tumult of Wars, and Government of Fleets, they have found leisure to make some Trials of Experiments: which works as much excell that of Declaiming, which some of the Roman Generals us'd in their Camps, as it is better to do, than to talk well.

Of our Churchmen the Greatest and the most Reverend, by their care, and passion, and endeavours, in advancing this Institution, have taken off the unjust scandal from Natural knowledge, that it is an Enemy to Divinity. By the perpetual Patronage, and assistance, they have afforded the Royal Society, they have confuted the false opinions of those men, who believe that Philosophers must needs be irreligious: they have shewn that in our veneration of Gods Almighty power, we ought to imitate the manner of our respect to Earthly Kings. For as, the greater their Dominion is,
the more observance is wont to be given to their nearest Servants and Officers: so the greatness of the Divine Majesty is best to be worshipp'd, by the due honouring, and observing of Nature, which is his immediate Servant, and the universal Minister of his pleasure.

But I make haste to that, which ought to be esteem'd the very life, and soul of this undertaking, the protection, and favour of the King, and the Royal Family. When the Society first address'd themselves to his Majesty, he was pleas'd to express much satisfaction, that this enterprize was begun in his Reign: he then represented to them the gravity, and difficulty of their work, and assur'd them of all the kind influence of his Power, and Prerogative. Since that he has frequently committed many things to their search: he has refer'd many foreign Rarities to their inspection: he has recommended many domestick improvements to their care: he has demanded the result of their trials, in many appearances of Nature: he has been present, and assist'd with his own hands, at the performing of many of their Experiments, in his Gardens, his Parks, and on the River. And besides I will not conceal, that he has sometimes reprov'd them for the slowness of their proceedings: at which reproofs they have not so much cause to be afflicted, that they are the reprehensions of a King, as to be comforted, that they are the reprehensions of his love, and affection to their progress. For a Testimony of which Royal benignity, and to free them from all hindrances, and occasions of delay, he has given them the establishment of his Letters Patents, of which I will here produce an Epitome.

Charles
Charles the second, by the Grace of God, of England, Scotland, France, and Ireland King, Defender of the Faith, &c. To all unto whom these presents shall come, Greeting. Having long resolved within our self to promote the welfare of Arts and Sciences, as well as that of our Territories and Dominions, out of our Princely affecion to all kind of Learning, and more particular favour to Philosophical Studies. Especially those which in-deavour by solid Experiments either to reform or improve Philosophy. To the intent therefore that these kinds of study, which are no where yet sufficiently cultivated, may flourish in our Dominions; and that the Learned world may acknowledge us to be, not only the Defender of the Faith, but the Patron and Encourager of all sorts of useful Knowledge.

Know ye, that we out of our special Grace, certain knowledge, and meer motion, have given and granted, and do by these presents give and grant for us, our Heirs, and Successors, That there shall be for ever a Society, consisting of a President, Council, and Fellows, which shall be called by the name of the President, Council, and Fellows of the Royal Society of London, for and improving of Natural knowledge, of which Society we do by these presents declare our self to be Founder and Patron. And we do hereby make and constitute the said Society by the name, &c. to be a Body corporate, to be continued under the same name in a perpetual succession; And that they and their successors (whose studies are to be imployed for the promoting of the knowledge of natural things, and useful Arts by Experiments. To the glory of God, and the good of mankind) shall by the foresaid name of President, Council, &c. be enabled and made capable in Law, to levy, hold, possess, and injoy, Lands, Tenements, &c. Liberties, Franchises, Jurisdictions, for perpetuity,
or Terms of Lives, or Years, or any other way: as also Goods, Chattels, and all other things of what Nature or Kind soever. And also by the name aforesaid to Give, Grant, Demise, or Assign the said Lands, Goods, &c. and to do all things necessary thereabout. And the said Persons by the name aforesaid are unable to implead, be impleaded, sue, defend, &c. in any Courts, and before any Judges, Officers, &c. whatsoever of the King, His Heirs and Successors, in all and singular Actions Real and Personal: Pleas, Causes, &c. of what kind soever, as any of His Subjects within his Kingdom of England, or Corporations, are by Law capable and enabled to do.

And the said President, Council, and Fellows are impowr'd to have a Common Seal for their use in their Affairs: and from time to time to break, change, and make anew the same, as shall seem expedient unto them.

And his Majesty, in Testimony of his Royal Favour towards the said President, Council, and Fellows, and of His especial esteem of them, doth Grant a Coat of Arms to them and their Successors, viz. On a Field Argent a Canton of the three Lyons of England: For a Crest, an Eagle proper on a Ducal Coronet supporting a Shield charged with the Lyons aforesaid; and for Supporters, two Talbots with Coronets on their Necks. The said Armes to be borne, &c. by the said Society upon all occasions.

And that His Majesties Royal Intention may take the better effect for the good Government of the said Society from time to time: It is established, That the Council aforesaid shall consist of 21 Persons; (whereof the President for the time being always to be one.) And that all Persons, which within two Moneths next ensuing the date of the said Charter shall be chosen by the said President
The HISTORY of the

Fident and Council; and in all times after the said two
Moneths, by the President, Council, and Fellows [and
noted in a Register to be kept for that purpose] shall be
Fellows of the said Society, and so accounted, and call'd
during life, except by the Statutes of the said Society to
be made any of them shall happen to be amoved. And by
how much any Persons are more excelling in all kinds of
Learning, by how much the more ardently they desire to
promote the Honour, Business, and Emolument of the said
Society, by how much the more eminent they are for Intel-
grity, Honesty, Piety, Loyalty, and Good Affection toward
His Majesty, His Crown and Dignity; by so much the
more fit and worthy such Persons are to be judged for re-
ception into the Society.

And for the better execution of his Royal Grant, His
Majesty hath nominated, &c. His Trusty and Well-bel-
ved William Viscount Brouncker, Chancellor to His
dearest Consort Queen Catharine, to be the First and
Modern President to continue in the said Office from the
date of the Patent to the Feast of Saint Andrew next
ensuing, and until another Person of the said Council be
duly chosen into the said Office. The said Lord Brouncker
being sworn in all things belonging thereto well and
faithfully to execute the said Office before His right well-
beloved and right Trusty Cousin and Counsellor, Edward,
Earl of Clarendon, Lord High Chancellor of England,
in the words following.

William Viscount Brouncker do promise to deal
faithfully and honestly in all things belonging to
that Trust committed to me, as President of the Royal
Society of London, for improving Natural Knowledge.
So help me God.

And
And His Majesty hath nominated, &c. the Persons following, His Trusty and Well beloved Sir Robert Murray Knight, one of His Privie Council in His Kingdom of Scotland, Robert Boyle Esquire, William Brereton Esquire, eldest Son to the Lord Brereton, Sir Kenelme Digby Knight, Chancellor to His dearest Mother Queen Mary, Sir Gilbert Talbot Knight, Master of His Jewellhouse, Sir Paul Neile Knight, one of the Ushers of His Privie Chamber, Henry Slingsby Esquire, one of the Gentlemen of His said Privie Chamber, Sir William Petty Knight, Timothy Clark Doctor of Physick, and one of His Physicians, John Wilkins Doctor of Divinity, George Ent Doctor of Physick, William Erksyne Esq., one of His Cupbearers, Jonathan Goddard Doctor of Physick, William Ball Esquire, Matthew Wren Esquire, John Evelyn Esquire, Thomas Henshaw Esquire, Dudley Palmer of Grayes-Inn Esquire, Abraham Hill of London Esquire, and Henry Oldenburg Esquire, together with the President aforesaid, to be the first and Modern 21. of the Council and Fellows of the Royal Society aforesaid, to be continued in the Offices of the Council aforesaid, from the date of the Patent to the Feast of Saint Andrew next following, and from thence till other fit Persons be chosen into the said Offices. The said Persons to be sworn before the President of the Society, for the time being, well and truly to execute the said Offices, according to the form and effect of the aforesaid Oath to be administered to the President by the Lord Chancellor aforesaid. For the administering which Oath to the said Persons, and all others hereafter from time to time to be chosen into the said Council, full Power and Authority is Granted to the President for the time being. And the said Persons duly sworn, and all other from time to time duly chosen into the said Council,
oil and sworn, are to aid, advise and assist in all affairs, businesses, and things concerning the better Regulation, Government, and Direction of the Royal Society, and every Member thereof.

Furthermore, Liberty is granted to the said Society, lawfully to make and hold meetings of themselves, for the searching out and discovery of Natural Things, and Transaction of other businesses relating to the said Society, when and as often as shall be requisite, in any College, Hall, or other Convenient place in London, or within 10 Miles thereof.

And Power is Granted to the said Society, from time to time to nominate and choose yearly, on Saint Andrews day, one of the Council aforesaid, for the time being, to be President of the Society until Saint Andrews day next ensuing (if he shall so long live, or not be removed for some just and reasonable Cause) and from thence until another be chosen and put into the said Office: the said President so elected, before admission to that Office, to be sworn before the Council, according to the form before expressed, who are impow'rd to administer the said Oath from time to time, as often as there shall be cause to choose a President.

And in Case that the said President, during his Office, shall die, receive, or be removed; then, and so often as it shall be Lawful for the Council of the Royal Society, to meet together to choose one of their Number for President of the said Society, and the Person so chosen and duly sworn, shall have and exercise the Office of President for the remainder of the year, and until another be duly chosen into the said Office.

And in Case that any one or more of the Council aforesaid, shall die, receive, or be removed (which powers or any of them, for misdeemous, or other reasonable cause, are declared
ROYAL SOCIETY.

declared to be amovable by the President and the rest of the Council) then and so often it shall be lawful for the President, Council, and Fellows, to choose one or more of the Fellows of the Royal Society in the room of him or them so deceasing, receding, or removed, to compleat the aforesaid number of 21. of the Council, which Person or Persons, so chosen, are to continue in Office until Saint Andrews day then next ensuing, and until others be duly chosen, the said Persons being sworn, faithfully to execute their Offices, according to the true intention of the Patent.

And His Majestie doth will and Grant unto the said President, Council, and Fellows, full power and authority on Saint Andrews day yearly, to elect, nominate, and change 10. of the Fellows of the Royal Society, to supply the places and Offices of ten of the aforesaid number of 21. of the Council, declaring it to be His Royal Will and Pleasure, that ten and no more of the Council aforesaid be annually changed and removed by the President, Council, and Fellows aforesaid.

And it is Granted on the behalf of the said Society, that if it shall happen, that the President to be sick, infirm, detained in His Majesties Service, or otherwise occupied, so as he cannot attend the necessary Affairs of the Society, then and so often it shall be lawful for him to appoint one of the Council for his Deputy, who shall supply his place from time to time, as often as he shall happen to be absent during the whole time of the said Presidents continuance in his Office, unless he shall in the mean time constitute some other of the Council for his Deputy: And the Deputy so constituted is empowered to do all and singular things which belong to the Office of the President of the Royal Society, and in all ample manner and form as the said President may do by virtue of
His Majesties Letters Patents, He the said Deputy being duly sworn before the Council in form before specified, who are impowrd to administer the Oath as often as the case shall require.

It is further granted to the Society, to have one Treasurer, two Secretaries, two or more Curators of Experiments, one or more Clerk or Clerks, and also two Sergeants at Mace, who may from time to time attend on the President: all the said Officers to be chosen by the President, Council and Fellows, and to be sworn in form and effect before specified, well and faithfully to execute their Offices, which Oath the Council are impowrd to administer: And His Majesty nominates and appoints his well-beloved Subjects, the aforesaid William Ball Esquire, to be the first and Modern Treasurer, and the aforesaid John Wilkins and Henry Oldenburg, to be the first and Modern Secretaries of the Royal Society, to be continued in the said Offices to the Feast of Saint Andrew next following the date of the Patent. And that from time to time, and ever hereafter, on the said Feast of Saint Andrew (if it be not Lords day, and if it be Lords day, on the next day after) the President, Council, and Fellows aforesaid, are impowrd to nominate and choose honest and discreet Men for Treasurer and Secretaries, which are to be of the Number of the Council of the Royal Society, which Persons Elected and sworn, in form before specified, are to exercise and enjoy the said Offices until the Feast of Saint Andrew then next following.

And if it shall happen, that the aforesaid Elections of the President, Council, Treasurer, and Secretaries, or any of them, cannot be made or perfected on the Feast of Saint Andrew aforesaid: it is granted to the aforesaid President, Council, and Fellows, that they may lawfully nominate and assign another day as near to the said Feast of Saint Andrew as conveniently may be, for making or perfecting
perfeeting the said Elections, and so from day to day till the said Elections be perfected.

And in case that any of the aforesaid Officers of the Royal Society shall die, recede, or be remov'd from their respective Offices, then and so often it shall be lawful for the said President, Council, and Fellows, to choose one or more into the Office or Offices vacant, to hold the same during the residue of that year, and until others be duly chosen and sworn in their places.

Moreover, on the behalf of the Society, it is granted unto the President and Council, that they may assemble and meet together in any Colledge, Hall, or other convenient place in London, or within ten miles thereof (due and lawful summons of all the Members of the Council to extraordinary meetings being always premised) and that they being so met together, have full power and authority from time to time, to make, constitute, and establish such Laws, Statutes, Orders, and Constitutions, which shall appear to them to be good, useful, honest, and necessary, according to their judgments and discretions, for the Government, Regulation and Directions of the Royal Society, and every Member thereof: And to do all things concerning the Government, Estate, Goods, Lands, Revenues, as also the Businesses and Affairs of the said Society: All which Laws, Statutes, Orders, &c. so made, His Majesty wills and commands, that they be from time to time inviolably observed, according to the tenor and effect of them: Provided that they be reasonable and not repugnant or contrary to the Laws, Customs, &c. of his Kingdom of England.

And furthermore, full Power and Authority is given and granted unto the said Society, from time to time to choose one or more Printers and Gravers, and by writing sealed with the Common Seal of the Society, and signed by the President for the time being, to grant them power to print such things, matters and businesses concerning the said
said Society, as shall be committed to them by the Council from time to time; The said Printers and Gravers being sworn before the President and Council in form before specified, which President and Council are empowered to give the said Oath.

And for the greater advantage and success of the Society in their Philosophical Studies and Indeavours, full Power and Authority is granted unto them, to require, take, and receive, from time to time, dead bodies of Persons executed, and the same to anatomize, to all intents and purposes, and in as ample manner and form as the Colledge of Physitians, and Company of Chirurgions of London (by what names soever the said two Corporations are or may be called) have had and made use of, or may have and use the said Bodies.

And for the improvement of such Experiments, Arts, and Sciences as the Society may be employ'd in, full Power and Authority is granted unto them, from time to time by Letters under the hand of the President in the presence of the Council, to hold Correspondence and Intelligence with any Strangers, whether private Persons, or Collegiate Societies or Corporations, without any Interruption or Molestation whatsoever: Provided that this Indulgence or Grant be extended to no further use than the particular Benefit and Interest of the Society, in Matters Philosophical, Mathematical, and Mechanical.

Full Power and Authority is also granted on the behalf of the Society to the Council, to erect and build one or more Colledges within London, or ten miles thereof, of what form or quality soever, for Habitation, Assembling, or Meeting of the President, Council and Fellows, about any affairs and businesses of the Society.

And if any abuses or differences shall ever hereafter arise
arise and happen about the Government or Affairs of the Society, whence the Constitution, Progress, and Improvement, or Business thereof may suffer or be bindred: In such cases His Majesty Assigns and Authorizes His right Trusty and right Well-beloved Cofen and Counsellor, Edward Earl of Clarendon Lord High Chancellor of England, by himself during his life, and after his decease the Lord Arch-bishop of Canterbury, the Lord Chancellor, or Lord Keeper of the Great Seal of England, the Lord High Treasurer of England, the Lord Keeper of the Privy Seal, the Lord Bishop of London, and the two principal Secretaries of State for the time being, or any four or more of them, to compose and redress any such differences or abuses.

And lastly, His Majesty straightly charges and commands all Justices, Mayors, Aldermen, Sheriffs, Bailiffs, Constables, and all other Officers, Ministers, and Subjects whatsoever, from time to time to be aiding and assisting unto the said President, Council, and Fellows of the Royal Society, in and about all things, according to the true intention of His Letters Patents.

This is the Legal Ratification which the Royal Society has receiv'd. And in this place I am to render their publique thanks to the Right Honourable the Earl of Clarendon Lord Chancellor of England, to Sir Jeffery Palmer Attorney General, and to Sir Heneage Finch Solicitor General: who by their cheerful concurrence, and free promotion of this Confirmation, have wip'd away the asperions, that has been scandalously cast on the Profession of the Law, that it is an Enemy to Learning, and the Civil Arts. To shew the Fidelity of this reproach, I might instance in many Judges and Counsellors of all Ages, who have been the orna-
ornaments of the Sciences, as well as of the Bar, and Courts of Justice. But it is enough to declare, that my Lord Bacon was a Lawyer, and that these eminent Officers of the Law, have compleated this foundation of the Royal Society: which was a work well becoming the largeness of his Wit to devise, and the greatness of their Prudence to establish.

According to the intention of these Letters Patents, their Council has ever since been annually renew'd: their President, their Treasurer, their Secretaries chosen: The chief employments of the Council have been to manage their Political affairs, to regulate disorders, to make addresses, and applications in their behalf; to guard their Privileges, to disperse correspondents, but Principally to form the Body of their Statutes, which I will here insert.

An Abstract of the Statutes of the Royal Society.

**V V**

Hatever Statute shall be made, or repeal'd, the making or repealing of it shall be voted twice, and at two several meetings of the Council.

This Obligation shall be subscrib'd by every Fellow; or his election shall be void.

We who have hereto subscrib'd, do promise each for himself, that we will indeavour to promote the good of the Royal Society of London, for the Improvement of Natural Knowledge, and to pursue the ends, for which the same was founded: that we will
will be present at the Meetings of the Society, as often as conveniently we can: especially at the anniversary Elections, and upon extraordinary occasions: and that we will observe the Statutes and Orders of the said Society: Provided, that whenever any of us shall signify to the President under his hand, that he desires to withdraw from the Society, he shall be free from this Obligation for the future.

Every Fellow shall pay his admission money, and afterwards contribution towards the defraying of the charges of Observations and Experiments, &c.

The ordinary meetings of the Royal Society shall be held once a week, where none shall be present, besides the Fellows, without the leave of the Society, under the degree of a Baron in one of His Majesties three Kingdoms, or of His Majesties Privie Council; or unless he be an eminent Forreigner, and these only without the leave of the President.

The business of their weekly Meetings shall be, To order, take account, consider, and discourse of Philosophical Experiments, and Observations: to read, hear, and discourse upon Letters, Reports, and other Papers, containing Philosophical matters, as also to view, and discourse upon the productions and rarities of Nature, and Art: and to consider what to deduce from them, or how they may be improved for use, or discovery.

The Experiments that be made at the charge of the Society. Two Curators at least shall be appointed for the Inspection of those which cannot be perform'd before the Society: by them the bare report of matter of Fact shall be stated and return'd.

The Election of Fellows shall be made by way of Ballet: and their Admission by a solemn Declaration made by the President of their Election.
The Election of the Council and Officers, shall be made once a year: Eleven of the present Council shall be continued, by Lot, for the next year, and ten new Ones chosen, in like manner. Out of this new Council shall be elected a President, Treasurer, and two Secretaries, in the same way.

The President shall preside in all meetings, regulate all debates of the Society, and Council; state, and put Questions; call for Reports, and Accounts from Committees, Curators, and others; summon all extraordinary meetings upon urgent occasions; and see to the execution of the Statutes. The Vice-President shall have the same power in the absence of the President.

The Treasurer, or his Deputy, shall receive and keep Accounts of all money due to the Society, and disburse all money payable by the Society. He shall pay small sums by order of the President under his hand, but those that exceed five pounds by order of the Council. All Bills of charges for Experiments shall first be signed by the Curators. The Accounts of the Treasurer shall be Audited four times a year, by a Committee of the Council, and once a year by a Committee of the Society.

The Secretaries are to take Notes of the Orders, and material passages of the Meetings; to take care of the Books, Papers, and Writings of the Society; to order, and direct the Clerks in making Entries of all matters in the Register, and Journal-Books of the Society, or Council; to draw up such Letters as shall be written in their Name, which shall be approved at one of their Meetings; to give notice of the Candidates propounded in order to Election.

The Curators by Office shall have a sufficient allowance for their encouragement, which shall increase proportionally with the revenue of the Society, provided that it exceed
exceed not two hundred pounds a year. They shall be well skilled in Philosophical, and Mathematical Learning, well vers'd in Observations, Inquiries, and Experiments of Nature and Art. They shall take care of the managing of all Experiments, and Observations appointed by the Society, or Council, and report the same, and perform such other tasks, as the Society, or Council shall appoint: such as the examining of Sciences, Arts, and Inventions now in use, and the bringing in Histories of Natural and Artificial things, &c. They shall be proposed at least a month before they are chosen. They shall be examined by the Council before the election: To their Election every Member of the Society shall be summoned: They shall at first be only elected for a year of probation, (except they be of known merits) at the end of the year, they shall be either elected for perpetuity, or for a longer time of probation, or wholly rejected. The causes of ejecting a Curator shall be the same with ejecting a Fellow, or for fraudulent dealing, and negligence in the affairs of the Society, provided that he shall first receive three respective admonitions. If any Curator shall be disabled by Age, Infirmity, or any Casualty, in the service of the Society, some provision shall be made for him during life, if his condition requires, according as the Council shall think fit.

The Clerk shall constantly attend at all Meetings: he shall follow the directions of the Secretaries, in Registering, and entering all matters that shall be appointed: he shall not communicate any thing contain'd in their Books, to any that is not a Fellow. He shall have a certain rate for what he copies, and a yearly stipend for his attendance.

The Printer shall take care for the printing of such Books as shall be committed to him by order of the Society.
The Operators of the Society, when they have any of their Work under their hands, shall not undertake the work of any other persons, which may hinder the business of the Society. They shall have Salaries for their attendance.

The Common Seal of the Society, shall be kept in a Chest with three Locks, and three different Keys, by the President, Treasurer, and one of the Secretaries. The Deeds of the Society, shall be pass’d in Council, and eald. by them and the President.


The names of Benefactors shall be honourably mention’d in a Book provided for that purpose.

In case of Death, or Recess of any Fellow, the Secretaries are to note it in the Margent of the Register, over against their names.

The causes of Ejection shall be contemptuous disobedience to the Statutes and Orders of the Society; defaming, or malicious damnifying the same. This shall be declar’d by the President at one of the Meetings; and the Ejection recorded.

When these Statutes were presented to his Majesty, he was pleas’d to superscribe himself, their Founder, and Patron, his Royal Highness, and his Highness Prince Rupert, at the same time, declaring themselves Fellows.

Nor
Nor has the King only encourag'd them, by kindness of words, and by Acts of State: but he has also provok'd them to unwearied activity in their Experiments, by the most effectual means of his Royal Example. There is scarce any one sort of work, whose advancement they regard, but from his Majesty's own labours, they have receiv'd a pattern for their indevours about it. They design the multiplying, and beautifying of Mechanick Arts: And the noise of Mechanick Instruments is heard in Whitehall itself. They intend the perfection of Graving, Statuary, Limning, Coining, and all the works of Smiths, in Iron, or Steel, or Silver: And the most excellent Artists of these kinds, have provision made for their practice, even in the Chambers, and Galleries of his Court. They purpose the trial of all manner of operations by fire: And the King has under his own roof found place for Chymical Operators, They resolve to restore, to enlarge, to examine Physick: And the King has indow'd the Colledge of London with new Privileges, and has planted a Physick Garden under his own eye. They have bestow'd much consideration, on the propagating of Fruits and Trees; And the King has made Plantations enough, even almost to repair the ruines of a Civil War. They have begun an exact Survey of the Heavens: and Saint Jameses Park may witness, that Ptolomey and Alphonso were not the only Monarchs, who observ'd the motions, and appearances of the Stars. They have studied the promoting of Architecture in our Island: and the beauty of our late Buildings, and the reformation of his own Houses, do sufficiently manifest his Skill and Inclination to that Art: of which magnificence, we had seen more effects.
s. XXVIII.

And the present Genius of our Nation.

By these, and many other instances it appears, that the King has not only given succour to the Royal Society, in the prosecution of their labours; but has also led them on in their way, and traced out to them the paths, in which they ought to tread. And with this propitious inclination of his Majesty, and the highest Degrees of men, the Genius of the Nation itself irresistibly conspires. If we reflect on all the past times of Learning in our Island; we may still observe some remarkable accidents, that retarded these Studies, which were still ready to break forth, in spite of all opposition.

Till the union of the two Houses of York, and Lancaster, the whole force of our Country was ingag’d in Domestick Wars, between the King, and the Nobility, or in the furious contentions between the divided Families: unless sometimes some magnanimous Prince, was able to turn their strength, to foreign conquests. In King Henry the Seventh, the two Houses were joynd. His Government was like his own temper,
temper, close, severe, jealous, avaricious, and withall victorious, and prudent: but how unprepared his time was for new discoveries, is evident by the slender account that he made of the proposition of Columbus. The Reign of King Henry the eighth, was vigorous, haughty, magnificent, expensive, learned. But then the alteration of Religion began, and that alone was then sufficient to possession the minds of men.

The Government of King Edward the sixth was contentious, by reason of the factions of those who managed his childhood: and the shortness of his life deprived us of the fruits, that might have been expected, from the prodigious beginnings of the King himself. That of Queen Mary was weak, melancholy, bloody against the Protestants, obscure by a foreign Marriage, and unfortunate by the loss of Calais. That of Queen Elizabeth was long, triumphant, peaceable at home, and glorious abroad. Then it was shewn, to what height the English may rise, when they are commanded by a Prince, who knows how to govern their hearts, as well as hands. In her days the Reformation was settled, commerce was established, and Navigation advanced. But though knowledge began abundantly to spring forth, yet it was not then reasonable for Experiments to receive a public encouragement: while the writings of antiquity, and the controversies between us, and the Church of Rome, were not fully studied, and dispatched.

The Reign of King James was happy in all the benefits of Peace, and plentifully furnished with men of profound Learning. But in imitation of the King, they chiefly regarded the matters of Religion, and Disputation: so that even my Lord Bacon, with all his authority in the State, could never raise any College of
of Salomon, but in a Romance. That of King Charles the First, began indeed to be ripe for such undertakings, by reason of the plenty, and felicity of the first years of his Government, and the abilities of the King himself: who was not only an imitable Master, in reason and eloquence, but excelled in very many practical Arts, beyond the usual custome of Kings, nay even beyond the skill of the best Artists themselves. But he alas! was call'd away from the studies of quiet, and peace, to a more dangerous, and a more honourable reputation. The chief Triumphs that Heaven reserv'd for him, were to be gather'd from his suffering virtues, in them he was only exceeded, by his Divine Example of our Saviour: in imitation of whole Passion, those afflictions, and those thorns which the rude Souliers design'd for his disgrace, and torment, became his glory, and his Crown.

The late times of Civil War, and confusion, to make recompense for their infinite calamities, brought this advantage with them, that they stirr'd up mens minds from long ease, and a lazy rest, and made them active, industrious, and inquisitive: it being the usual benefit that follows upon Tempests, and Thunders in the State, as well as in the Sky, that they purifie, and clear the Air, which they disturb. But now since the Kings return, the blindness of the former Ages, and the miseries of this last, are vanish'd away: now men are generally weary of the Relicks of Antiquity, and satiated with Religious Disputes: now not only the eyes of men, but their hands are open, and prepar'd to labour. Now, there is a universal desire, and appetite after knowledge, after the peaceable, the fruitful, the nourishing Knowledge: and not after that of antient Sects, which only yielded hard indigestible arguments,
or sharp contentions instead of food: which when the minds of men requir'd bread, gave them only a stone, and for fish a serpent.

Whatever they have hitherto attempted, on these Principles, and encouragements, it has been carried on with a vigorous spirit, and wonderful good Fortune, from their first constitution, down to this day. Yet I over hear the whispers, and doubts of many, who demand, what they have done all this while? and what they have produc'd, that is answerable to these mighty hopes, which we indavour, to make the world conceive of their undertaking?

If those who require this Account, have themselves perform'd any worthy things, in this space of time; it is fit, that we should give them satisfaction. But they who have done nothing at all, have no reason to upbraid the Royal Society, for not having done as much, as they fancy it might. To those therefore who excite it to work, by their examples, as well as words and reproofs, methinks it were a sufficient Answer, if I should only repeat the particulars, I have already mention'd, wherein the King has set on foot a Reformation, in the Ornaments, and Advantages of our Country. For though the original praise of all this is to be ascrib'd to the Genius of the King himself: yet it is but just, that some honour should thence descend to this Assembly, whose purposes are conformable to his Majesties performances of that Nature: Seeing all the little scandals, that captious humours have taken against the Royal Society, have not risen from their general proceedings; but from a few pretended offences, of some of their private Members: it is but reason, that we should allege in their
commendation, all the excellent Designs, which are
begun by the King, who has not only stil'd himself
their Founder, but acted as a particular Member of
their Company.

To this I will also add, that in this time, they have
pass'd through the first difficulties of their Charter,
and Model: and have overcome all oppositions,
which are wont to arise, against the beginnings of
great things. This certainly alone were enough to free
them from all imputation of idleness, that they have
fram'd such an Assembly in six years, which was nev-
er yet brought about in six thousand. Besides this the
world is to consider, that if any that think, the whole
compass of their work might have come to a sudden
issue: they seem neither to understand the intenti-
ons of the Royal Society, nor the extent of their task.
It was never their aim, to make a violent dispatch.
They know that precipitancy in such matters, was the
fault of the Antients: And they have no mind, to fall
into the same error, which they indeavour to correct.
They began at first on so large a Bottom, that it is im-
possible, the whole Frame should be suddenly com-
pleted. 'Tis true, they that have nothing else to do,
but to express, and adorn conclusions of Knowledge
already made, may bring their Arts to an end, as soon
as they please. But they who follow the flow, and
intricate method of Nature, cannot have the reasons
of their productions, so much in their own power.
If we would always exact from them, daily or weekly
harvests; we should wholly cut off the occasions
of very many excellent Inventions, whose subjects
are remote, and come but seldom under their con-
deration. If we should require them, immediately
to reduce all their labours, to publick, and conspicu-
ous
ous use, by this dangerous speed, we should draw
them off from many of the best Foundations of Know-
ledge. Many of their noblest discoveries, and such
as will hereafter prove most serviceable, cannot in-
fantly be made to turn to profit. Many of their
weightiest, and most precious observations, are not
always fit to be expos'd to open view: For it is with
the greatest Philosophers, as with the richest Mer-
chants, whose Wares of greatest bulk and price, lie
commonly out of sight, in their Warehouses, and not
in their Shops.

This being premis'd, I will however venture to lay
down a brief draught of their most remarkable par-
ticulars: which may be reduc'd to these following
heads: The Queries, and Directions, they have gi-
gen abroad: the Proposals, and Recommendations
they have made: the Relations they have receiv'd:
the Experiments they have try'd: the Observations
they have taken: the Instruments they have invent-
ted: the Theories that have been proposed: the
Discourses they have written, or publish'd: the Re-
pository, and Library: and the Histories of Nature,
and Arts, and Works, they have collected.

Their manner of gathering, and dispersing Que-
ries is this. First they require some of their parti-
cular Fellows, to examine all Treatises, and Descripti-
ons, of the Natural, and Artificial productions of
those Countries, in which they would be inform'd.
At the same time, they employ others to discourse
with the Seamen, Travellers, Tradesmen, and Mer-
chants, who are likely to give them the best light.
Out of this united Intelligence from Men and Books,
they compose a Body of Questions, concerning all

V 2
the observable things of those places. These Rap-
pers being produc'd in their weekly Assemblies,
are augmented, or contracted, as they see occa-
on. And then the Fellows themselves are wont
to undertake their distribution into all Quarters,
according as they have the convenience of corre-
spendence: of this kind I will here reckon up some
of the Principal, whose particular heads are free to
all, that shall desire Copies of them for their Dire-
tion.

They have compos'd Queries, and Directions,
what things are needful to be observ'd, in order
to the making of a Natural History in general: what
are to be taken notice of towards a perfect History:
of the Air, and Atmosphere, and Weather: what is
to be observ'd in the production, growth, advancing,
or transforming of Vegetables: what particulars are
 requisite, for collecting a compleat History of the A-
griculture, which is us'd in several parts of this Na-
tion.

They have prescrib'd exact Inquiries, and given
punctual Advice for the tryal of Experiments of rar-
refaction, refraction, and condensation: concerning
the cause, and manner of the Petrifaction of Wood:
of the Loadstone: of the Parts of Anatomy, that
are yet imperfect: of Injections into the Blood of
Animals; and Transfusing the blood of one Animal
into another: of Currents: of the ebbing, and flow-
ing of the Sea: of the kinds, and manner of the feed-
ing of Oysters: of the Wonders, and Curiosities ob-
servable in deep Mines.

They have Collected, and sent abroad Inquiries
for the East Indies, for China, for St. Helena, for Ten-
risf; for any high Mountain, for Ginny, for Barbary, and
Morocco,
Morocco, for Spain, and Portugal, for Turkey, for France, for Italy, for Germany, for Hungary, for Transilvania, for Poland, and Sweden, for Iceland, and Greenland. They have given Directions for Seamen in General, and for observing the Eclipses of the Moon; for observing the Eclipses of the Sun by Mercury, in several parts of the World, and for observing the Satellites of Jupiter.

Of this their way of Inquiring, and giving Rules for direction, I will here produce a few Instances: from whose exactness it may be guessed, how all the rest are performed.
The HISTORY of the

ANSWERS
RETURN'D BY

Sir PHILIBERTO VERNATTI
Resident in Batavia in Java Major,
To certain Inquiries sent thither by Order of
the Royal Society, and recommended by
Sir ROBERT MORAY.

Q. 1. Whether Diamonds and other Precious Stones
grow again after three or four years, in the same
places where they have been digged out?
A. Never, or at least as the memory of man can at-
tain to.

Q. 2. Whether the Quarries of Stone in India, near
Fetipoca, not far from Agra, may be cleft like Logs, and
fawn like Planks, to cie! Chambers, and cover Houses.
A. What they are about the Place mentioned, I
have not as yet been well informed; but in Persia not
far from Cyrus where the best Wine growtheth, there is
a sort of hard Stone which may be cleft like Firr-
wood, as if it had a grain in it; the same is at the Coast
Cormandel about Sadraspatuam; where they make
but a mark in the Stone, set a wedge upon it, with a
wooden hammer, as thick and thin as they please; it
is used commonly for pavement in houses, one foot
square, and so cheap, that such a stone finely polish'd
costs not above six pence.

Q. 3.
Q. 3. Whether there be a Hill in Sumatra which burneth continually, and a Fountain which runneth pure Balsam.

A. There is a Hill that burneth in Sumatra near Endrapeor; but I cannot hear of any such Fountain; and I believe that the like Hill is upon Java Major opposite to Batavia: for in a clear morning or evening, from the Road a man may perfectly perceive a continual smoak rise from the top and vanish by little and little. I have often felt Earthquakes here, but they do not continue long; in the year 1656, or 57. (I do not remember well the time) Batavia was cover'd in one afternoon, about two of the Clock, with a black dust, which being gathered together, was so ponderous, that it exceeded the weight in Gold. I, at that time, being very ill, did not take much notice of it, but some have gathered it, and if I light upon it shall send you some. It is here thought, it came out of the Hill: I never heard of any that had been upon this Hills top: Endrapeor is counted a mighty unwholsome place, as likewise all others where Pepper grows; as Jamby Banjar, Balingtoan, &c. though some impute it to the Hills burning.

As for the Fountain it is unknown to us, except: Oleum Terre is meant by it, which is to be had in Sumatra, but the best comes from Pegu.

Q. 4. What River is that in Java Major that turns Wood into Stone?

A. There is none such to our knowledge; yet I have seen a piece of Wood with a Stone at the end of it; which was told me, that was turned into Stone by a River in Pegu; but I took it but for a Foppery; for divers Arbuta grow in Rocks, which being appropriated
priated curiously, may easily deceive a too haftly-be-
liever.

Q. 5. Whether it be true, that upon the Coast of An-
chin in Sumatra, the Sea, though it be calm, groweth ve-
ry high when no rain falls, but is smooth in rain, though
it blows hard.

A. Sometimes, but not always; the Reason is
this, that Anchin lieth at the very end and corner of
Sumatra, as may be seen by the Map, open in the
main Ocean, so that the Sea comes rowling from the
Cabo de bona Esperanca, and all that way unto it, and it
is natural to the Sea to have a continual motion, let it
be never so calm; which motion cannot be called a
Wave, neither have I any English for it at present, but
in Dutch we call it, Deyninge van Dee Zee, and the
calmer it is, the higher; the natural motion of the Sea
elevates very slowly the water; so that I have seen
Ships and Junks toiled by these Deynings in a calm,
(when there is scarce wind enough to drive a bubble)
that a man can scarce stand in them; some say this
motion proceeds from boisterous winds at Sea far
distant. That rain beats down the swelling of these
Deynings (especially if it be vehement) proceeds
naturally from its weight and impetuosity. And it is
observed, that about Anchin the Mountains are high
and steep, from whose tops boisterous, called Tra-
vant, come suddenly (like a Granado cast) falling in-
to the Sea, are accompanied commonly with a great
shower of rain, and last not above a quarter, or at
the most, half an hour, which is too short a time to di-
sturb the Sea, or to cause a contrary motion in it, being
shelter'd by these Mountains.

Q. 6. Whether in the Island of Sambreiro, which
lyeth Northwards of Sumatra, about eight degrees North-
ern
there be found such a Vegetable as Master James Lancaster relates to have seen, which grows up to a Tree, shrinks down when one offers to pluck it up into the ground, and would quite shrunk unless held very hard. And whether the same, being forcibly pluck'd up, hath a worm for its root, diminishing more and more; according as the Tree groweth in greatness; and as soon as the Worm is wholly turned into the Tree, rooting in the ground, and so growing great? And whether the same plucked up young turns, by that time it is dry, into a hard Stone, much like to white Corral.

A. I cannot meet with any that ever have heard of such a Vegetable.

Q. 7. Whether those Creatures that are in these parts plump and in season at the full Moon, are lean and out of season at the new, find the contrary at the East-Indies.

A. I find it so here, by Experience at Batavia, in Oysters and Crabs.

Q. 8. What ground there may be for that Relation, concerning Horns taking root, and growing about Goa?

A. Inquiring about this, a Friend laught, and told me it was a Jeer put upon the Portugese, because the Women of Goa are counted much given to lechery.

Q. 9. Whether the Indians can so prepare that stupefying Herb Datura, that they make it lye several dayes, months, years, according as they will have it, in a man's body, without doing him any hurt, and at the end kill him, without missing half an hours time?

A. The China men in this place, have formerly used Datura as a Fermentation, to a sort of Drink much beloved by the Souldiers and Mariners, called Suyker, X bier,


Q. 10. Whether those that be stupified by the juice of this Herb Datura, are recovered by moistening the soles of their feet in fair water?

A. No. For I have seen divers Souldiers and Mariners fall into the Rivers and Ditches, being stupified by their drink aforesaid, who were rather worse after they were taken out, than better.

Q. 11. Whether a Betel hath such contrariety to the Durion, that a few leaves thereof put to a whole shopful of Durions, will make them all rot suddenly? And whether those who have surfeited on Durions, and thereby overbeated themselves, do by laying one leaf of Betel cold upon the heart, immediately cure the inflammations, and recover the Stomach? This Betel being thought to preserve those Indians from Tooth-ache, looje Gums, and Scurvey, and from stinking breath; some of it is desired to be sent over with the fruit America, and the other Ingredients, and manner of preparing it.

A. I have seen that Betel leaves in a short time will spoil a Durion, take away his nature, and turn a fat creamy substance into water. Commonly those that eat great quantities of Durions, eat a Betel, afterwards as a Correctorium; but of laying a leaf upon the heart, I have never heard. As for the other qualities of the Betel, I believe they are good, if not abused; as most of the Indians do, who never are without it in their mouths, no not sleeping, which corrodes their teeth, and makes them as black as Jet: It draws from the head the Flegmatick humours, which are voided by spitting; so we use it: but
but the Indians swallow down their spittle, together with the juice of the Betel, and the Areica. The manner of preparing it is easy, being nothing but the Nut leaf and Calx viva, of which last each one adds as much as pleaseth his palate. There is a sort of Fruit called Singboa, which is used with the Areica, instead of Betel, and can be dried and transported as well as the Areica, and hath the same force, but a great deal more pleasant to the palate.

Q. 12. Whether the Papayas, that beareth fruit like a Melon, do not grow, much less bear fruit, unless male and female be together?

A. They grow, as I have seen two in the English-house at Bantam, and bear little Fruit, which never comes to perfection; but if the male and female be together, one bears great Fruit, the other nothing but Flowers.

Q. 13 Whether the Arbor Triste sheds its Flowers at the rising of the Sun, and shut them again at the setting of the Sun? And whether the distilled water thereof (called Aqua di Mogli by the Portugals) may not be transported to England? And whether at the rising of the Sun the leaves of the Arbor Triste drop off as well as the flowers?

A. There are two sorts of the Arbor Triste; one is called by the Portugals Triste de Die, the other Triste de Nofe; the one sheds his Flowers at the Rising, the other at the Setting of the Sun; but neither of them shed their leaves. There is no body here that understands the distilling of waters; some say this Aqua di Mogli is to be had at Malaca, for which I have writ, and shall send it if procurable.

Q. 14. Whether the Arbor de Rays, or Tree of Root, propagate itself in a whole Forrest, by shooting up and
The HISTORY of the Letting fall roots from its branches into the ground; that spring up again, and so on?

A. This is true. And we have divers trees about Batavia, and the like adjacent Islands, above fifty foot in the diameter.

Q. 15. What kind of fruit is that in Jucca, which grows immediately out of the Trees body, and is said to breed the Plague if eaten immoderately?

A. It is a fruit much like to Durion, which groweth in the same manner; hath a faint smell, and sweet waterish taste; for my part I do not affect them: The Plague is a Disease unknown amongst the Indians; but this fruit, as most others do, immoderately eaten, causeth a Dirthea, which easily degenerates to a Tenasium, by us called Peising, a dangerous Sickness, and worse than the Plague.

Q. 16. What Poison is it the King of Macassar in Golebees is said to have particular to himself, which not only kills a man immediately, that hath received the slightest Wound by a Dart, but also within half an hour's time, make the flesh touched with it, so rotten, that it will fall like Soap from the Bones, and whose poisonou Steam will soon fly up to a Wound made with an unpoysoned Dart, if the Blood be only in the slightest manner touch'd with a Dart, infected with the Poison. What certainty there is of this Relation?

A. That there is such a Poison in this King's possession is most certain; but what it is, no Christian hitherto ever knew right. By the Government of Arnold, de Flaminginge Van Oufborn divers have been tortured; yea, killed.

Some say it is the Gall of a Venemous Fish; Others say, it is a Tree, which is so Venemous, that those who are condemned to die, fetch the Poison, but not one of
of an hundred escape death: the Roots of this Tree are held an Antidote against the Poyson; but our People, when we had War with Macassar, found no Antidote like to their own or others Excrements; as soon as they felt themselves wounded, instantly took a dose of this same, which presently provoked to vomit; and so, by repulsion, (as I perceive) and sweat, freed the Noble parts from further Infection. That a Wound should be infected by this Poyson, though inflicted by an impoysoned Weapon, is not strange to those who study Sympathy; and yet belief in that much renowned Sympathetical Powder of Sir Kenelme Digby. Yet such Effects of the Macassars Arts are unknown to us.

Q. 17. Whether in Pegu and other places in the East Indies, they use a Poyson that kills by smelling, and yet the Poyson smell is hardly perceived?

To this no Answer was return'd.

Q. 18. Whether Camphire comes from Trees? What kind of Trees they are in Borneo; that are said to yield much excellent Camphire, as that one pound thereof is said to be worth an hundred of that of China and other places?

A. Camphire comes from Trees of an Excessive bulk, as you may see by the Chests which come from Japann into Europe, made of the same wood of Borneo; it comes likewise from Trees, which are said to stand in Sandy Ground. And drop like a Gum.

But of late an Experiment is found in Ceylon, that the Root of a Cinnamon Tree yields as good Camphire, as either Japann, or China, of which I shall send you a pattern, being now to be had at present here; as also an Oyl extracted from the same Roots, which...
reserves something of the Cinnamon smell: but may be the fault of the Distiller.

Q. 19. Whether some of that rare Wood, called Paolo d'Aquila and Calamba, of an extraordinary value, even in the Country where it groweth, as in Siam about San, and Patan, and in Cochinchina, may not be brought over; as also some of those strange Nests of Cochinchina, made by Birds upon Rocks, of a certain viscous froth of the Sea, which Nests grown dry and hard, are said to become transparent; and when dissolved in Water, serves excellently to season all their Meats?

A. If the Question be made, whether these things may be brought over by permission of the Company? I answer: as first, that their Laws forbid the transportation of all whatsoever, whether necessary to the conservation of Health, or acquisition of Wealth, or Rarities, &c. but if the querie be concerning the nature and substance of the Wood and Nests: they are transportable, and can subsist without decaying many years. Lignum Aquile is far inferior to Calamba, though not easie to be discerned: the pound of Calamba is worth in Japan thirty, and sometimes forty pounds Sterling; the best comes from Cambodio, and seems to be the pith of the Tree Aquile in Japan, it is used as Incense to perfume Cloth, and Chambers. It is held for a great Cordial, and commonly used by that Nation, as also the Chinese: In Desessione spiritu vitalium; as in Paralisii & Nervorum laxatione & impotentia: They rub it with Aqua Cynamoni upon a Stone, till the substance of the Wood is mixt, sicut pulpa, with the Water, and so drink it with Wine, or what they please: The Birds-nests are a great Restorative to Nature, and much used by the lecherous Chinese.

Q. 20.
Q. 20. Whether the Animal call'd Abadon, or Rhi-
noceros, hath teeth, claws, flesh, blood, and skin, yea bis
very dung and water, as well as his horns, Antidotal?
And whether the horns of those beasts be better or worse,
according to the food they live upon.

A. Their horns, teeth, claws, and blood are esteem-
ed Antidotes, and have the same use in the Indian
Pharmacopeia as the Therica hath in ours: the flesh I
have eaten is very sweet and short: some days be-
fore the Receipt of your Letter, I had a young one
no bigger than a Spaniel Dog, which followed me
wherever I went, drinking nothing but Buffalo milk,
lived about three weeks, then his teeth began to
grow, and got a looseness, and died. 'Tis observed,
that Children (especially of European Parents) at
the breaking out of their teeth are dangerous sick,
and commonly die of the scouring in these parts. His
skin I have caused to be dried, and so present it unto
you, since fate permits not to send him you living;
such a young one was never seen before: The food
I believe is all one to this Animal, being, that they
are seldom seen but amongst withered Branches,
thistles and thorns; so that the horn is of equal
virtue.

Q. 21. Whether the falsifying of the China Musk is
not rather done by mixing Oxen and Cows Livers dried
and pulverized with some of the putrified and concrete
flesh and blood of the China Musk-cat, than by beaten
gether the bare flesh and blood of this Animal,
&c.

Not answered.

Q. 22. Whether there be two sorts of Gumlack,
one produced from a certain winged Ant, the other
the Exudation of a Tree: The first had in the Islands,
of Suachan, the last in the Kingdom of Martaban?

A. We know of none but such as drop from Trees, and comes from divers places in Siam, Cambodice, Pegu, &c.

Q. 23. If the best Ambergris be found in the Islands Socotora and Aniana, neer Java? To endeavour the getting of more certain knowledge; what it is, being reported to be bred in the bottom of the Sea like to a thick mud?

A. The best that is in the World comes from the Island Mauritius; And is commonly found after a Storm. The Hogs can smell it at a great distance; who run like mad to it, and devour it commonly before the people come to it. It is held to be a Zeequal viscoity, which being dried by the Sun, turns to such a Consistence as is daily seen. My avines father Isaac Vigny a Frenchman in Oleron, hath been a great Traveller in his time, and he told me, he sailed once in his youth through so many of these Zeequalen, as would have loaded ten thousand Ships; the like having been never seen; his Curiosity did drive him to take up some of those, which being dried in the Sun, were perceived to be the best Ambergrise in the World; I have seen one piece which he kept for a Memento, and another piece he sold for 1300 l. Sterling. This being discovered, they set sail to the same place where these Zeequalen appeared, and cruising there, to and fro, for the space of six weeks, but could not perceive any more. Where this place is situated, I do not know; but Monsieur Gentillot, a French Captain in Holland, can tell you.

Q. 24. To enquire of the Divers for Pearls staying long under water; whether they do it by the assistance of any
anything they carry with them, or by long and often use
get a trick of holding their breath so long, at the Isle of
Baharen neer Ormus?

A. What they do at Baharen is unknown to me,
but since we have had Tute Corein in Ceylon, where
very good Pearls grow, I hear the Divers use no Ar-
tifices. The manner is thus; at a set time of the year
Merchants come from all parts, as likewise Divers
with their Boats; each Boat hath a certain quantity
of square Stones, upon which Stones the Divers goe
down, and give a token to their Companions, when
they think it time to be hal’d up: each Stone payes
tribute to the Company. The Oyster or Shell-fish is
not immediately open’d, but laid on heaps, or in holes
at the Sea-side. When the Diving time is ended, the
Merchants come, and buy these heaps, according as
they can agree, not knowing whether they shall get
any thing or no. So that this is a meer Lottery. This
Pearl-fishing is dangerous, being the Divers common-
ly make their Will, and take leave of their Friends,
before they tread the Stone to go down.

Q. 25. Whether Cinnamon when first gathered hath
not a taste at all, but acquires its taste and strength by fif-
ten days sunning? And whether the Bark be gathered
every two years in the Isle of Ceylon?

A. The Cinnamon Tree as it groweth, is so fra-
grant, that it may be smelt a great way off before it
be seen. And hath even then, a most Excellent taste;
so that by Sunning it looseth rather than acquires any
taste or force; the Tree being pill’d is cut down to
the root; but the young Sprigs after a year or
two give the best and finest Cinnamon.

Q. 26. To learn, if it may be, what Art the Master-
workmen of Pegu, have to add to the colour of their Rub-
bies?

Y

A.
A. Not answered.

Q. 27. To inquire after, and get, if possible, some of the Bones of the Fish called Caballa, which are so powerful in stopping blood.

A. 'Tis done, and they shall follow with the Dutch Ships.

Q. 28. Whether at Hermita, a Town in Ethiopia, there are Tortoises, so big, that Men may ride upon them?

A. It is reported, that there be extraordinary great ones there; I have seen some Sea-Tortoises here, of four foot broad, in oval form, very low leg'd, but of that strength, that a man may stand on one: The manner of catching them, is to turn them with a Fork upon their backs.

Q. 29. Whether there be a Tree in Mexico, that yields Water, Wine, Vinegar, Oyl, Milk, Honey, Wax, Thread, and Needles?

A. The Cocos Trees yields all this and more; the Nut, while it is green, hath very good Water in it, the Flower being cut, drops out great quantity of liquor, called Sury, or Tawnack, which drank fresh, hath the force, and almost the taste of Wine; grown Sour, is very good Vinegar; and distilled, makes very good Brandy, or Areck: The Nut grated, and mingled with water, tasteth like Milk: pressed, yields very good Oyl; Bees swarm in these Trees, as well as in others; Thread & Needles are made of the leaves and tough twigs. Nay, to add something to this description; in Ambonina, they make Bread of the body of the Tree, the leaves serve to thatch houses, and likewise sails for their Boats.

Q. 30. Whether about Java, there be Oysters of that sort bignes, as to weigh three hundred weight?
Q. 31. Whether near Malacca, there be found in the Gall of certain Swine, a Stone esteemed incomparably above Bezoar?

A. In that Country, but very seldom, there grows a Stone, in the Stomach of a Porcupine, called Pedro Porco: of whose virtue there are large descriptions; and the Hollander are now so fond, that I have seen 40 Dollars of $ given for one no bigger than a Pidgeons' Egg! There is sophistication as well in that as Bezoar, Mask, &c. and every day new falsehood, so that I cannot well set down here any rules, but must be judged by experience. A false one I send you, which doth imitate very near in virtue, the true one, but is a great deal bigger, and of another colour.

As for the Observations desired of the Islands Saint Helena, and Ascension, they may be better made by the English East-India men, which commonly touch at both places; but the Hollander never, or very seldom.

Q. 32. Whether it be winter at the East-side of the Mountain Gates, which comes from the North to Cape Comoryn, whilst it is summer on the West-side? and Vice versa.

A. Not only there, but likewise on the Island of Zeylon.

Q. 33. In what Country Lignum Alloes is found, whether it be the Wood of a Tree? or the Root of a Tree? How to know the best of the Kind?

A. Lignum Alloes, Lignum Paradisi, Calamba, are synonyma, the same: And the same Wood comes most from
from Cambodia, and Siam; but they say it is brought by the people of Lawlan, a Country about Cambodia, whence Musk, and Benzoin, and most Aromada come: it is easily distinguished from other Wood, by its strong scent and richness of Balm in it, which appears in its blackness: it is of great Value, and hard to be gotten here.

The rest of the Queries are not answered, because the time is short since I received them, and especially, because I cannot meet with any one that can satisfy me, and being unsatisfied myself, I cannot nor will obtrude any thing upon you, which may hereafter prove fabulous; but shall still serve you with truth.
A

METHOD

For making a History of the Weather. By Mr. HOOK.

"For the better making a History of the Weather, I conceive it requisite to observe,
   1. The Strength and Quarter of the Winds, and to register the Changes as often as they happen; both which may be very conveniently shewn, by a small addition to an ordinary Weather-clock.
   2. The Degrees of Heat and Cold in the Air; which will be best observed by a sealed Thermometer, graduated according to the Degrees of Expansion, which bear a known proportion to the whole bulk of Liquor, the beginning of which gradation, should be that dimension which the Liquor hath, when encompassed with Water, just beginning to freeze, and the degrees of Expansion, either greater or less, should be set or marked above it or below it.
   3. The Degrees of Dryness and Moisture in the Air; which may be most conveniently observed by a Hygroscope, made with the single beard of a wild Oat perfectly ripe, set upright and headed with an Index, after the way described by Emanuel Magnan, the conversions and degrees of which, may be measured by divisions made on the rim of a Circle, in
"
"The Center of which, the Index is turned round: "The beginning or Standard of which Degree of "Rotation, should be that, to which the Index points, "when the beard, being thoroughly wet, or covered "with Water, is quite unwreathed, and becomes "straight. But because of the smallness of this part of "the Oat, the seed of a wild Vetch may be used instead "of it, which will be a much larger Index, and will be "altogether as sensible of the changes of the Air. "4. The degrees of Pressure in the Air: which "may be several ways observed, but best of all "with an Instrument with Quicksilver, contrived "so, as either by means of water or an Index, it may "sensibly exhibit the minute variations of that Acti-
"on. "5. The Constitution and face of the Sky or Hea-
vens; and this is best done by the eye; here should "be observed, whether the Sky be clear or clouded; "and if clouded, after what manner; whether with "high Exhalations or great white Clouds, or dark "thick ones. Whether those Clouds afford Fogs or "Mists, or Sleet, or Rain, or Snow, &c. Whether the "under side of those Clouds be flat or waved and ir-
regular, as I have often seen before thunder. Which "way they drive, whether all one way, or some one "way, some another; and whether any of these be "the same with the Wind that blows below; the "Colour and face of the Sky at the rising and setting "of the Sun and Moon; what Haloes or Rings may "happen to encompass those Luminaries; their big-
ness, form and number. "6. What Effects are produc'd upon other bo-
dies: As what Aches and Distempers in the bodies "of men: what Diseases are most rise, as Colds, Fe-
"vours,
ROYAL SOCIETY.

"Vours, Agues, &c. What putrefactions or other changes are produc’d in other bodies; As the sweating of Marble, the burning blew of a Candle, the blasting of Trees and Corn; the unusual sprouting, growth, or decay of any Plants or Vegetables: the putrefaction of bodies not usual; the plenty or scarcity of Insects; of several Fruits, Grains, Flowers, Roots, Cattel, Fishes, Birds, any thing notable of that kind. What conveniences or inconveniences may happen in the year, in any kind, as by floods, droughts, violent showers, &c. What nights produce dews and hoar-frosts, and what not?

7. What Thunders and Lightnings happen, and what Effects they produce; as souring Beer or Ale, turning Milk, killing Silk-worms, &c.?

8. Any thing extraordinary in the Tides; as double Tides, later or earlier, greater or less Tides than ordinary. Rising or drying of Springs; Comets or unusual Apparitions, new Stars, ignes fatui, or shining Exhalations, or the like.

These should all or most of them be diligently observed and registred by some one, that is always conversant in or near the same place.

Now that these and some other, hereafter to be mentioned, may be registred so as to be most convenient for the making of comparisons, requisite for the raising Axioms, whereby the Cause or Laws of Weather may be found out; It will be desirable to order them so, that the Scheme of a whole Moneth may at one view be presented to the Eye:

And this may conveniently be done on the pages of a Book in folio, allowing fifteen dayes for one side, and fifteen for the other. Let each of those pages be divided into nine Columns, and distinguished by...
The HISTORY of the

"perpendicular lines; let each of the first six columns be half an inch wide, and the three last equally share the remaining of the side.

"Let each column have the title of what it is to contain; in the first at least, written at the top of it: as, let the first column towards the left hand, contain the days of the month, or place of the Sun, and the remarkable hours of each day. The second, the place, latitude, distance, ages and phases of the Moon. The third the quarters and strength of winds. The fourth the heat and cold of the season. The fifth the dryness and moisture of it. The sixth the degrees of pressure. The seventh the faces and appearances of the sky. The eighth the effects of the weather upon other bodies, thunders, lightnings, or any thing extraordinary. The ninth general deductions, corollaries or syllogisms, arising from the comparing the several phenomena together.

"That the columns may be large enough to contain what they are designed for, it will be necessary, that the particulars be expressed with some characters, as brief and compendious as is possible. The two first by the figures and characters of the signs, commonly used in almanacks. The winds may be express by the letters, by which they are express in small sea-cards: and the degrees of strength by 1, 2, 3, 4, &c., according as they are marked in the contrivance of the weather-cock. The degrees of heat and cold may be express by the numbers appropriate to the divisions of the thermometer. The dryness and moisture, by the divisions in the rim of the hydroscope. The pressure by figures denoting the height of the mercurial cylinder. But for
for the faces of the Sky, they are so many, that ma-
ny of them want proper names; and therefore it
will be convenient to agree upon some determi-
nate ones, by which the most usual may be in brief
express. As let Clear signify a very clear Sky with-
out any Clouds or Exhalations: Checker'd a clear
Sky, with many great white round Clouds, such as
are very usual in Summer. Hazy, a Sky that looks
whitish, by reason of the thickness of the higher
parts of the Air, by some Exhalation not formed in-
to Clouds. Thick, a Sky more whitened by a grea-
ter company of Vapours: these do usually make
the Luminaries look bearded or hairy, and are of-
tentimes the cause of the appearance of Rings and
Haloes about the Sun as well as the Moon. Overcast,
when the Vapours so whiten and thicken the Air,
that the Sun cannot break through; and of this
there are very many degrees, which may be express-
by a little, much, more, very much overcast, &c. Let
Hairy signify a Sky that hath many small, thin and
high Exhalations, which resemble locks of hair, or
flakes of Hemp or Flax: whose varieties may be
express by straight or curv'd, &c. according to the
resemblance they bear. Let Water'd signify a Sky
that has many high thin and small Clouds, looking
almost like water'd Tabby, called in some places a
Mackeril Sky. Let a Sky be called Waved, when
those Clouds appear much bigger and lower, but
much after the same manner. Cloudy, when the Sky
has many thick dark Clouds. Lowring, when the
Sky is not very much overcast, but hath also under-
thearth many thick dark Clouds which threaten
rain. The signification of gloomy, foggy, misty, fleat-
ing, driving, rainy, snowy, reaches or racks va-
ible,
riable, &c. are well known, they being very com-
monly used. There may be also several faces of
the Sky compounded of two or more of these,
which may be intelligibly expressed by two
or more of these names. It is likewise desirable, that
the particulars of the eighth and ninth Columns
may be entered in as little room, and as few words
as are sufficient to signify them intelligibly and
plainly.

It were to be wished that there were divers in se-
veral parts of the World, but especially in distant
parts of this Kingdom, that would undertake this
work, and that such would agree upon a common
way somewhat after this manner, that as near as
could be, the same method and words might be
made use of. The benefit of which way is easily e-
nough conceivable.

As for the Method of using and digesting those
so-collected Observations; That will be more ad-
vantageously considered when the supellex is pro-
vided; A Workman being then best able to fit
and prepare his Tools, for his work, when he sees
what materials he has to work upon.
A Scheme
At one view representing to the eye the observations of the weather for a month.

<table>
<thead>
<tr>
<th>Days of the Month and place of the Sun.</th>
<th>Age and sign of the Moon at Noon</th>
<th>The Quarters of the Wind and its strength.</th>
<th>The Degrees of Heat and Cold.</th>
<th>The Degrees of Dryness and Moisture.</th>
<th>The Degrees of Prevalence.</th>
<th>The Faces or visible appearances of the Sky.</th>
<th>The Notable Effects.</th>
<th>General Deductions to be made after the side is fitted with Observations: As</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>27</td>
<td>W.</td>
<td>2 9 1 2</td>
<td>5 29</td>
<td>Clear blew, but yellowish in the N. E.</td>
<td>A great dew.</td>
<td>From the last quarter of the Moon to the change of weather was very temperate but cold for the season; the Wind pretty constant between N. and W.</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td>5 46</td>
<td>Perigeu.</td>
<td>1 3 16</td>
<td>2 9 29</td>
<td>A cloud of smoke.</td>
<td>Thunder, far to the South.</td>
<td>A very great Tide.</td>
</tr>
<tr>
<td>12</td>
<td>46</td>
<td>8</td>
<td>W.S.W.</td>
<td>1 7</td>
<td>2 9 29</td>
<td>A clear sky all day, but as yesterday.</td>
<td>Not by much.</td>
<td>A little before the last great Wind, and till the Wind rose at its highest, the Quicksilver continued descending till it came very low; after which it began to ascend,</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>28</td>
<td>N.W.</td>
<td>3 9</td>
<td>2 8 29</td>
<td>A little checker'd.</td>
<td>Thunder in the South.</td>
<td>Marble stones, &amp;c. &amp;c.</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>6</td>
<td>6 24. 51. N.</td>
<td>1 2 9</td>
<td>2 9 29</td>
<td>A very great checker'd at 4. P.M. at Sunset red and hazy.</td>
<td>No dew upon the ground.</td>
<td>&amp;c. &amp;c. &amp;c. &amp;c. &amp;c.</td>
</tr>
<tr>
<td>13</td>
<td>40</td>
<td>10</td>
<td>I</td>
<td>2 10 29</td>
<td>Overcast and lowing.</td>
<td>No dew upon the ground.</td>
<td>Very much upon Marble stones, &amp;c. &amp;c. &amp;c. &amp;c. &amp;c.</td>
<td>&amp;c. &amp;c. &amp;c. &amp;c. &amp;c.</td>
</tr>
<tr>
<td>10</td>
<td>N. Moon, S. at 7. 25'</td>
<td></td>
<td></td>
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</tbody>
</table>
The HISTORY of the

DIRECTION

For the Observations of the Eclipses of the MOON.

By Mr. ROOKE.

Eclipses of the Moon are observed for two principal Ends; One Astronomical, that by comparing Observations with Calculations, the Theory of the Moons motion may be perfected, and the Tables thereof reformed: The other Geographical, that by comparing among themselves Observations of the same Ecliptical Phases, made in divers places, the difference of Meridians, or Longitudes of those places may be discovered.

The Knowledge of the Eclipses Quantity and Duration, the Shadows, Curvity and Inclination, &c. conduce only to the former of these Ends: The exact time of the beginning, middle, and end of the Eclipses, as also in total ones, the beginning and end of total darkness is useful for both of them.

But because these times considerably differ in Observations made by the bare eye, from those with a Telescope, and because the beginning of Eclipses and the end of Total darkness are scarce to be observed exactly, even with Glasses (one not being able clearly to distinguish between the true shadow and Penumbra, unless one have seen, for some time before, the line, separating them, pass along with the
"surface of the Moon." And lastly, because in small partial Eclipses, the beginning and end (and in total ones of short continuance in the shadow, the beginning and end of total darkness) are unfit for nice Observations, by reason of the slow change of apperances, which the oblique motion of the shadow then causeth: For these Reasons I shall propose a Method particularly designed for the accomplishment of the Geographical end in observing Lunar Eclipses free (as far as is possible) from all the mentioned inconveniences: For, "First, It shall not be practicable without a Telescope."

"Secondly, The Observer shall alwayes have Opportunity before his principal Observation, to note the distinction between the true shadow and Penumbra."

"Thirdly, It shall be applicable to those reasons of the Eclipse, when there is the suddenest alteration in the apperances. To satisfie all which intents, "Let there be of the eminentest Spots, dispersed over all Quarters of the Moon's surface, a select number generally agreed on, to be constantly made use of to this purpose, in all parts of the world: As for Example, those which Hevelius calleth.


"Palm\{Meotis: Marcotis:"

Laune Niger Major.

"Let:
Let in each Eclipse (not all, but for instance) three
of these Spots, which then ly nearest to the Eclip-
tic, be exactly observed, when they are first touched
by the true Shadow, and again when they are just
completely entered into it; and (if you please)
also in the decrease of the Eclipse, when they are first
fully clear from the true Shadow: For the accu-
rate determination of which moments of time (that
being in this business of main importance) let there
be taken Altitudes of remarkable fixed Stars, on
this side the line, of such as ly between the Equa-
tor and Tropic of Cancer; but beyond the line, of
such as are situated towards the other Tropic;
and in all places, of such, as at the time of Obser-
vation, are about four hours distant from the Me-
ridian.

Mr.
Mr. ROOK'S

DISCOURSE

Concerning the Observations of the Eclipses of the Satellites of Jupiter.

Longitudinis sue Differentia Meridianorum scientia est vel Nautica, vel Geographica.

Illa Navi, aqua innatantis; Hec Urbium, Insularum, Promontoriorum, &c. Globo terræ et adhærentium suum investigat.

In Navi, motu vario subindo translatâ; Observatio, identidem est repetenda; at loci terreni, sicam perpetuâ sedem obtinentis, positionem semel determinasse sufficit.

Maria, stellibus ut plurimum agitata, subtilem Instrumentorum, praestim Telecopii longioris tractationem minime permittunt.

Longitudinis Scientia Nautica vix unquam de Calo expectanda: Geographica vero ab Eclipsibus Corporum celestium præcipue petenda.

(Veteribus notis: scil. Solis & Lunæ.

Eclipses sunt vel Satellitum Jovis, ante Tubi Optici usum incognita.

(Missam secundum C. Hugenii Lunulam Saturniæ, Observatione difficiliorem.)

Waremper multa retro sæcula Observationes; nè duo, quidem loca quantum Meridianorum intercapidinem habéant, satis certò definitum esse Experimur; harum vero per pauculos annos adhibéndæ diligentì animadversione s.
The HISTORY of the
versione; pricipua totius terrarum Orbis partes, quomodo ad se invicem sita sint, accuratissim a determinatum iri non desperamus.

Causa, ob quam minus in hoc negotio praestitisse Eclipses Luminarii,

Sunt

1. Communis, utrisque ipsarum Raritas

2. Solari, Parallaxis Lune.

Propria

3. Lunari, Penumbræ Terra.

His ergo præferimus Satellitum Jovisialium defectus frequentiissimos, quæ qua Parallaxi, in quibus etiam penebræ Jovis prodeñse magis, quam officere videtur.

Methodus Longitudinis, ex Eclipsibus vel alius Phænomenis Cælestibus, indaganda duplex est: Una, cum tempore ad Meridianum Tabularum propriae supposita, tempus alibi observatum; Altera, tempora variis in locis observata, inter se comparata.

Cum Arti Nauticae Prior illa uniuscuro interserviat quando cælestes accuratius mult°, quam nobis sperandum videtur, cognitos sponsonis; ob Astronomiae imperfectiones, et observationem Marinorum hallucinationem perpetuo seri necessarium: supra pronunxivimus Longitudinis Scientiam Nauticam uix unquam de Cælo expeñandam.

Methodus altera, Geographiae persicienda idonea, cum non alienum ob causam præriorum Calculum adhibeat, nisi ut eo moniti pures, eadem Phænomeno, in diversis locis, observando simul invigilant; Periodorum atque Epocharum auxilium minimi desiderat.

Satellites Jovis numero sunt quattuor, varia quid


Horum
Horum non nisi minimi modi sunt observandum propositionem; immersionem nempè in Umbra Jovis sue ipsum Eclipses initium.

Solam hanc quam salutem, ut potest in individibilibi serò constitutum: Licet enim lumen languor atque diminutio moram aliquantulum trabere possit, omnimodo tamen Extinctor Evanescentia (de qua unice solicti sumus) momento quasi contingere deprehenditur.

Ante 8° Satellites ad Occidentem Disci Jovialis respecus; in deliquia incident; post Acronychia, ad Orientem.

Intimi & (nisi fortè rarissime) penintimi Eclipsis tantum Occidentalem initia nobis apparere possunt: duorum autem remotiorum multa etiam Orientalium exordia conficere licet.

Defecit Medicaorum observatu facilliores reddant.
1. Major Planetarum claritas.
2. Motus ipsorum tardior.
3. Penumbra Jovis cressior.

Hac omnia nobiscum meditati, subducta bene singularum ratione, Satellitum intimum & penextimum ad remotum praeter accommodatos; atque adeò, cum saepe frequentes sunt ipsorum Eclipses, solos adhibendos esse judicamus.

Extinnum omnino negligentius utpotè minimum omnium & obscurissimum; proficientem vero quod tantà non nunquam sit Latitudinum pradictus, ut Umbra Jovis ipsum Aphefium neeqquam attingat.

Penintimus autem nullà gaudet ex suprà recentis Praeogativud, qua alterutri saltum corum, quo subs prædictum potiori jurè non debeatur.

Maxima, Satellitum in Umbra incidentium, a limbo A a Disci
The HISTO RY of the

Disce Jovialis distantia, unà aut alterà, post pròrem So-
lis & Jovis quadraturam, hebdomada contingit.

Estque ea Penextimi sesquidiametror Jovis seri e qua-
lis: Intimi vero semidiametro ejusdem non multo ma-
jor sextà ante memoratam Quadruratam Hebdomada,
Penextimus Umbram ingrediens Diametror Jovis a disco
abest: Augendà inde usque ad maximam distantiam in-
crementum (non uniformem) continuè decrescente.

Hinc iisdem reciprocè passibus (decremento sc. sen-
sim incremente) diminuitur istiusmodi intervallaum, ad
bimestre usque tempus a dictà Quadruratà elapsum,
quando iterum Diametror Joviali aequatur.

Postèd antem usque ad ipsam Acronychia, penextimus
Umbram subiturus, equabili seri è gradu (singulis nem-
pe hebdomadis quadrante Diametris) promotis ad imb-
bum Jovis accedit. Intimi, pro diverso Jovis ad solém
sit, distantia edem planè ratione variatur: ejus enim,
quam neque obtinet, Penextimus, trienti fere perpetuo
est aequalis.

Mense circiter post Jovem soli oppositum, Penextimus
(Intimi post 8, immersiones observandi non posse
soprà immersum) simul ac corporis Jovialis Umbra ori-
entali transferit, Occidentalem umbra continuè in-
trabit.

Inde angetur paulatim penextimi evanescentis dis-
stantia, donec unà aut alterà ante posteriorem quadratu-
ram hebdomada, maxima edadis, quando a disce Jo-
vialis margine semidiametror ejusdem remotior.

Postquam antem buncisque diminuità seminm velutiuce,
umbra Jovis ab ipsius Disco recessit: hinc, mortem continue
accelerato, ad eundem revertit.

Por bimestre ante & post Jovis cum sole conjunctione
num spatium in locis Longitudinis multum differenti-
tibus, eadem Eclipse apparere requiro: autocum pro tunc
temporis
temporibus observationes instituere non est opera pre-
tium.

Qua cum ita sint, tempus quadrimestre, a sextili priori
usque ad ipsa fera Acronychia numerandum, utriusque Sa-
telliti Observando sit unice opportunum: Penextimi
autem soli, insuper trimestro, ab altero post oppositionem
mense ad sextilem posteriorem.

Intra tempora jam definita, othoginta circiter utrius-
que simul Saturniis fient Eclipses; Penextimi sc. fere
triginta, intimi autem quinquaginta.

Hae cum (non ubiuis terrarum sed) aliae aliis in lo-
cis sunt conspicienda, in sex Classes digeremus.

1. In Europā & Africa
2. In Asia.
3. In America.
5. In Europa, Africa & America.

Eclipses ob-
servandas
compre-
bendet.

Non opus est fortè ut moneamus in Insulis

Æthiopiæ
Oceanī
Atlantici
Pacifici

observandam esse Classem
4am.
5am.
6am.

Calculus Eclipsium a nobis exhibendus in ipso fortasse
loco ad quem instituitor plus bōrā integra nonnunquam
à vero observabint, ob variam sc. in Satellitum motu
animaliō ab Excentricitate (ut verisimilis est) & propri-
orum ipsius Orbitarum ad Jovis Orbitam inclinatione ori-
undam.

Alibi autem terrarum multo minus calculo fidendum,
propter incertam insuper in plerisque locis Meridiano-
A a 2

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The HISTORY of the

rum Differentiam: quae tamen, ut sit, Reductio temporis, aliquantunque adhibenda est.

Longam itaque futuram secundum Eclipsium horum expectationem præmonem, aassiduamque interim attentionem, mecum (ob xandv admodum xerun) unquam fere interruptam, esse continuandum: primam enim, quam visu asequimur, lumenis diminutionem, brevissimam (praefertim in intimo) interpositam morulamox insequitur perfecta ejus extin[litio.

Molestum autem in observando tedium, summa

Tuis iam dixisti abunde compensabit, idemque plurimum minus sociorum mutuas operas tradentium, ubi suppetit presentia.

Ad momenta temporis accuratissime notanda (quod in hismodi Observationibus est Palmarium) per utile erit Horologium Oscillatorium, ab ingenioso & candidissimo Hugenio feliciter excogitatum.

Appendix.

Longitudinis Scientiam Nauticam vix unquam de Celto expeditandam suprà afferimus: quia tamen ejusmodi aliquando futura est, non alius fundamentum, quam Lunarium motum precise cognitionem, habitura videtur. Horum autem restitutionem a Parallaxi inchoandam solertissime monuit Keplerus. Parallaxem vero indagande, & a Lunae latitudine (qui semper fieri complicatur) distinguende optima (si non sola) Methodus est, qua in regionibus longe disstitis & sub eodem Meridiano positis, altitudinem Lunae Meridianarum, per singulas orbite partes simul observatarum series innititur: inde enim, Polorum elevatione solum praecognitam, certissima innotescit Globi Lunaris a Terrestri distantia.
Upon the Reading of these last Directions, Mr. Rook the Author of them being dead, I cannot forbear saying something of that excellent Man, which his incomparable Modesty would not have permitted me to write, if he had been living. He was indeed a man of a profound judgment, a vast comprehension, prodigious memory, solid experience. His skill in the Mathematicks was reverenced by all the lovers of those Studies; and his perfection in many other sorts of Learning, deserves no less admiration. But above all, his Knowledge had a right influence, on the temper of his mind, which had all the humility, goodness, calmness, strength, and sincerity of a sound, and unaffected Philosopher. This is spoken not of one who liv’d long ago, in praising of whom, it were easy to feign, and to exceed the Truth, where no man’s memory could confute me: But of one who is lately dead, who has many of his acquaintance still living, that are able to confirm this testimony, and to join with me, in delivering down his name to posterity, with this just character of his Virtues. He dy’d in the year sixty two, shortly after the establishment of the Royal Society, whose Institution he had zealously promoted. And it was a deplorable accident in his Death, that he deceas’d the very night, which he had for some years expected, wherein to finish his accurate Observations on the Satellites of Jupiter: however this Treasure will not be lost, for the Society has...
To many of these queries they have already receiv'd good returns, and satisfaction: and more such accounts are daily expected from all coasts. Besides these, there have been several great and profitable attempts, relating to the good of mankind, or the English nation, propounded to them, by many publick bodies, and private persons: which they have again recommended, to be examin'd apart, by divers of their own number, and by other men of ability and integrity, who have accepted of their recommendations of this kind, the principal, that I find recorded in their registers, are these.

They have propounded the composing a catalogue of all trades, works, and manufactures, wherein men are employ'd, in order to the collecting each of their histories: by taking notice of all the physical receipts, or secrets, the instruments, tools, and engines, the manual operations or sleights, the cheats, and ill practices, the goodness, baseness, and different value of materials, and whatever else belongs to the operations of all trades.

They have recommended the making a catalogue, of all the kinds of natural things to be found in England. This is already in a very good forwardness. And for its better completing, many expedients for the preserving, drying, and embalming of all living creatures have been prosecuted.

They have suggested the making a perfect survey, map, and tables of all the fixed stars within the zodiac, both visible to the naked eye, and discoverable by a six foot telescope, with a large aperture; towards

The HISTORY of the
the observing the apparent places of the Planets, with a Telescope both by Sea and Land. This has been approved, and begun, several of the Fellows having their portions of the Heavens allotted to them.

They have recommended the advancing of the Manufacture of Tapestry: the improving of Silk making: the propagating of Saffron: the melting of Lead-Ore with Pit-coal: the making Iron with Sea-coal: the using of the Dust of Black Lead instead of Oyl in Clocks: the making Trials on English Earths, to see if they will not yield: to fine a substance as China, for the perfecting of the Potters Art.

They have proposed, and undertaken the comparing of several Soys, and Clays, for the better making of Bricks, and Tiles: the way of turning Water into Earth: the observing of the growth of Pibbles in Waters: the making exact Experiments in the large Florentine Leadstone: the consideration of the Bononian Stone: the examining of the nature of Tertiifying Springs: the using an Umbrella Anchor, to stay a Ship in a Storm: the way of finding the Longitude of places by the Moon: the observation of the Tides about Lundy, the Southwest of Ireland, the Bermoo-das, and divers parts of Scotland; and in other Seas and Rivers where the ebbing and flowing is found to be irregular.

They have started, and begun to practice the propagation of Potatoes; the planting of Verjusce Grapes in England; the Chymical examination of French, and English Wines; the gradual observation of the growth of Plants, from the first spot of life; the increasing of Timber, and the planting of Fruit Trees; which they have done by spreading the Plants into many parts of the Nation, and by publishing a large
large Account of the best ways of their cultivation.

They have propounded, and attempted with great effect, the making Experiments with Tobacco oyl; the Anatomizing of all amphibious Creatures, and examining their Lungs; the observing the manner of the Circulation of the blood in Fishes; the ways of transporting Fish from one place to another for Breed; the collecting Observations on the Plague; the examining of all the several ways to breed Bees; the altering the taste of the Flesh of Animals, by altering their food; the probability of making Wine out of Sugar-canes: Which last I will set down as one Example.
A PROPOSAL
For making WINE.
By Dr. GODDARD.

It is recommended to the care of some skilful Planters in the Barbadoes, to try whether good Wine may not be made out of the juice of Sugar-canes. That which may induce them, to believe this work to be possible, is this observation, that the juice of Wine, when it is dry'd, does always granulate into Sugar, as appears in Raisins, or dry'd Grapes: and also that in those vessels wherein cute, or unfermented Wine is put, the sides are wont to be cover'd over with a crust of Sugar. Hence it may be gather'd, that there is so great a likeness of the liquor of the Cane, to that of the Vine, that it may probably be brought to serve for the same uses. If this attempt shall succeed, the advantages of it will be very considerable. For the English being the chief Masters of the Sugar Trade, and that falling very much in its price of late years, while all other outlandish productions are risen in their value: it would be a great benefit to this Kingdom, as well as to our Western Plantations, if part of our Sugar, which is now in a manner a meer Drug, might be turn'd into Wine, which is a Forein Commodity, and grows every day dearer: especially seeing this might be done, by only bruising, and pressing the Canes, which would be a far less labour and charge, than the way, by which Sugar is now made.
These are some of the most advantageous proposals, they have scatter'd, and encourag'd in all places, where their Interest prevails. In these they have recommended to many distinct, and separate Trials, those designs, which some private men had begun, but could not accomplish, by reason of their charge: or those which they themselves have devis'd, and conceiv'd capable of success: or even those of which men have hitherto seem'd to despair. Of these, some are already brought to a hopeful issue: some are put in use, and thrive by the practice of the publick: and some are discover'd to be feasible, which were only before thought imaginary, and fantastical. This is one of the greatest powers of the true, and unwearied Experimenter, that he often rescues things, from the jaws of those dreadful Monsters, Improbability, and Impossibility. These indeed are two frightful words to weaker minds, but by Diligent and Wise men, they are generally found to be only the excuses of Idleness, and Ignorance. For the most part, they lie not in the things themselves, but in mens falle opinions concerning them they are rais'd by opinions, but are soon abolish'd by works. Many things, that were at first improbable to the minds of men, are not so to their eyes: many that seem'd unpracticable to their thoughts, are quite otherwise to their hands: many that are too difficult for their naked hands, may be soon perform'd by the same hands, if they are strengthen'd by Instruments, and guided by Method: many that are unmanageable by a few hands, and a few Instruments, are easie to the joynt force of a multitude: many that fail in one Age, may succeed by the renew'd indeavors of another. It is not therefore the conceit or fancy of men alone, that is of sufficient
cient authority to condemn the most unlikely things for impossible: unless they have been often attempted in vain, by many eyes, many hands, many instruments, and many ages.

This is the assistance, and information, they have given to others, to provoke them to inquire, and to order, and regulate their inquisitions. To these I will add the relations of the effects of nature, and art, which have been communicated to them. These are infinite in number. And though many of them have not a sufficient confirmation, to raise theories, or histories on their infallibility: yet they bring with them a good assurance of likelihood, by the integrity of the relates; and with all they furnish a judicious reader, with admirable hints to direct his observations. For I will once more affirm, that as the minds of men do often mistake falsehoods for truths, though they are never so circumpect: so they are often drawn by uncertain, and sometimes erroneous reports, to stumble on truths, and realities; of this vast heap of relations, which is every where scatter'd in their entry books, I will only take notice of these occasional accounts.

relations of two new kinds of stars, observ'd in the year sixty six, the one in andromeda, the other in cygnus, in the same place, where they appear'd sixty years since, and have ever since disappear'd: of several observations of celestial bodies made in spain: of observations of several of the planets made at rome, and in other parts, by extraordinary glasses: of the comparative goodness of glasses used in other countries: of several eclipses observ'd in divers parts of the world. relations of paraliæ, and other such appearances
seen in France: of the effects of Thunder and Lightning: of Hurricanes, and Spouts: of the bigness, figure, and effects of Hailstones: of Fish, and Frogs said to be rain'd: of the raining of Dust out of the Air, and of the distance it has been carri'd by great Fires, and Earthquakes: of changes of Weather, and a way of predicting them: of the vermination of the Air: of the suppos'd raining of Wheat in Gloucestershire, which being sown was found to be nothing but Ivy Berries.


Relations of the times of the rising, and disappearing of Springs: of Artificial Springs: of the Natures of several of our English Springs, and of other Oleaginous, and Bituminous Springs: of the fitness, and unfitness of some waters for the making of Beer, or Ale: of brewing Beer with Ginger instead of Hops: of Tides and Currents: of Petrifying Springs: of the Water blasts of Tivoly: of Floating Islands of Ice: of the shining of Dew in a Common of Lancashire; and elsewhere: of Divers, and Diving, their habit, their long holding their breath, and of other notable things observ'd by them.

Relations of the Effects of Earthquakes, and the moving, and sinking of Earths: of deep Mines, and deep Wells: of the several layers of Earth in a Well at Amsterdam: of the shining Cliffs in Scotland: of the layers of Earth observ'd in divers Cliffs: of Screw-Stones,
Stones, Lignum Fossil, Blocks buried in Exeter River, Trees found under ground in Cheshire, Lincolnshire, and elsewhere: of a Coal-Mine wrought half a mile from the shore, under the Sea: of the fatal effects of damp on Miners, and the ways of recovering them.

Relations of the extraordinary strength of some small Loadstones, taking up above 150 times their own weight: of several English Loadstones: of the variation of the Loadstone observ'd in two East-India voyages, and other places: of the growing of Pebbles inclus'd in a glass of water: of several excellent English clays: of Gold found in little lumps in a Mine in England: of the moving sands in Norfolk.

Relations about refining Lead, and Tin-Oar: of hardning Steel so as to cut Porphyry with it, and softening it so much, as to make it easy to be wrought on: of impregnating Lead-Oar with Metal, after it has been once freed: of Petrify'd Teeth, and a Petrify'd humane fact: of several ways of splitting Rocks: of living Muscles found in the midst of Rocks at Legorn: of the way of making quick-silver: of things observable at the bottom of the Sea: of a soft Metal, which hardens after it has taken off the Impression, and the way of reducing such impressions into as small a proportion as is desir'd.

Relations about Agriculture: of ordering of Vines: of the setting and planting of Trees several ways: of Elms growing from chips, of new Trees sprung from rotten roots: of several kinds of Trees, growing one out of another; and in the place of others: of the best ways of pruning: of making a kind of Silk with Virginia-Grass: of a kind of Grass making stronger Ropes than the common Hemp: of a new way of ordering Mulberry Trees in Virginia:
Virginia: of a Locust Tree Bow standing bent six months, without loosing its Spring: of a way of improving the planting of Tobacco.

Relations of the usefulness of changing seed yearly: of the steeping, liming, sowing it several ways: of freeing it from Worms: preserving it long (as eighty years) of freeing it from smut: of the causes, and first signs of smut: of the Instrument and way of chopping Straw, for the seeding of Horses: of Plants growing in meer Water: of others growing in meer Air: of several Indian Woods: of the growing of the divided parts of Beans: of the growing of chopp'd stalks of Potatoes: of ordering Melons: of keeping their Seed, and producing extraordinary good ones without transplanting.

Relations of the growth, breeding, feeding, and ordering of Oysters: of a Sturgeon kept alive in Saint Jameses-Park: of the moveable Teeth of Pikes: of young Eels cut alive out of the old ones Belly: of the transporting Fish-spawn, and Carps alive from one place to another: of the strange increase of Carps so transported: of Snake-Stones and other Antidotes: of Frogs, Frog-spawn, Toads, Newts, Vipers, Snakes, Rattle-Snakes.

Relations of Swallows living after they have been frozen under water: of Barnacles and Soland Geese: of a new way of hatching Pigeons: of the way of hatching Chickens in Egypt: of Eggs proving fruitful, after they had been frozen: of recovering a tir'd Horse with Sheeps blood.

Relations of several Monsters with their Anatomies: of the measure of a Giant-child: of Stones found in several parts of the Body: of an unusual way of cutting the Stone out of the Bladder: of a Womans voiding the Bones of a child out of her side eighteen years after her having been with child: of grafting Teeth, and making the Teeth of one Man grow in the mouth of another.

Relations of several Chirurgical operations: of renewing the beating of the heart, by blowing into the Receptaculum chyli: of the Art of perfectly restoring Nerves, transversely cut, practis'd in France: of a Mummy found in the Ruines of Saint Pauls, after it had lain buried above 200 years: of breaking the Nerve to the Diaphragm, and of its effects: of cutting a Stetoma out of a Womans Breast: of making the blood Florid with Volatil, and Coagulating with Acid Salts.


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The HISTORY of the

A

RELATION

OF THE

PICO TENERIFFE.

Receiv'd from some considerable Merchants and Men worthy of Credit, who went to the top of it.

"Hav'ing furnish'd our selves with a Guide, Servants, and Horses to carry our Wine and Provisions, we set out from Oratava, a Port Town in the Island of Teneriffe, scissuated on the North of it at two miles distant from the main Sea. We travelled from twelve at night till eight in the morning, by which time we got to the top of the first Mountain towards the Pico de Tenerira; here, under a very great and conspicuous Pine tree, we brake our fast, dined and refreshed our selves, till two in the afternoon; then we proceeded through much Sandy way, over many lofty Mountains, but naked and bare, and not covered with any Pine trees, as our first nights passage was: this exposed us to excessive heat, till we arrived at the foot of the Pico; where we found many huge Stones, which seemed to have been fallen down from some upper part.

"About
"About six a clock this evening, we began to ascend up the Pico, but being now a mile advanced, and the way no more passable for our Horses, we quitted and left them with our Servants: In this mile ascent some of our company grew very faint and sick, disorder'd by fluxes, vomitings, and Aguish distempers, our Horses hair standing up right like Bristles: but calling for some of our Wine, which was carried in small Barrels on a Horse, we found it so wonderfully cold, that we could not drink it till we had kindled a fire to warm it, although yet the temper of the Air was very calm and moderate. But when the Sun was set, it began to blow with that violence, and grew so cold, that taking up our lodging under certain great Stones in the Rocks, we were constrained to keep great fires before the mouthes of them all night.

"About four in the morning we began to mount again, and being come about a mile up, one of the Company fail'd, and was able to proceed no further. Here began the black Rocks. The rest of us pursued our Journey till we came to the Sugarloaf, where we begin to travel again in a white sand, being fore-shod with shoes whose single soles are made a finger broader than the upper leather, to encounter this difficult and unstable passage; being ascended as far as the black Rocks, which are all flat, & lie like a pavement, we climbed with in a mile of the very top of the Pico, and at last we gained the Summit, where we found no such smoak as appeared a little below, but a continual breathing of a hot and sulphurous Vapour, which made our faces extreamly sore.

"In this passage we found no considerable altera-
tion of Air, and very little Wind; but being at the
top, it was so impetuous, that we had much ado to
stand against it, whilst we drank the Kings health,
and fired each of us a pece. Here we also brake
fast, but found our Strong-water had quite lost its
force, and was become almost insipid, whilst our
Wine was rather more spirituous and brisker than
it was before.
The top on which we stood, being not above a
yard broad, is the brink of a Pit called the Caldera,
which we judged to be about a Musquet-shot over,
and neer four score yards deep, in shape like a Cone,
within hollow like a Kettle or Cauldron, and all
over cover'd with small loose Stones mixt with
Sulphur and Sand, from amongst which issue divers
Spiracles of smoak and heat, when stirred with any
thing puffs and makes a noise, and so offensive, that
we were almost stifled with the sudden Emanation
of Vapours upon the removing of one of these
Stones, which are so hot as they are not easily to be
handled. We descended not above four or five
yards into the Caldera, in regard of its sliding from
our feet and the difficulty. But some have ad
ventured to the bottom. Other observable mate-
rials we discover'd none, besides a clear sort of Sul-
phur, which looks like Salt upon the Stones.
From this famous Pico, we could ken the Grand
Canaria, fourteen leagues distant, Palma eighteen,
and Gomera seven leagues, which interval of Sea
seemed to us not much larger than the River of
Thames about London. We discerned also the Her-
ry, being distant above twenty leagues, and so to the
outmost limits of the Sea, much farther.
So soon as the Sun appeared, the shadow of the
"Pico seemed to cover not only the whole Island, and the Grand Canaries, but the Sea to the very Horizon, where the top of the Sugar-loaf or Pico visibly appeared to turn up and cast its shade into the Air it self, at which we were much surprized: But the Sun was not far ascended, when the Clouds began to rise so fast, as intercepted our prospect both of the Sea, and the whole Island, excepting only the tops of the subjacent Mountains, which seem'd to pierce them through: Whether these Clouds do ever surmount the Pico we cannot say, but to such as are far beneath, they sometimes seem to hang above it, or rather wrap themselves about it, as constantly when the North-west Wind blows; this they call the Capse, and is a certain prognostick of ensuing Storms.

One of our company, who made this journey again two years after, arriving at the top of the Pico before day, and creeping under a great Stone to throwd himself from the cold Air (after a little space) found himself all wet, and perceived it to come from a perpetual trickling of water from the Rocks above him. Many excellent and very exuberant Springs we found issuing from the tops of most of the other Mountains, gushing out in great Spouts, almost as far as the huge Pine tree which we mention'd.

"Having stay'd some time upon the top, we all descended by the Sandy way till we came to the foot of the Sugar-loaf, which being steep, even to almost a perpendicular, we soon pasted. And here we met a Cave of about ten yards deep, and fifteen broad, being in shape like an Oven or Cupola, having a hole at the top which is neer eight yards over; by
by this we descended by a Rope, which our Servants held at the top, whilst the other end being fastned about our middles, we swing our selves, till being over a Bank of Snow, we slide down and light upon it. We were forced to swing thus in the descent, because in the middle of the bottom of this Cave, opposite to the overture at the top, is a round Pit of water, resembling a Well, the surface whereof is about a yard lower than the Snow, but as wide as the mouth at top, and is about six fathom deep. We suppose this Water not a Spring, but dissolved Snow blown in, or Water trickling through the Rocks.

About the sides of the Grot, for some height, there is Ice and Icicles hanging down to the Snow. But being quickly weary of this excessive cold place, and drawn up again, we continued our descent from the Mountains by the same passages we went up the day before, and so about five in the evening arrived at Oratava, from whence we set forth, our Faces so red and sore, that to cool them, we were forced to wash and bathe them in Whites of Eggs, &c.

The whole height of the Pico in perpendicular is vulgarly esteemed to be two miles and a half. No Trees, Herbs, or Shrubs in all the passage but Pines, and amongst the whiter Sands a kind of Broom, being a bushy Plant; and at the side where we lay all night, a kind of Cordon, which hath Stems of eight foot high, the Trunk near half a foot thick, every Stem growing in four squares, and emerging from the ground like Tuffs of Rushes; upon the edges of these Stems grow very small red Buttons or Berries, which being squeezed produced a poy-
Sonous Milk, which lighting upon any part of a Horse, or other Beast, fetches off the hair from the skin immediately; of the dead part of this we made our fires all night. This Plant is also universally spread over the Island, and is perhaps a kind of Euphorbium.

Of the Island Tenariffe it self, this account was given by a Judicious and Inquisitive Man, who liv'd twenty years in it as a Physician and Merchant. His opinion is, that the whole Island being a ground mightily impregnated with Brimstone, did in former times take fire, and blow up all or near upon all at the same time, and that many Mountains of huge Stones calcin'd and burnt, which appear every where about the Island, especially in the Southwest parts of it, were rais'd and heav'd up out of the Bowels of the Earth, at the time of that general conflagration; and that the greatest quantity of this Sulphur lying about the Center of the Island, rais'd up the Pico to that height at which it is now seen. And he saies, that any one upon the place shall carefully note the scituation, and manner of these calcin'd Rocks how they lie, will easily be of that mind: For he saies, that they lye for three or four miles almost round the bottom of the Pico, and in such order one above another almost to the very Sugar-loaf (as 'tis called) as if the whole ground swelling and rising up together by the Ascension of the Brimstone, the Torrents and Rivers of it did with a sudden Eruption rowl and tumble them down from the rest of the Rocks, especially (as was said before) to the South-west; For on that side, from the very top of the Pico almost to the Sea shore, lye huge heaps of these burnt Rocks.
Rocks one under another. And there remain to
this time the very Tracts of the Rivers of Brim-
stone, as they ran over all this quarter of the Island,
which hath so wasted the ground beyond recovery, that nothing can be made to grow there but
Broom: But on the North side of the Pico, few or
none of these Stones appear. And he concluded
hence, that the Volcanio discharg'd it self chiefly to
the South-west. He adds further, that Mines of
several Mettals were broken and blown up at the
same time. These calcin'd Rocks resembling some
of them Iron-Ore, some Silver, and others Copper.
Particularly at a certain place in these South-west
parts called the Azulejos, being very high Mount-
tains, where never any English man but himself
(that ever he heard of) was. There are vast quan-
tities of a loose blewh with Earth intermixt with blew
Stones, which have on them yellow rust as that of
Copper and Vitriol: And likewise many little
Springs of Vitriolate waters, where he supposes was
a Copper Mine. And he was told by a Bell-founder
of Oratava, that out of two Horse loads of this
Earth, he got as much Gold as made two large
Rings. And a Portuuez told him, who had been
in the West-Indies, that his opinion was, there were
as good Mines of Gold and Silver there as the best
in the Indies. There are likewise hereabout Ni-
trous Waters and Stones covered with a deep Saf-
fron colour'd rust, and tasting of Iron. And fur-
ther he mentions a Friend of his, who out of two
lumps of Earth or Ore, brought from the top of
this side the Mountain, made two Silver-spoons. All
this he confirms from the late instance of the Palme
Island eighteen leagues from Tenariffa, where a
"Volcano was fired about twelve years since, the violence whereof made an Earthquake in this Island so great, that he and others ran out of their houses, fearing they would have fallen upon their heads. They heard the noise of the Torrents of flaming Brimstone like Thunder, and saw the fire as plain by night, for about six weeks together, as a Candle in the room: And so much of the Sand and Ashes, brought from thence by the Wind with Clouds, fell on his Hat, as fill'd a Sand-box for his Ink-horn.

"In some part of this Island there grows a crooked Shrub which they call Legnan, which they bring for England as a sweet Wood: There are likewise Apricots, Peaches, &c. in Standard, which bear twice a year. Pear-trees also which are as pregnant: Almonds of a tender shell; Palms, Plantains, Oranges and Lemmons, especially the Pregnades which have small ones in their bellies, from whence they are so denominated. Also they have Sugar Canes, and a little Cotton. Colloquintida, &c. The Roses blow at Christmas. There are good Carnations, and very large; but Tulips will not grow or thrive there: Sampier clothes the Rocks in abundance, and a kind of Clover the Ground. Another Grass growing near the Sea, which is of a broader leaf, so luscious and rank, as it will kill a Horse that eats of it, but no other Cattle. Eighty ears of Wheat have been found to spring from one root, but it grows not very high. The Corn of this is transparent and bright like to the purest yellow Amber; and one bushel hath produced one hundred and thirty in a seasonable year.

"The Canary birds (which they bring to us in "England)
The HISTORY of the

"England) breed in the Barancos or Gills, which the
"Water hath fretted away in the Mountains, being
"places very cold. There are also Quails, Partridges,
"larger than ours and exceeding beautiful, great
"Wood-pigeons, Turtles at Spring, Crows, and some-
"times from the Coast of Barbary appears the Fal-
"con. Bees are carried into the Mountains, where
"they prosper exceedingly.

"They have wild Goats on the Mountains, which
"climb to the very top of the Pico sometimes: Also
"Hogs and multitudes of Conies.

"Of Fish they have the Cherna, a very large and
"excellent fish, better tasted than any we have in
"England: the Mero, Dolphin, Shark, Lobsters
"without the great claws, Muscles, Periwinkles, & the
"Clacas, which is absolutely the very best Shell-fish
"in the world, they grow in the Rocks five or six un-
"der one great shell, through the top holes whereof
"they peep out with their Nebs, from whence (the
"shells being broken a little more open with a stone)
"they draw them forth. There is likewise another
"Fish like an Eel, which hath six or seven tails of a
"span in length united to one head and body, which
"is also as short. Besides these, they have Turtles
"and Cabridos which are better than our Trouts.

"The Island is full of Springs of pure Water ta-
"sting like Milk. And in Lalagina (where the Wa-
ter is not altogether so Limpid and Clear) they
"percolate it through a kind of spungy Stone cut in
"form of a Bason.

"The Vines which afford those excellent Wines,
grow all about the Island within a mile of the Sea,
"such as are planted farther up are nothing esteem'd,
"neither will they thrive in any of the other Islands,
for the Guanchios or antient Inhabitants he gives this full Account.

September the third, about twelve years since, he took his Journey from Guimar (a Town inhabited for the most part by such as derive themselves from the old Guanchios) in the company of some of them, to view their Caves and the Bodies buried in them. This was a favour they seldom or never permit to any (having in great veneration the Bodies of their Ancestors, and likewise being most extremly a-gainst any molestation of the Dead) but he had done several Eleemosynary Cures amongst them (for they are generally very poor, yet the poorest thinks himself too good to marry with the best Spaniard) which indered him to them exceedingly, otherwise it is death for any Stranger to visit these Caves or Bodies.

These Bodies are fowled up in Goat-skins with thongs of the same, with very great curiosity, particularly in the incomparable exactness and evenness of the seams, and the Skins are made very close and fit to the body: Most of these Bodies are entire, the eyes closed, hair on the head, ears, nose, teeth, lips, beard, all perfect, only discoloured and a little shrivelled, likewise the Pudenda of both Sexes; He saw about three or four hundred in several Caves, some of them are standing, others lie on beds of Wood, so hardned by an art they had (which the Spaniards call Curar, to cure a piece of wood) as no Iron can pierce or hurt it. He says, that one day being hunting a Ferret (which is much in use there) having a bell about his neck, ran after a Coney into a hole, where they lost the sound of the bell; the owner being afraid he should loose his Ferret, seeking
"Seeking about the Rock and Shrubs, found the
mouth of a Cave, and entering in, was so a-frighted,
that he cryed out. It was at the sight of one of
these Bodies very tall and large, lying with his head
on a great Stone, his feet supported with a little
wall of stone, the body resting on a bed of Wood.
(as before was mention'd.) The fellow being now a
little out of his fright entered it, and cut off a great
piece of the skin that lay on the breast of this body,
which, the Doctor says, was more flexible and pli-
ant than ever he felt any. Kids-leather-glove, and
yet so far from being rotten, that the man used it for
his Flail many years after.

These bodies are very light, as if made up of
straw, and in some broken Limbs he observed the
Nerves and Tendons, and also some strings of the
Veins and Arteries very distinctly.

His great care was to enquire of these people
what they had amongst them of Tradition con-
cerning the embalming and preservation of these
Bodies; from some of the eldest of them, (above
a hundred and ten years of age,) he received this
Account, That they had of old one particular
Tribe of men that had this Art amongst themselves
only, and kept it as a thing sacred, and not to be
communicated to the Vulgar: These mixt not with
the rest of the Inhabitants, nor married out of their
own Tribe, and were also their Priests and Ministers
of Religion: That upon the Conquest of the sp-
niards they were most of them destroy'd, and the
Art lost with them, only they held some Traditions
yet of a few Ingredients, that were made use of
in this business. They took Butter of Goats Milk
(some said Hogs Grease was mingled with it) which
they
they kept in the Skins for this purpose, in this they boiled certain Herbs; first a sort of wild Lavender, which grows there in great quantities on the Rocks: Secondly, an Herb called Lara, of a very gummy and glutinous Consistence, which now grows there under the tops of the Mountains only: Thirdly, a kind of Cyclamen or Sow-bread: Fourthly, wild Sage, growing plentifully in this Island: These with others bruiled and boiled in the Butter, render'd it a perfect Balsame. This prepared, they first unbowed the Corps (and in the poorer sort, to save charges, they took out the Brain behind, and these poor were also sew'd up in Skins with the hair on, whereas the richer sort were (as was said before) put up in Skins so finely and exactly dressed, as they remain most rarely pliant and gentle to this day.) After the Body was thus ordered, they had in readiness a Lixivium made of the Bark of Pine trees, with which they washed the Body, drying it in the Sun in Summer, and in Stoves in Winter, this repeating very often. Afterward they began their Unction with the Balsame, both without and within, drying it again as before. This they continued till the Balsame had penetrated into the whole habit, and the Muscles in all parts appeared through the contracted Skin, and the Body became exceeding light: Then they sew'd them up in the Goat-skins, as was mention'd already. He was told by these Ancient People, that they have above twenty Caves of their Kings and great Persons, with their whole Families, yet unknown to any but themselves, and which they will never discover. Lastly, he says, that Bodies are found in the Caves of the Grand-Caravio in sacks, and quite consumed.
not as these in Teneriffa. Thus far of the Bodies and embalming.

Antiently when they had no knowledge of Iron, they made their Lances of Wood hardned as before, some of which the Doctor hath seen. He hath also seen Earthen-pots so hard, that they cannot be broken; of these some are found in the Caves and old Favances, and used by the poorer people that find them to boil meat in. Likewise they did Carbor Stone it self, that is to say, a kind of Slate called now Tobona, which they first formed to an edge or point as they had occasion to use it, either as Knives or Lancets to let blood withall.

Their Food is Barly roasted, and then ground with little Mills, which they made of Stone, and mixed with Milk and Honey: This they still feed on, and carry it on their backs in Goat-skins.

To this day they drink no Wine, nor care for Flesh. They are generally very lean, tall, active and full of courage.

He himself hath seen them leap from Rock to Rock, from a very prodigious height, till they came to the bottom, sometimes making ten fathom deep at one leap.

The manner is thus:

First: they Tertiate their Lance (which is about the bigness of a half Pike) that is, they poise it in their hand, then they aim the point of it at any piece of a Rock, upon which they intend to light (sometimes not half a foot broad.) At their going off they clap their feet close to the Lance, and so carry their bodies in the Air. The point of the Lance first comes to the place, which breaks the force of their fall; then they slide gently down by.
by the Staffe, and pitch with their feet upon the very place they first design'd, and from Rock to Rock till they come to the bottom. Their Novices sometimes break their necks in learn-
ing.

He added several Stories to this effect of their great activity in leaping down Rocks and Cliffs. And how twenty eight of them made an escape from the battlements of an extraordinary high Castle in the Island, when the Governor thought he had made sure of them.

He told also (and the same was seriously con-
firmed by a Spaniard, and another Canary Mer-
chant then in the company.) That they whistle so loud as to be heard five miles off. And that to be in the same Room with them when they whistle, were enough to endanger breaking the Tympanum of the ear, and added, that he (being in Compa-
ty of one that whistled his loudest) could not hear perfectly for fifteen days after, the noise was so great.

He affirms also, That they throw Stones with a force almost as great as that of a Bullet, and now use Stones in all their fights as they did ancient-
ly.

When
When my Reader shall behold this large number of Relations; perhaps he will think, that too many of them seem to be incredulous stories, and that if the Royal Society shall much busie themselves, about such wonderful, and uncertain events, they will fall into that mistake, of which I have already accus'd some of the Antients, of framing Romances, instead of solid Histories of Nature. But here, though I shall first confirm what I said before, that it is an unprofitable, and unfound way of Natural Philosophy, to regard nothing else, but the prodigious, and extraordinary causes, and effects; yet I will also add, that it is not an unfit employment for the most judicious Experimenter to examine, and record the most unusual and monstrous forces, and motions of matter: It is certain that many things, which now seem miraculous, would not be so, if once we come to be fully acquainted with their compositions, and operations. And it is also as true, that there are many Qualities, and Figures, and powers of things, that break the common Laws, and transgress the standing Rules of Nature. It is not therefore an extravagance, to observe such productions, and are indeed admirable in themselves, if at the same time we do not strive to make those appear to be admirable, that are groundless, and false. In this there is a neer resemblance between Natural and civil History. In the Civil, that way of Romance is to be exploded, which heightens all the characters, and actions of men, beyond all shadow of probability: yet this does not hinder, but the great, and eminent virtues of extraordinary men of all Ages, may be related, and proposs'd to our example. The same is to be affirm'd of Natural History. To make that only to consist of strange, and delightful Tales, is to render it nothing
nothing else but vain, and ridiculous Knight-Errantry. Yet we may avoid that extreme, and still leave room, to consider the singular, and irregular effects, and to imitate the unexpected, and monstrous excesses, which Nature does sometimes practise in her works. The first may be only compar'd to the Fables of Amadis, and the Seven Champions: the other to the real Histories of Alexander, Hannibal, Scipio, or Cesar: in which though many of their Actions may at first surprize us; yet there is nothing that exceeds the Truth of Life, and that may not serve for our instruction, or imita-

If this way of general receiving all credible ac-

ounts of Natural, and Artificial productions shall seem expos'd to overmuch hazard, and uncertainty: that danger is remov'd by the Royal Societies reducing such matters of here-lay and information, into real, and impartial Trials, perform'd by their own hands: Of the exactness, variation, and accurate repetition of their Experiments, I have already discours'd: I will now go on to lay down in short compass those parts of the visible World, about which they have chiefly bestow'd their pains.

The first kind that I shall mention, is of Experi-

ments about Fire, and Flame, of these many were made in order to the examination of a Theory propounded to them, that there is no such thing, as an Elementary Fire of the Peripatetics; nor Fiery Atoms of the Epicureans: but that Fire is only the Act of the dissolution of heated Sulphurous Bodies, by the Air as a Mensurium, much after the same manner, as Aqua Fortis, or other sharp Menstruums do work on dissoluble
luble Bodies, as Iron, Tin, Copper: that heat, and light are two inseparable effects of this dissolution; as heat, and ebullition are of those dissolutions of Tin, and Copper: that Flame is a dissolution of Smoke, which consists of combustible particles, carry'd upward by the heat of rarify'd Air: and that Ashes are a part of the Body not dissoluble by the Air.

Of this sort, they have made Experiments, to find the lasting of the burning of a Candle, Lamp, or Coals, in a Cubic foot of common, rarify'd, and condens'd Air: to exhibit the sudden extinction of Candles, Lamps, and lighted Coals, when they are put into satiated Air: to shew the speedy extinction of kindled Charcoals, by blowing on them with bellows, that Air which had before been satiated with burning: to shew that the greatest and most lasting heat, without a supply of fresh Air, is unable to burn Wood, Sulphur, and most other combustible matters: to find the comparative heat of all kinds of Fires, and Flames of several Materials, as of Sulphur, Camphire, Spirit of Wine, Oyl, Wood, Coal, Salcoa, Iron: to find at what degree of heat, Lead, Tin, Silver, Brass, Copper, Gold will melt.


Experiments of Candles, and Coals, extinguish'd by the damp of a deep Well: of the burning of Lamps under water: of burning Spirit of Wine, and Camphire together, and the diversity of their Flames: of reducing
reducing Copper to a very combustible substance: of heating the Air, by blowing it through a red-hot earthen Pipe, so as to burn Wood: of the brightness of the Flame of Niter, and Sulphur: of the burning and flaming of Tin-filings by the help of Niter: of kindling Bodies, in common, rarify'd, and condens'd Air, by the help of a Burning-glass: of the comparative heat cast by a Burning-glass, in the morning, and at noon: of burning with a Lens made of Ice: of calcining Antimony in the Sun with loss: to find whether Aurum Fulminans or Purpur Fulminans do flame upon Explosion: of hatching Eggs with a Lamp Furnace.

Their second sort of Experiments is of those that of Air, have been made in order to find out the nature, properties, and uses of Air. Such as these.

Experiments for determining the height of the Atmosphere, for finding the pressure of the Atmosphere: on the tops of Mountains, on the surface of the earth, and at the bottoms of very deep Pits, and Mines, by the help of Quick-silver, and other contrivances: for finding the pressure of the Atmosphere, both in the same place, and places very far removed.

Experiments to determine the possible bounds of expansion, and condensation of the Air, by heat and cold, by exhausting and compressing: to determine the strength of Air under the several degrees of rarefaction, and condensation: of the force of condens'd Air in Wind-Guns: to state the comparative gravity of the Air to other fluid, and solid Bodies: to discover the refractive power of the Air, under the several Degrees of rarefaction, and condensation: to manifest the refractive veins of the Air: to produce a kind of opacity of the Air: of the falling of Smoak in rarify'd

E e
fy'd Air: to make small Glass-bubbles swim in Air very much condens'd: of Glass-balls rising in a heavy, or condens'd Air, and falling in a lighter and more rarify'd.

Experiments of the Propagation of Sounds through common, rarify'd, and condens'd Air: of the congruity, or incongruity of Air, and its capacity to penetrate some Bodies and not others: of generating Air by corrosive Menstruums out of fermenting Liquors, out of Water, and other Liquors, by heat, and by exhaustion: of the returning of such Air into the Water again: of the vanishing of Air into Water exhausted of Air: of the maintaining, and increasing a Fire by such Airs: of the fitness, and unfitness of such Air for respiration: of the use of Air in breathing.

Experiments of keeping Creatures many hours alive, by blowing into the Lungs with Bellows, after that all the Thorax, and Abdamen were open'd and cut away, and all the Intrails save Heart, and Lungs remov'd: of reviving Chickens, after they have been strangulated, by blowing into their Lungs: to try how long a man can live, by expiring, and inspiring again the same Air: to try whether the Air so respired, might not by several means be purify'd, or renew'd: to prove that it is not the heat, nor the cold of this respired Air, that choaks.

Experiments of the respiring of Animals, in Air, much rarify'd, and the fatal effects: of the long continuance of several Animals very well in Air, as much condens'd, as it will be under water, at two hundred fathoms deep, that is about eight times: of the quantity of fresh Air requisite for the life of a respiring Animal, for a certain space of time: of making Air unfit for respiration, by satiating it, by suffering Candles,
periments of including living animals, and kindled coals, and candles, in a large glass, to observe which of them will be first extinguished: of a man living half an hour, without any inconvenience, in a leaden bell, at divers fathoms under water: of the quantity of air respir'd at once by a man: of the strength a man has to raise weights by his breath.

Experiments of the swelling of an arm put into the rarifying engine, by taking off the pressure of the ambient air: of the swelling of vipers, and frogs, upon taking off the pressure of the ambient air: of the life, and free motion of fishes in water, under the pressure of air eight times condens'd: of insects not being able to move in exhausted air: of the resistance of air to bodies mov'd through it: of the not growing of seeds for want of air: of the growing of plants hung in the air, and of the decrease of their weight: of the living of a camelion, snakes, toads, and divers insects, in a free air, without food: of conveying air under water to any depth: of condensing air by water, and by the expansion of freezing water: of the swelling of lungs in the rarifying engine: of the velocity, and strength of several winds.

The third kind are those, which have been made, of water, about the substance, and properties of water: such are,

Experiments about the comparative gravity of salt water, and fresh, and of several medicinal springs found in this nation: of the differing weight of the sea-water, in several climates, and at several seasons:
of the weight of Distilled water, Snow-water, May-dew, Rain-water, Spring-water: of augmenting the weight of Liquor, by dissolving Salts: of the greater thickness of such Water, at the bottom, than at the top; of weighing, ascending, and descending Bodies in Water: of the pressure of the Water at several depths under its surface.

Experiments of the heat and cold of the Water, at several depths of the Sea: of propagating Sounds through the Water: of sounding the depth of the Sea without a line: of fetching up Water from the Bottom of the Sea: of fetching up Earth, Sand, Plants, from the bottom of the Sea.

Experiments of the resistance of Water to Bodies mov'd on its surface, of several Figures, and by several degrees of force: of the resistance of Water to Bodies mov'd through its substance ascending, and descending: of the expansion, and condensation of Water by heat and cold: of the condensation of Water by several ways of pressure: of converting Water into a vapourous Air, lasting sometimes in that form: the Torricellian Experiment try'd with Water in a Glass-cane thirty six and forty foot high, in a leaden Tube, also with a Glass at the top: the same try'd with Oyl, and other Liquors.

Experiments of the rising of Water in small Tubes, and many others about its congruity: of filtration, or of the rising of Water, to a great height in Sand, &c. of the swimming of Fishes: of Waters being able to penetrate through those Pores, where Air will not: of opening bellows at a depth under water, and blowing up Bladders, to find the pressure of the Water: of Water not subsiding in a high Glass-cane, upon removing the ambient pressure, after it had been well exhausted.
haunted of the Air-bubbles that lurk'd in it: of forcing Water out of a Vessel by its own vapours.

Experiments of the different weight, and refraction of warm Water, and cold: of the passing of Water through the coats of a Man's stomach: of the living of Fish in Water, the Air being exhausted: of closing up a Fish in a Glass of water: of the dying of Fishes in Water, upon taking off the pressure of the Air, in the rarifying Engine: of Hydrostaticks, and making a Body sink by pouring more water upon it: of raising Water above its Standard by sucking: of the subsiding of Water in the stem, upon putting the Bolt-head into warm water: of the shrinking of Water upon cooling.

The fourth kind are about Mines, Metals, Oars, Of Metals Stones, &c. Such as,

Experiments of Coppelling made at the Tower: of dissolving many Salts in one Liquor: of the Oculas Mundi: of Raising, of the Tenacity of several Metals examined by weights: of the rarefaction and condensation of Glass: of the volatizing Salt of Tartar, with burnt Alum, with Vinegar, and Spirit of Wine: on the Bononian Stone: on Diamonds, of their shining by rubbing: on Copper-oar: of the distillation of Coal: of refining several kinds of Lead-oar: of extracting a much greater quantity of Silver out of that Oar, than is commonly done: of several ways of reducing Lesbarges into Lead: of changing Gold into Silver.

Experiments Magnetic, of the best form of capping Loadstones: of the best forms of Needles, of several lengths and bignesses: of various ways of touching Needles on the Loadstone: of making the same Pole of the
The HISTORY of the Loadstone, both attract, and chase the same end of the Needle without touching it: to find the variation of the Loadstone here at London.

Experiments with the dipping Needle: of the extraordinary strength in proportion to its bulk of a small Loadstone: to measure the strength of the Magnetical attractive power, at several distances from the Stone: to examine the force of the attractive power, through several mediums, as Water, Air, Wood, Lead, and Stone: to divert the attractive power, by interposing Iron: to find the directive virtue of the Loadstone under water.

Experiments to manifest by the help of Steel-dust, the lines of the Directive virtue of the Loadstone to be oval, in a contrary position to what Des Cartes theory makes them: to manifest those lines of Direction by the help of Needles: to discover those lines of Direction, when the influence of many Loadstones is compounded: to find what those lines are encompassing a Spherical Loadstone, what about a Square, and what about a regular Figure: to bore through the Axis of a Loadstone: and fill it up with a Cylindrical Steel: Experiments on Loadstones having many Poles, and yet the Stones seeming uniform.

The fifth kind is of the growth of Vegetables in several kinds of Water; as River-water, Rain-water, Distilled water, May-dew: of hindering the growth of Seed Corn in the Earth, by extracting the Air: and furthering their growth, by admitting it: of steeping Seeds of several kinds: of inverting the Positions of Roots, and Plants set in the ground, to find whether there are values in the Pores of the Wood, that only open one way: of the decrease of the weight of Plants.
Plants growing in Air: of Lignum Vivum: of the growing of some branches of Rosemary: by only sprinkling the leaves with water: of Campfire wood: of Wood brought from the Canaries: of a stinking Wood brought out of the East-Indies: of the reunion of the Bark of Trees after it had been separated from the Body.

The sixth are Experiments Medicinal and Anatomical: as of cutting out the Spleen of a Dog: of the effects of Vipers biting Dogs: of a Camelon, and its dissection: of preserving Animals in Spirit of Wine, Oyl of Turpentine, and other Liquors: of injecting various Liquors, and other Substances, into the veins of several Creatures.

Experiments of destroying Mites by several Fumes: of the equivocal Generation of Insects: of feeding a Carp in the Air: of making Insects with Cheese, and Sack: of killing Water-Newts, Toads, and Slowworms with several Salts: of killing Frogs, by touching their skin, with Vinegar, Pitch, or Mercury: of a Spider not being enchanted by a Circle of Unicorns born, or Irish Earth, laid round about it.

Experiments with a Poison'd Indian Dagger on several Animals: with the Macassar Poison: with Florentine Poison, and several Antidotes against it: of making Flesh grow on, after it has been once cut off: of the grafting a Spur on the head of a Cock, and its growing: of the living of Creatures by Fictitious Air: of the reviving of Animals strangled, by blowing into their Lungs: of Flesh not breeding Worms, when secur'd from Fly-blowings: of the suffocation of Animals upon piercing the Thorax: of hatching Silk-worms Eggs in rarify'd Air: of transfusing the blood of one Animal into another.
The seventh sort are about those which are call'd sensible Qualities: as of freezing: of cold, and heat: of freezing Water freed from Air: of the time, and manner of the contraction in freezing luke-warm Water: of the temperature of several places, by seal'd Thermometers; as of several Countries; of the bottoms of deep Mines, Wells, Vaults, on the tops of Hills, at the bottom of the Sea.

Experiments of the contraction of Oyl of Vitriol, and divers other Oyls by freezing: of freezing bitter Tinctures: of freezing several ting'd Liquors: and driving all the tincture inward to the Center: of shewing Ice to be capable of various degrees of cold, greater than is requisite to keep it Ice: of producing cold by the dissolution of several Salts: of freezing Water without blebs: of a membranous substance separable from the blood by freezing: of a Thermometer in rarify'd and condens'd Air: of very easy freezing of Oyl of Anniseeds: of making a Standard of Cold by freezing distill'd-water.

The eighth are of Rarity, Density, Gravity, Pressure, Levity, Fluidity, Firmness, Congruity, &c. as of the Nature of Gravity: of the cohesion of two Flat Marbles: of compressing the Air with Mercury to find its spring: of the weights of Bodies, solid and fluid: of rarefaction, and condensation by the help of Mercury: of the tenacity of several Bodies: of the turning of two very fluid Liquors into one solid mass, by mingling them together.

Experiments for examining, whether the gravity of Bodies alter, according as they are carried a good way above, or below the surface of the Earth: of the standing
Standing of Mercury well exhausted, many inches, nay many feet, above its usual standing: of a Wheel-Baro-Meter: of the expansion, and contraction of Glass, and Metals by heat and cold: of Spirit of Wine, and several ting'd Liquors by the help of a Glass Tube: the examination of Monsieur Paschals Experiment, by many others.

The ninth are Experiments of Light, Sound, Colours, Of light, Taste, Smell: as of two transparent Liquors producing an opacous one: of Ecchosc and reflected sounds: of Musical sounds, and Harmonies: of Colours, of the greater refraction of Water, than of Ice: of Refraction in a new Engine; of the Refraction of Glass of various shapes under Water: of destroying the shining of Fish by Oyl of Vitriol: of making a great light by rubbing two Chrystals hard one against the other: of making a deaf, and dumb man to speak.

The tenth are Experiments of Motion: as of Glass Of Motion. drops several ways order'd, and broken: of the velocity of the descent of several Bodies of divers fashions through several Liquors: of determining the velocity of Bodies falling through the Air; try'd by many ways: of the swift motion of sounds: of the irregular motion of the Oyl of Turpentine on Spirit of Wine; of the strength of falling Bodies, according to the several Heights, from which they fall: of proportioning the shapes of Bodies, so as to make them fall together in the same time through differing Mediums.

Experiments of the swiftness of a Bullet shot with extraordinary Powder: of the best Figure of the weight
of the Motion of Pendulums: Bodies of various figures: to determine the length of Pendulums: to find the velocity of the vibrations of a sounding string: to find the velocity of motion, propagated by a very long extended wire: for explaining the inflection of a straight motion into a circular, by a supervening attractive power, towards the Center, in order to the explaining of the motion of the Planets.

Experiments of the circular and complicated motion of Pendulums, to explain the Hypothesis of the Moons moving about the Earth: of comparing the Motions of a circular Pendulum, with the motion of a straight one: of the propagation of motion from one Body to another: of the reflection of motion: of the vibrating motion of quicksilver in a crooked pipe: imitating the motion of a Pendulum: of communicating of the strength of Powder for the bending of Springs; and thereby for making artificial Muscles, to command what strength we desire.


Experiments of volatizing Salt of Tartar many ways:
ROYAL SOCIETY.

Ways: of examining the mucilaginous matter call'd
Star-shot: of examining our English Telescope, and
Microscopes, and comparing them with such as have
been made at Rome: of making a volatile Salt with
Oyl of Tarrentine, and Sea-salt: of the Quantity of
Spirits in Cyder: of the Strength of several Springs:
of examining a Pump made with Bellows: of dying
Silk with several Jamaica Woods: of finding the
Strength of Wood of several kinds, for bearing: of
finding the flexibility of various Woods, and deter-
mining the utmost extent of their yielding, and bend-
ing.

Experiments about the gravity of Bodies made on
the top of Saint Paul's Steeple, Westminster Abbey, and
several other high places; and in a Well of seventy
Fathoms depth: examined about the Virgula Divina,
wherein the common Assertions were found fall
c of the various refractions of several Liquors,
in a new refractive Engine: of common Oyl of To-
bacco, made by distillation in a Glass retort: of ma-
king the Object-glass of a Microscope, to bear as large
an Aperture as is desir'd.

Of this their way of Experimenting I will here
produce these Examples.
The HISTORY of the

EXPERIMENTS

Of the Weight of Bodies increased in the FIRE:

Made at the Tower, and the Account brought in by my Lord B. R. O. V. N. C. K. E. R.

1. Copper and Lead.

<table>
<thead>
<tr>
<th>Item</th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>0.</td>
<td>6.</td>
</tr>
<tr>
<td>Lead</td>
<td>4.</td>
<td>9.</td>
</tr>
<tr>
<td>Total</td>
<td>14.23</td>
<td></td>
</tr>
<tr>
<td>Into the fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of the fire</td>
<td>15.4 33</td>
<td></td>
</tr>
<tr>
<td>Gained</td>
<td>0.</td>
<td>5.32</td>
</tr>
</tbody>
</table>

Besides what the Copper lost in weight, supposed to be about three grains.

2. Copper and Lead.

<table>
<thead>
<tr>
<th>Item</th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>10.</td>
<td>2 4</td>
</tr>
<tr>
<td>Lead</td>
<td>4.</td>
<td>9.</td>
</tr>
<tr>
<td>Total</td>
<td>14.17 4</td>
<td></td>
</tr>
<tr>
<td>Into the fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of the fire</td>
<td>15.1 32</td>
<td></td>
</tr>
<tr>
<td>Gained</td>
<td>0.</td>
<td>7 32</td>
</tr>
</tbody>
</table>

3. Lead
3. Lead alone.

<table>
<thead>
<tr>
<th></th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copel</td>
<td>10</td>
<td>3 1/2</td>
</tr>
<tr>
<td>Lead</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Into the fire both</td>
<td>14</td>
<td>12 1/2</td>
</tr>
<tr>
<td>Out of the fire</td>
<td>14</td>
<td>23 1/2</td>
</tr>
<tr>
<td>Gained</td>
<td>0</td>
<td>10 1/2</td>
</tr>
</tbody>
</table>

4. Lead alone.

<table>
<thead>
<tr>
<th></th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copel</td>
<td>10</td>
<td>10 1/2</td>
</tr>
<tr>
<td>Lead</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Into the fire both</td>
<td>14</td>
<td>19 1/2</td>
</tr>
<tr>
<td>Out. of the fire</td>
<td>15</td>
<td>1 1/4</td>
</tr>
<tr>
<td>Gained</td>
<td>0</td>
<td>5 1/4</td>
</tr>
</tbody>
</table>

5. Copel alone.

<table>
<thead>
<tr>
<th></th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Into the fire</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Out. of the fire</td>
<td>10</td>
<td>1 1/2</td>
</tr>
<tr>
<td>Lost</td>
<td>0</td>
<td>3 1/2</td>
</tr>
</tbody>
</table>

6. Copel alone.

<table>
<thead>
<tr>
<th></th>
<th>d.</th>
<th>gr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Into the fire</td>
<td>10</td>
<td>wanting 7 1/2</td>
</tr>
<tr>
<td>Out of the fire</td>
<td>10</td>
<td>wanting 9 1/2</td>
</tr>
<tr>
<td>Lost</td>
<td>0</td>
<td>1 1/2</td>
</tr>
</tbody>
</table>

EXPE-
EXPERIMENTS
Of a Stone called
O C U L U S  M U N D I
Made by Dr. GODDARD.

A small stone of the kind, called by some Authors Oculus Mundi, being dry and cloudy, weighed —— 5 gr. 3\(^\text{3/4}\)
The same being put under Water, for a night and somewhat more, became transparent, and, the superfcies being wiped dry, weighed —— 6 gr. 2\(^\text{1/2}\)
The difference between these two weights — 0. 1\(^\text{1/2}\)
The same Stone kept out of Water one day and becoming cloudy again, weighed ——— 5. 2\(^\text{3/4}\)
which was more than the first weight ——— 0. 1\(^\text{1/4}\)
The same being kept dry two days longer, weighed ——— 5. 2\(^\text{1/2}\)
which was less than at first ——— 0. 2\(^\text{1/2}\)
Being kept dry something longer, it did not grow sensibly lighter.

Being put under Water for a night, and becoming again transparent, and wiped dry, the weight was — 6. 1\(^\text{3/4}\)
the same with the first, after putting in Water, and more than the last weight, after keeping of it dry — 0. 1\(^\text{1/2}\)

Another Stone of the same kind, being variegated with milky, white, and grey, like some sort of Agates, while it lay under Water, was always environed with little bubbles, such as appear in water before boylung, next the sides of the vessel.

There
There were also some of the like bubbles on the surface of the water just put in, as if either some Exhalations came out of it, or that it did excite some fermentation in the parts of the water contiguous to it.

There was little sensible difference of Transparency in this Stone, before the putting under Water, and after: To be sure the milky white parts continued as before, but more different in weight than in the former. For whereas, before the putting into the water, the weight was \(18\text{ gr.}\) \(\frac{3}{4}\); after it had lain in about twenty four hours the weight was \(20\text{ gr.}\) \(\frac{3}{4}\), so the difference was \(1\text{ gr.} \frac{1}{4}\).

The same Stone was infused in the water scalding hot, and so continued for a while after it was cold, but got no more weight, than upon infusing in the cold; neither was there any sensible difference in the weight both times.
The HISTORY of the

An Account of a Dog dissected.

By Mr. H O O K.

In prosecution of some Inquiries into the Nature of Respiration in several Animals; A Dog was dissected, and by means of a pair of bellows, and a certain pipe thrust into the Wind-pipe of the Creature, the heart continued beating for a very long while after all the Thorax and Belly had been open'd, nay after the Diaphragme had been in great part cut away, and the Pericardium remover'd from the heart. And from several trials made, it seem'd very probable, that this motion might have been continued, as long almost as there was any blood left within the vessels of the Dog; for the motion of the Heart seem'd very little chang'd after above an hours time from the first displaying the Thorax; though we found, that upon removing the Bellows, the Lungs would presently grow slack'd, and the Heart begin to have convulsive motions; but upon removing the motion of the Bellows, the Heart recovered its former motion, and the Convulsions ceased. Though I made a Ligature upon all the great Vessels that went into the lower parts of its Body, I could not find any alteration in the pulse of the Heart; the circulation, it seems, being perform'd some other way. I con'd not perceive any thing distinctly, whether the Air did unite and mix with the Blood; nor did in the least perceive the Heart to swell upon the extension of the Lungs; nor did the Lungs seem to swell upon the contraction of the Heart.

EX-
XPERIMENTS
Of the Recoiling of
GUNS
By the Lord BRUVNCKER.

When I was commanded by this Society, to make Fig. 1.

Some Experiments of the Recoiling of Guns:
 deren to the discovery of the cause thereof, I caused
engine that lies here before you to be prepared, and
it (assisted by some of the most eminent of this So-
1) I had divers shots made in the Court of this
age, near the length thereof from the mark, with a
barge (about a fourpenny weight) of Powder;
without any other success, then that there was no-
Regular in that way, which was by laying it upon a
table, unto which it was sometimes fastned with
at all the four places R, L, V, B, sometimes on-
R or L, having wheels affixed at L and V or R and
that it might the more easily recoil.

This uncertainty I did then conceive might arise from
or more of these three causes, viz.

1. The violent trembling motion of the Gun, whence
Bullet might casually receive some lateral impulse
in the nose of the piece at the parting from it.

2. The yielding of the Table which was sensible.

3. The difficulty of aiming well by the Sight and But-

Therefore
Therefore to avoid all these, the Experiments I caus'd to be made before you in the Gallery of this Colledge, you may be pleased to remember were performed, first, taking only eight grains of Powder for the charge. Secondly, laying the Engine upon the floor, and thirdly, aiming by a thread at M, a mark about an Inch and \( \frac{1}{4} \) from the mouth of the Gun (the edge of a knife being put for the mark the better to discern the line that was shot in) and they thus succeeded.

When the piece was fastned to the floor both at R and L, the Bullet then did so fully hit the mark, that it was divided by it into two parts, whose difference in weight was less than ten grains (about the thirty third part of the whole Bullet) although the lesser part was a little hollow, and that from which the neck of Lead was a little too close pared off: But when bindred from Recoiling only at R, the Bullet mist hit the mark towards L or A, for the whole Bullet, less than two grains excepted, went on that side: And in like manner when bindred from Recoiling at L, the Bullet mist hit the mark towards R or B, the whole Bullet, less than two grains excepted, passing the knife on that side thereof.

I had the honour to make other Experiments with the same Engine, lately at White-Hall before his Majesty and his Highness Royal within the Tilt-yard Gallery, where there is the hearth of a Chimney raised a little above the floor, about the distance of thirteen feet from the opposite wall, against which I caus'd a Plank to be placed, and the Engine to be laid first against the middle of the Hearth, that it might not recoil at all, and that part of the board to be marked against which it was levelled, known by a line stretched from the Breech of the Piece unto the Board, directly over the sight and button, and the fire being given (the charge being but eight grains of Powder, as
as before) the Bullet did fully hit the mark. Secondly, the Piece (charged and levelled in the same manner) was laid at the end of the Hearth next the Park, so that very little of the corner R rested against it, and then the Bullet miss'd the mark about an inch and a quarter towards the Park or A. The like being done at the other end of the Hearth, the Bullet then miss'd the mark as much the other way; and afterwards with double that charge something more, as before I had found it less with a smaller charge.

Since this (at first designing only to experiment the several distances that the bullet is carried wide of the mark with different charges of Powder) I made these Experiments following.

In the first Column whereof you have the corner stop from recoiling.

In the second the grains of Powder with which the Piece was charged.

In the third the distance the Bullet was shot wide from the mark in inches, tenths, and parts of tenths.

In the fourth the side on which the Bullet was carried.

In the last the distance of the mark from the muzzle of the Gun in feet.
Whence you may be pleased to observe:

First, That the recoil of the Piece being boundred only at R. or L., whatsoever be the charge of the Powder, the Bullet still misses the mark, placed at the mouth of the Gun, on the same side that the recoil is made.

Secondly, That about twelve grains of Powder shoots widest from the mark at all distances above mentioned, on the same side that the Recoil is made.

Thirdly, That about forty eight grains of Powder shoots widest from the mark, placed at nine feet from the muzzle of the Piece, on the contrary side to that on which the recoil is made.

The cause of the first I cannot doubt to be the recoil of the Piece (from the force of the Powder) before the Bullet be parted from it.

The second is, as I conceive, because with less than twelve grains the Piece ceaseth to recoil before the Bullet be parted from it. And with more than twelve grains the Bullet is parted from the Piece before it hath recoiled so far: A greater power not moving a greater weight swifter (horizontally) in the same proportion that it doth the lesser.

And for the third I have this to offer, viz. Because the mouth of the Gun is moving sideways whilst the Bullet is going out; Therefore the mouth of the Piece must be contiguous (at least) unto the Bullet on the contrary side to that on which the Piece recoils, some time after the separation made on the other side, and therefore the last impulse of the Bullet from the force of the Powder is on that side the Piece recoils; wherefore the Bullet must necessarily cross the Axis of the Piece, and that with a greater or lesser Angle, according to the force of the Powder, & when this Angle therefore is greater than the Angle of recoil, then must the Axis of that Cylinder in which the
The HISTORY of the Bullet moves cross the Axis of the mark, beyond which interjection the mark being placed, the Bullet must be carried necessarily wide of the mark on the contrary side to the recoil of the Pecce.

Fig. 2.

Let \( a d = a \).

and \( d c = r \).

and therefore \( a b = r - \nu \).

\( \nu : r^2 a^2 \)

Therefore \( ab : ad : r - \nu \).

\( \nu : r^2 a^2 \).

and \( x : r^2 a^2 = x r - a \).

Therefore \( x r a^2 = x r^2 a^2 + a^2 \).

therefore \( x r a = x^2 a^2 + a^2 \).

therefore \( \frac{x r}{x^2 + 1} = a \).

Quod Sc.

\( \text{Fek} = \text{flp} = \text{phm} \)

\( \text{Fek} = \text{flp} = \text{phm} \)

\( \text{the Angle of Recoile phn the Angle of Reflexion made at the parting of the Bullet from the Pecce. When phn > phm (mh being always parallel to fg) then must he enter self fg if continued.} \)

Some other Experiments I have also made with another Pecce (about the same length, but of a bore neer two tenths of an inch less) and ordered in the same manner, and do find, that with a small charge the Bullet is shot (thence too) wide of the mark on the same side on which the Recoil is made, and with a full charge wide the contrary side.
Caused besides two Pistol barrels of about five inches long to be placed upon Carriages with four Wheels, and loaded with lead, that they might not overturn when discharged, and both of equal weight, and an Iron Cylinder of the length of both their bores, and of the same diameter with a piece of Lead of weight equal to it. So that the piece of Lead affixed to either of these Guns (which of them I should please to charge) might equally poise the other with the Iron Cylinder. And thus indifferently charging either with eight grains more or less of Powder, and putting the Iron Cylinder home into both, the piece of Lead being affixed to that which held the Powder, and then both set upon the floor and the Powder fired, I could not thereby discover, that the charged Piece, or the other, either of them, did certainly recoil more or less than the other, they rather seemed still to be equal.

These few Experiments I have made since, the Barrel being first cut at the muzzle, parallel to a vertical plain passing the line CD.
The HISTORY of the

Besides these, there is another that I shall mention, and that is the Experiment it self, or the Double-Bottom'd-Ship, invented by Sir William Petty: of this I will venture to add a few words, and I think I may do it, without transgressing that Rule I had fix'd to my self, of not enlarging on the praise of particular Names, or Designs. For since the Experiment it self is lost, I hope I may securely speak of its advantages: seeing men are wont out of common humanity to allow the commendations of dead Men, I trust I may commend a wreck'd Ship, without any fear of the envy that may thence arise to the Author. In brief therefore I will say this of it, that it was the most considerable Experiment, that has been made in this Age of Experiments: if either we regard the great charge of the work, or the wonderful change it was likely to make in Navigation, or the great success, to which this first Attempt was arriv'd. Though it was at first confronted with the doubts, and Objections of most Seamen of our Nation, yet it soon confuted them by Experience. It appear'd very much to excel all other forms of Ships, in sayling, in carriage, in security, and many other such benefits. Its first Voyage it perform'd with admirable swiftness. And though it miscarried after its return, yet it was destroyed by a common fate, and by such a dreadful tempest, as overwhelm'd a great Fleet the same night: so that the Antient Fabricks of Ships have no reason to triumph over that new Model, when of three score and ten sail that were in the same Storm, there was not one escap'd to bring the News.

In a word, though this Invention succeeded not, while it was only supported by private Purposes: it will undoubtedly produce great effects, if ever it shall be
be retriev'd upon the publick Stock of a Nation: which will be able to sustain the first hazards, and losses that must be allow'd to happen in the beginnings of all extraordinary Trials.

To their Experiments I will subjoin their Observations, which differ but in name from the other, the same fidelity, and truth being regarded in collecting them both.

Observations of the fix'd Stars for the perfecting of Astronomy, by the help of Telescopes: of the Comets in 1665, and 1666, which were made both in London, and elsewhere; and particularly of the first Comet, for above a month after, it disappear'd to the naked eye, and became Stationary, and Retrograde.

Observations about Saturn, of the proportion, and position of its Ring, of the Motion and Orbit of its Lunale, of the shadow of the Ring on the Body, and of the Body on the Ring; and of its Phases, &c. of Jupiter's Belts, and of its spots, and verticity about its Axis, of its eclipsing its Satellites, and being eclips'd by them; of the Orbs, Inclinations, Motions, &c. of the Satellites, together with Tables, and Ephemerides of their motions.

Observations of the Spots about the Body of Mars, and of its whirling motion about its Center: of several Eclipses of the Sun, and Moon, and some of them as were not taken notice of, by Astronomers, or Tables commonly us'd: of the Spots in the Moon, and of the several appearances in the Phases of it: of the Moon at the same time, by Correspondents in several parts of the World, towards the finding her Parallax, and distance.

Observations of the Elliptical and waved Figures of
of the Planetary Bodies, near the Horizon from the refraction of the Hemisphere: of the effects of Lightning: of the various pressure of the Atmosphere, by a Wheel-barometer for several years, and of its usefulness for predicting the changes of Weather.


Observations of the liming of Ground, for improvement of the Bodies of Sheep, but spoiling their Wool: of several ways for preventing smutty Corn: of the importance of changing Seed-corn: of the alteration of the Horns of Sheep, and other Cattle, by the change of Pasture: of the Pores and Valleys in Wood: the Anatomy of Trees: of the sensitive, and humble Plant.

Observations on the Bills of Mortality: on the leaves of Sage: on small living Elies in the Powder of Cantharides: of Insects bred in Dew: of Virginian Silk-Bottoms: of the Parts, and Anatomy of Fishes: of the Teeth of Lupus Marinus, that they are the same thing with the Toad-stones set in Rings: of the Respiration of Fishes: of Berracles: of the calcin’d Powder of Toads: of an Outlandish Deer-skin, and hair: of the Parts of Vipers: of Stones taken out of the Heart of a Man: of young Vipers, that they do not eat holes through their old ones Bellies, as is commonly affirmed.

For Examples of this Head, I will only refer my Reader
Reader to those which Mr. Graunt has publish'd on the Bills of Mortality; wherein the Author has shewn, that the meanest and most trivial matters may be so cultivated, as to bear excellent Fruit, when they come under the management of an accurate, and prudent Observer: For from those Papers, which went about so many years, through every Tradesmans hands, without any manner of profit, except only to the Clerks that collected them, he has deduc'd many true Conclusions, concerning the gravest, and most weighty Parts of Civil Government, and humane Nature.

As I am now passing away from their Experiments. §. XXXV. and Observations, which have been their proper, and principal work: there comes before me an Objection, which is the more to be regarded, because it is rais'd by the Experimenters themselves. For it is their common complaint, that there is a great nicety, and contingency, in the making of many Experiments: that their success is very often various, and inconstant, not only in the hands of different, but even of the same Tiers. From hence they suggest their fears, that this continuance of Experimenters, of which we talk so much, will not prove so advantageous, though they shall be all equally cautious in observing, and faithful in recording their Discoveries: because it is probable, that the Trials of Future Ages will not agree with those of the present, but frequently thwart, and contradict them.

The Objection is strong, and material; and I am so far from diminishing the weight of it, that I am rather willing to add more to it. I confess many Experiments are obnoxious to failing; either by reason of...
some circumstances, which are scarce discernable, till the work be over: or from the diversity of Materials, whereof some may be genuine, some sophisticated, some simple, some mix'd, some fresh, some may have lost their virtue. And this is chiefly remarkable, in Chemical Operations, wherein if the dissolvents be ill prepar'd, if the Spirits be too much, or too little purified, if there be the least alteration, in the degree of Fire, the quantity of Matter, or by the negligence of those that attend it, the whole course will be overthrown, or chang'd from its first purpose.

But what is now to be concluded from hence? shall this instability, and Casualty of Experiments, deter us from labouring in them at all? or should it not rather excite us to be more curious and watchful in their process? It is to be allow'd that such undertakings are wonderfully hazardous and difficult; why else does the Royal Society endeavour to preserve them from degenerating, by so many forewarnings, and rules, and a Method so severe? It is granted, that their event is often uncertain, and not answerable to our expectations. But that only ought to admonish us, of the indispensable necessity of a jealous, and exact Inquiry. If the uncertainty proceeded from a constant irregularity of Nature, we had reason then to despair; but seeing it for the most part arises only from some defect or change in our progress, we should thence learn, first, to correct our own miscarriages, before we cease to hope for the success.

Let then the Experiment be often renew'd. If the same kinds, and proportions of Ingredients be used, and the same circumstances be punctually observ'd, the effect without all question will be the same. If, some little variation of any of these, has made any alteration,
tion, a judicious, and well practis'd Trier will soon be able to discern the cause of it; and to rectifie it, upon the next repetition. If the difference of time, or place, or matter, or Instruments, will not suffer the product to be just the same in all points; yet something else will result, that may prove perhaps as beneficial. If we cannot always arrive at the main end of our Labours, some less unlookt Curiosities will arise. If we cannot obtain that which shall be useful for practice, there may something appear that may instruct.

It is strange that we are not able to inculcate into the minds of many men, the necessity of that distinction of my Lord Bacon's, that there ought to be Experiments of Light, as well as of Fruit. It is their usual word, What solid good will come from thence? They are indeed to be commended, for being so severe Exactors of goodness. And it were to be wished, that they would not only exercise this vigour, about Experiments, but on their own lives, and actions: that they would still question with themselves, in all that they do; what solid good will come from thence? But they are to know, that in so large, and so various an Art as this of Experiments, there are many degrees of usefulness: some may serve for real, and plain benefit, without much delight: some for teaching without apparent profit: some for light, now, and for use hereafter; some only for ornament, and curiosity. If they will persist in contemning all Experiments, except those which bring with them immediate gain, and a present harvest: they may as well cavil at the Providence of God, that he has not made all the seasons of the year, to be times of mowing, reaping, and vintage.
§ XXXVI. Of the variety, and excellence of the Instruments, with which this Age abounds, for their help in Philosophical matters, I have already discoursed in the former Part. I will now go on to mention those new ones, which they themselves, or some of their Members, have either invented, or advanced, for the ease, strength, and direction of their senses, in the motions of Nature, and Art: of this kind are these that follow.

An Instrument for finding a second of Time by the Sun: another for finding the Celestial Refractions.

Three several Quadrants made after three new contrivances, which though they are not above eighteen Inches in Diameter, and so are manageable in any Window, or Turret, are yet far more exact, than the best, that have been hitherto us'd, for Astronomical Observations, or taking Angles at Land.

A new Instrument for taking Angles by reflection; by which means the Eye at the same time sees the two Objects, both as touching in the same point, though distant almost to a Semicircle: which is of great use for making exact Observations at Sea.

A new kind of Back-staff for taking the Suns altitude by the Shadow, and Horizon: which is so contriv'd, that though the shadow be at three foot distance, or as much more as is desired, yet there shall not be the least penumbra; and the Shadow may be easily distinguish'd to the fourth part of a minute.

A Hoop of all the fix'd Stars in the Zodiac, for the speedy finding the Position of the Ecliptic, and for knowing the extent of the Constellations.

A Copernican Sphere*, representing the whirling Motion
Motion of the Sun, and the Motion of the several Planets.

A great many new ways of making Instruments, for keeping time very exactly, both with Pendulums, and without them: whereby the intervals of time may be measure'd both on the Land and Sea.

A universal Standard, or measure of Magnitudes, by the help of a Pendulum, never before attempt-ed.

A new kind of Pendulum Clock, wherein the Pendulum moves circularly, going with the most simple, and natural motion, moving very equally, and making no kind of noise.

A Pendulum Clock shewing the equation of Time.

Three new ways of Pendulums for Clocks, and several ways of applying the motion of the Watch-work to them.

Several new kinds of Pendulum Watches for the Pocket, wherein the motion is regulated, by Springs, or Weights, or Loadstones, or Flies moving very exactly regular.

Several sorts of Instruments for compressing, and rarefying the Air: A Wheel-Barometer, and other Instruments for finding the pressure of the Air, and serving to predict the changes of the Weather.

A new kind of Scales, for examining the gravity of Bodies in all places: to see whether the attraction of the Earth, be not greater in some parts of the Earth, than in others, and whether it do not decrease, at farther distances from the surface of the Earth, either upwards into the Air, or downwards under the Earth.

A very exact pair of Scales, for trying a great number of Magnetical Experiments.

Several.
Several very accurate Beams, for trying many Statistical Experiments, and for finding the most exact gravity of several kinds of Bodies.

A great number of Magnetical Instruments, for making Experiments about Loadstones.

Several new kinds of Levels for finding the true Horizon, where, by one of not above a foot length, the Horizontal line may be found, without the error of many seconds.

A new kind of Auger for boring the ground, and fetching up whatever it meets within the right order.

A new Instrument for fetching up any Substance from the bottom of the Sea, whether Sand, Shells, Clay, Stones, Minerals, Metals.

A new Bucket for examining and fetching up whatever Water is to be found at the bottom of the Sea, or at any depth, and for bringing it up without mixing with the other Water of the Sea, through which it passes.

Two new ways of sounding the depth of the Sea without a Line, for examining the greatest depth of the Ocean, in those parts of it, that are most remote from the Land.

Several Instruments for finding the velocity of swimming Bodies of several Figures, and mov'd with divers strengths, and for trying what Figures are least apt to be overturn'd, in order to the making a true Theory, of the Forms of Ships, and Boats for all uses.

An Instrument of great height, with Glass-windows on the sides, to be fill'd with Water, for examining the velocity of Bodies of several Substances, Figures and Magnitudes, by their descent.
An Instrument for measuring, and dividing the time of their Descent, to the accurateness of two, or three thirds of time, serving also for examining the swiftness of Bodies descending through the Air, and of Bodies shot by a Gun, or Bow.

A Bell for diving under water to a great depth, wherein a man has continued at a considerable depth under water, for half an hour, without the least inconvenience.

Another Instrument for a Diver, wherein he may continue long under water, and may walk to and fro, and make use of his strength, and limbs, almost as freely as in the Air.

A new sort of Spectacles, whereby a Diver may see any thing distinctly under Water.

A new way of conveying the Air under Water, to any Depth, for the use of Divers.

An Instrument for measuring the swiftness, and strength of the Wind.

An Instrument for the raising a continual stream of Water, by turning round a moveable valve, within the hollow of a close Cylindrical Barrel.

Several kinds of Thermometers for discovering the heat, and cold of the Air, or any other Liquors: a Thermometer for examining all the degrees of heat in Flames, and Fires, made of several Substances; as also the degrees of heat requisite to melt Soder, Lead, Tin, Silver, Brass, Iron, Copper, Gold.

A Standard for Cold several ways.

An Instrument for planting of Corn.

Four several sorts of Hygroscopes made with several Substances, for discovering the drouth, and moisture of the Air.

Several kinds of ways to examine the goodness, and badness of Waters.
Several Engines for finding, and determining the force of Gun-powder, by Weights, Springs, Sliding, &c.

An Instrument for receiving, and preserving the force of Gun-powder, so as to make it applicable, for the performing of any motion desir’d.

Several Instruments for examining the recoiling, true carriage, and divers other proprieties of Guns.

Several kinds of Otocousticons, or Instruments to improve the sense of hearing.

Several Models of Chariots, and other Instruments, for Progressive Motion.

A Chariot-may-wiser, measuring exactly the length of the way of the Chariot, or Coach to which it is apply’d.

An Instrument for making Screws with great dispatch.

A way of preserving the most exact impression of a Seal, Medal, Sculpture; and that in a Metal harder than Silver.

An Instrument for grinding Optick-glasses: a double Telescope: several excellent Telescopes of divers lengths, of six, twelve, twenty eight, thirty six, sixty foot long, with a convenient Apparatus for the managing of them: and several contrivances in them for measuring the Diameters, and parts of the Planets, and for finding the true position, and distance of the small fixed Stars, and Satellites.

Towards the exactness of all manner of these Optick glasses, the English have got a great advantage of late years, by the Art of making Glass, finer, and more serviceable for Microscopes, and Telescopes, than that of Venice. This Invention was brought into our Coun
try, and practis'd here, by the care, and expence of the Duke of Buckingham; whom the Author of these Papers ought to mention with all honour; both for his Skill and Zeal in advancing such Experimental Studies of which I am writing: and also because it has been by the favour of so great a Patron, that I have injoy'd the leisure, and convenience of composing this History.

As soon as they were reduc'd into a Fix'd Assembly, §.XXXVII one of the Principal Intentions they propos'd to accomplish, was a General Collection of all the Effects of Arts, and the Common, or Monstrous Works of Nature. This they at first began by the casual Presents, which either Strangers, or any of their own Members bestow'd upon them. And in short time it has increas'd so fast, by a contribution from all Parts, and chiefly by the bounty of Mr. Colwall, that they have already drawn together into one Room, the greatest part of all the several kinds of things, that are scatter'd throughout the Universe. The Keeping, and Ranging of these into order, is committed to Mr. Hook, who had also the honour of being made the first Curator of the Royal Society by election. This Repository he has begun to reduce under its several heads, according to the exact Method of the Ranks of all the Species of Nature, which has been compos'd by Doctor Wilkins, and will shortly be publish'd in his Universal Language: A Work wherein this excellent Man has undertaken a Design, that very well fits the temper of his own Mind; for it well became him to teach a Communion of Speech amongst all Philosophers; whose chief study it has always been, to promote a general agreement, and
This Book had sooner seen the light, if part of it had not perish'd in the Fire. Of its use and accurate composition there is no man can doubt, that has ever heard the name of the Author: of whom, if I had not at first restrain'd myself from particular commendations, I might have said very much in his praise, which deserves to be known to all the World, and to be the first Experiment of his own Universal Language.

Having well succeeded in this their purpose of collecting divers patterns of all Natural, and Artificial things: they have also (amongst others) appointed a Committee, whose chief employment shall be to read over whatever Books have been written on such subjects. By this means they hope speedily to observe, and digest into Manuscript volumes, all that has been hitherto try'd, or propounded in such studies. This is the only help that an Experimenter can receive from Books: which he may still use, as his Guides, though not as his Masters. For this end they have begun a Library consisting only of such Authors, as may be serviceable to their Design. To this there has been lately made a great Addition, by the Munificent Gift of Mr. Henry Howard of Norfolk, who has bestow'd on the Society the whole Arundelian Library, containing several hundreds of choice Manuscripts, besides some thousands of other Books of all kinds. And because many of them belong'd to other Professions, this Noble Benefactor has given them with a free permission of changing them for others, that shall be more proper for their Work: Whereby they will shortly be able to shew a compleat Collection of all that has been publish'd
ROYAL SOCIETY.

publish'd in the Antient, or Modern Tongues, which either regards the productions of Nature, or the effects of all Manual Arts.

Nor is this the only bounty which this Illustrious Person has conferred on the Royal Society; since by the firing of London, the first place of their meeting has been restored to its original use, and made an Exchange, he has afforded them a retreat in his own house, where they assemble at present: By which favour he has added a new honour to the antient Nobility of his Race: one of his Ancestors had before adorned that place with many of the best Monuments of Antiquity: And now by entertaining these new discoveries under his Roof, his Family deserves the double praise of having cherish'd both the old, and new Learning; so that now methinks in Arundel house, there is a perfect representation, what the Real Philosophy ought to be: As there we behold new Inventions to flourish amongst the Marbles, and Images of the Dead: so the present Arts, that are now rising, should not aim at the destruction of those that are past, but be content to thrive in their company.

It will not I hope be expected, that I should present my Reader an Index of all the several Writings, which have at any time been publish'd by the Members of the Royal Society. I shall omit those, which either were courses and printed before the beginning of this Institution, or which treat of matters, that have no relation to their Design. Only I will say in general, that there is scarce any Art, or Argument, which has ever been the subject of humane Wit, of which I might not produce Instances, that some Fellows of this Society have given good proofs of their labours in it: of those Discourses,
The HISTORY of the

...which have been since compos'd by some of their Body, or read before their weekly Assemblies, and directly concern the advancement of their Work, these are the principal.

Several Hypotheses explaining the divers Phases and Motions, and other Phanomena of the Comets.

Several Hypotheses of Saturn, and its Satelles.

An Hypothesis of the cause of the Ruggosity of the Moons surface.

An Hypothesis of the motion of the Moon, and of the Sea depending upon it.

An Hypothesis of the Motion of the Planets, and of Circular Motion in general.

Several Hypotheses for the Equation of Time.

A Discourse about the possibility of the Retardation of Celestial Motions, and of their going slower, and slower, the longer they last.

A Discourse of making the several Vibrations of a Pendulum equal, by making the weight of it move in a Cycloid instead of a Circle.

Several Discourses, and Hypotheses about the length of a Pendulum, for moving once in a second of Time.

A Discourse of the most convenient length of a Pendulum, for making a Standard for a universal Measure.

Several Astronomical Discourses of Mr. Horrex retriev'd, and digested for the Press.

Uleg Beg translated, about the places of the six'd Stars, and several other Astronomical Observations.

A Discourse about the possibility of the change of the attractive power of the Earth, and consequently of the variation of the vibrative motion of Pendulums.

A Discourse about short inclining Pendulums, and of other Pendulums counterpois'd above the Center of Motion,
Motion, and of others lying Horizontal in the manner of a Beam. 

An Hypothesis about Fire, and Flame. 

An Hypothesis, and discourse of the gravity, pressure, and spring of the Air. 

A Discourse of an Air Register. 

Several Discourses Mathematical, and Philosophical, upon the Experiment of raising great weights by the Breath. 

A Discourse and Demonstration against a propos'd Method of doubling the Cube, and of finding two mean Proportionals. 

Several Discourses about Thermometers, Hygroscopes, Baroscopes, and other Weather-wisers. 

An Hypothesis and Discourse of the Inflection and inflective veins of the Air, and of the fitness, and unfitness of the Air for Celestial Observations. 

An Hypothesis of the Form, and Spring of the Air. 

A Discourse of the different parts of the same Water, and of the difference of Waters. 

A Discourse and Hypothesis of Filtration, and of the Congruity, and Incongruity of Bodies. 

A Discourse of the possible height of the Air, and of its proportionable rarefaction upwards. 

An Hypothetical Discourse about the suspension of the Clouds, and their pressure. 

An Hypothesis, and Discourse of Earthquakes. 

A Discourse of Petrifications, and an Hypothesis for explaining the several varieties of such Bodies. 

Several Discourses about the Leadstone, and an Hypothesis for salving its appearances. 

A Discourse about the Pores of Stones. 

A Discourse about Eggs. 

A Discourse concerning the Glass-drops.
The HISTORY of the

A Discourse and Hypothese of annealing, and tempering Steel.
Discourses about Cyder, and Coffee.
A Discourse of the original of Forms.
An Hypothese of Light.
A Discourse and Hypothese of the Nature and Proprieties of Colours.
A Discourse about improving Wood for Dying, and for fixing Colours.
A Discourse about the improvement of Musick.
A Discourse of the differing Heat of Summer, and Winter:
A Discourse, and Hypothese about Fluidity.
Discourses upon several Mercurial Experiments.
Discourses of Hydrostaticks.
Discourses about the force of falling Bodies.
A Treatise of the motion of the Muscles.
A Discourse of the usefulness of Experimental Philosophy.
A Treatise of the vanity of Dogmatizing.
The Sceptical Chymist.
Essayes about Salt-peter.
The Parallel of the Antient, and Modern Architecture.
Microscopical Observations.
Micrographia, or a Discourse of things discover'd by a Microscope.

Three Books of Feavers, of the Brain, and of the Scurvy, which I will alledge as the great Instances of this head: Wherein the Famous Author has with accurate diligence made prodigious improvements in all the parts of Physick, and shewn that the largeness of his Knowledge in it, is equal to the happy success of his practice.

In
In this Collection of their Discourses, and Treatises, my Reader beholding so many to pass under the name of Hypotheses, may perhaps imagine that this consists not so well with their Method, and with the main purpose of their Studies, which I have often repeated to be chiefly bent upon the Operative, rather than the Theoretical Philosophy. But I hope he will be satisfied, if he shall remember, that I have already removed this doubt, by affirming, that whatever Principles, and Speculations they now raise from things, they do not rely upon them as the absolute end, but only use them as a means of farther Knowledge. This way the most speculative Notions, and Theorems that can be drawn from matter, may conduce to much profit. The light of Science, and Doctrines of causes, may serve exceeding well to promote our Experimenting; but they would rather obscure, than illuminate the mind, if we should only make them the perpetual Objects of our Contemplation: as we see the light of the Sun, is most beneficial to direct our footsteps in walking, and our hands in working, which would certainly make us blind, if we should only continue fix'd, and gazing on its Beams.

The Histories they have gather'd are either of Nature, Arts, or Works. These they have begun to collect by the plainest Method, and from the plainest Information. They have fetched their Intelligence from the constant and unerring use of experienced Men of the most unaffected, and most unartificial kinds of life. They have already perform'd much in this way, and more they can promise the world to accomplish in a very short space of Time. There are already brought in to them the History of
of Comets in general, and especially of the two last: The History of English Mines, and Oars: and particularly two several Histories of Tinneries and Tin-working.


The two last of these were communicated to the Royal Society by the favour of Prince Rupert: whom I take the boldness to mention here, for his excellent knowledge, and use in all manner of Mechanical Operations.
Operations. But his name will be recorded in all the Histories of this time, for greater works, for many glorious Enterprizes by Sea and Land, and for the Immutable Benefits whereby he has oblig'd the English Nation.

The Instances that I shall give of this their manner of collecting Histories, shall be of Works, that of Saltpeter, of Arts, that of Dying, of Nature, that of Oysters: which last may perhaps seem a subject too mean to be particularly alledg'd; but to me it appears worthy to be produc'd. For though the British Oysters have been famous in the World, ever since this Island was discover'd, yet the skill how to order them aright, has been so little consider'd amongst our selves, that we see at this day, it is confin'd to some few narrow Creeks of one single County.
Whether the Nitre of the Antients be of the same species with the Salt which is commonly known by the name of Salt-peter, is variously disputed by very learned Authors amongst the modern Physitians: on the negative side are Matthiolus and Bellonius; the latter of which had the advantage, by the opportunity of his travels in Egypt, to have often seen and handled them both, and is so positive as to pronounce, that in all Christendom there is not one grain of Nitre to be found, unless it be brought from other parts, although at the time of his being in Grand Cairo (which was about the year 1550.) it was so common there (as he fayes) that ten pounds of it would not cost a Moidin. Among those that hold the affirmative, the most eminent are Cardan and Longius; and it should seem the general vote of Learned men hath been most favourable to that Opinion, by reason that in all Latine Relations and Prescriptions, the word Nitrum or Halinitrum is most commonly used for Salt-peter.
"I have often enquired amongst our London Drugsters for Egyptian Nitre, and if I had been so fortunate as to have found any, I doubt not but I should have been able to have put an end to that Question by a Demonstration; that is, by turning the greatest part of it into salt-peter. However, the Observations I have made in my own private Experiments, and in the practice of salt-peter-men and Refiners of salt-peter, seem to give me sufficient ground to suspect, that the confidence of those, who hold them to be several Salts, proceedeth chiefly from their being unacquainted with the various varieties of salt-peter in the making and refining of it: and also their comparing double refined salt-peter (of which Gunpowder is made) with that description of Nitrum and Aphronitrum in the tenth chapter of the one and thirtieth Book of Pliny's Natural History (the only tolerable account of that Salt that hath been handed to us from Antiquity) where he tells us, That Aphronitrum was colore penè purpureâ, and Egyptian Nitre fusum & Lapidosum, adding afterward, sunt ibi Nitariae in quibus rufum exit a colore terrae, which is sufficient to have hinted to any one but moderately versed in the modern way of ordering salt-peter, that the Antients were not at all skilled in refining their Nitre from the Earth and common Salt that is usually mingled with it, nor from that foul yellow Oyl, which, it seems, did accompany their Nitre, as well as it doth our salt-peter, in great abundance; for Pliny takes notice of it, when he mentions the removing the Nitre (after it is grain-ed) out of the Nitariae, saying, Hic quoque naturæ olei intervenit, ad scabiem animalium utilis: And indeed
indeed this greasie Oyl (which the Workmen call "Mother of Salt-peter", and perhaps is but the crude and unripe part of it) doth by nature so wonder-fully adhere to every part else of the Peter (it may be ordained for the nutriment and augmentation of it) that the separation of it is the sole cause of the great charge and labour that is required to the refining of Peter: otherwise the Peter will be yellow, or brown, or some other dark colour. And Scaliger in his 104. Exercit. sect. 15, saith, Sublimis purpure qua splendor quidam in salis-peter-terris sepulcro esto nobis observatus; and he that shall Boyle a Lixivium past through a Salt-peter-earth, up to a consiulence, without filtering it through ashes, or giving the Salt leave to Chrystandize, may perhaps find something not unlike the Nitre of the Antients.

To make this doubt yet clearer, it will require your patience to observe a few short remains out of the same Pliny, concerning the production of Nitre; faith he, Exiguum Nitri fit apud Medos, candescenti-bus siccitate convallibus quod vocant Hakmirbaga: minus etiam in Thracia juxta Philippopolis Jordidum Terra quod appellant Agrium.

This agrees very exactly with what I have been informed of by a Refiner of Salt-peter, that near Sophia, Santa-Cruz, and several other places in Barbary, he hath seen Salt-peter shoot out of the ground (as thick and white as a hoar frost) on many barren and desert Lands; only he adds, that this happens not till the beginning of the rains in August, or September; and that it is the falling of the fresh-water that causes the Salt-peter to shoot out into little Chrystals; and that the people of the Coun-
try do no more but take it off the ground as clean as they can, and sell it to Merchant-Strangers. This is, says he, the Barbary Peter, which the Refiners buy commonly at twenty shillings per Cent.

Much after the same manner (by the relation of an India Merchant) is that great quantity of Peter produced, which of late years hath been brought into England, and other parts of Christendom, from about Pegu in East-India, saving that the Natives do refine it once, before they sell it to the Merchants: But being not so skilful, to discharge it from the common Salt, which attends Peter, our Workmen do refine it again, before it be fit for Gun-powder.

The next remarque out of Pliny is, Aquæ vero Nitrofa pluribus in locis reperientur, sed fine viribus Denfandi (he means by the heat of the Sun in those places) Optimum Copiosumque in Clytis Macedoniae quod vocant Chalastricum candidum, purumque proximum sali. Lacus est Nitrosis, exiliente et medio dulci fonticulote, ibi sit Nitreum circa Canis ortum, novem diem, totidemque cessat, &ursus innatat & deinde cessat, ita autem diebus quibus sigillum sed tuere imbris salis Nitrum faciunt, Aquilones deterius quia Vali- dium commovent limum. In Egypto autem consici-
tur multi abundantissimae sed deterius nam fuscum lapi-
dosumque est, fit penes eodem modo quo Sal: nisi quod Salinis mare infusioni, Nilum autem Ni-
traris.

How such great plenty of Nitre should be found in the Waters above mention'd will be no difficulty to conjecture, if we consider that Lakes are the receptacles of Land floods, and that great Rains may easily bring it to the Lake in Macedonia, from the higher
higher parts in the Country about it. And for the
River Nile, there must needs be less scruple con-
cerning it, if we call to mind that once in a year, it
sweeps with an impetuous overflow the burnt and
barren Deserts of Africa under the Torrid Zone;
where, by the relation of Travellers, those Sands
are visibly full of Nitre, and those few Springs and
Wells that are to be found there, are by that rea-
son so bitter, that the Mores and their Camels are
forced to make a hard shift with them in their long
journeys.

But when he comes to describe the Aphronitrum,
he comes more home, both to the name and nature
of our Salt-peter, in these words, Proxima etas Me-
dicorum tradidit, Aphronitrum in Asia Coliigit in
Spelunca & molibus distillans, dein sole siccat. And
Scaliger speaking of Salt-peter, says, Est quaedam
Natri specie inhaerens Rupibus, in quibus insolatur, ac
propterea Salpetra dicitur. And I my self, for my
own satisfaction in the point, have drawn very
good Rock peters out of those Stiria, which are
usually found hanging like Icycles in Arched-cel-
lars and Vaults; and have been told, that a Phy-
sitian in Shropshire did perform great Cures by ver-
tue of Sal-prunella, which he made only of Flower
of Brimstone and those Stiria.

But to steer more directly upon our immediate
subject, Salt-peter, though it be likely, that the Air
is everywhere full of a volatile kind of Nitre,
which is frequently to be seen coagulated into fine
white Salt, like Flower of Wheat (but by the ve-
ry taste may be easily known to be Peter) sticking
to the sides of Plastered-walls, and in Brick-walls
to the Mortar between the Bricks, (in dry wea-
ther,
ther, or where the wall is defended from the rain;) for Lime doth strongly attract it; though Dew and Rain do convey much of it to the Earth, and the Clouds seem to be spread out before the face of the Sun, either to imbibe some part of his influence, or to have a Salt generated in them, for to advance the fertility of the Earth, and certainly they return not without a blessing; for I have more than once extracted salt peter out of Rain and Dew, but from the latter more plentifully, and yet even there, is salt-peter accompanied with a greasy purple Oyl, in great plenty: Though (as I have found upon trial) that most standing waters, and even deep Wells have some small quantity of salt-peter in them; though the face of the Earth, if it were not impregnated with this Salt, could not produce Vegetables; for Salt (as the Lord Bacon sayes) is the first Rudiment of Life; and Nitre is as it were the life of Vegetables: Yet to be more sure of it, I made Experiment likewise there too, and found some little of it in fallows, and the Earth which Moles cast up in the Spring: Though I say the Air and Water want it not, yet is it not there to be had in any proportion, answerable to the charge in getting it: And though the Earth must necessarily have great quantities thereof, generated or infused into it; yet in these temperate Countreys of Europe, it is no sooner dilated by Rain-water, or the Moisture of the Earth, but it is immediately applied to the production or nutriment of some Plant, Insect, Stone, or Mineral; so that the Artist will find as little of it here to serve his turn, as in the other two Elements.

The only place therefore, where salt-peter is to be
be found in these Northern Countries, is in Stables, Pigeon-houses, Cellars, Barns, Ware-houses, or indeed any place, which is covered from the Rain, which would dissolve it, and (as I have said) make it vegetate; as also from the Sun, which doth rarifie it, and cause it to be exhaled into the Air; (For the same reason Husbandmen also might make double or treble the profit they usually do of their Muck, if they would lay it up under a Hovel, or some covered place, until they carry it out upon their Land.) And I have been told by an experienced Workman, that no place yields Peter so plentifully, as the Earth in Churches, were it not an impiety to disturb the Ashes of our Ancestours, in that sacred Depository.

Provided always, that the Earth be of good mould, and the better the mould is, the more Peter is produc'd, for in Clay or sandy Earth, little or none is to be found: The freer ingress the Air hath into a place, is still of more advantage, so that the Sun be excluded: And let the Earth be never so good, if it be laid on a brick or boarded floor, it will not be so rich in Peter, as if it have free communication with the Exhalations of the lower parts of the Earth.

In any place thus qualified, you cannot miss of good quantities of Peter, if it have not been drawn out in some years before; which a Workman will quickly find, after he hath digged the first spadeful of Earth, by laying a little of it on the end of his tongue, and if it taste bitter, he is sure of good store of mineral, (as they love to call it,) that is, saltpeter; if the Ground be good, it continues rich, to six or eight foot deep, and sometimes, but not often, to ten.
"After the salt-peter is extracted, if the Earth be laid wet into the same place again, it will be twenty years ere any considerable quantity grow there of it; but if the Earth be well dried, it will come in twelve or fourteen: and if they mingle, with the dried Earth store of Pigeons-dung, and mellow Horse-dung, and then temper it with Urine (as was usual before we were supplied with Peter from India) it will be fit to dig again in five or six years. He that shall cast Water upon a Ground fit to dig for Peter, will only sink the Mineral deeper into the Earth; but he that throws Soap-suds on it, will quite destroy the Peter, (as the Workmen have a Tradition) and it very well deserves a further Enquiry.

That salt-peter, and the way of drawing it out of the Earth, now in use, was a modern Invention, is generally concluded by all Authors; but whether we owe it to chance, or the sagacity of some great Wit, is as unknown, as the time when it was first discovered.

It seems to have many years preceded the Invention of Gunpowder, which by the Germans is ascribed to Constantine Aulitzer, or Berthold Schwertz, a Monk of Friburgh, and was, in all probability, not long discovered, when the Inventor (as Polydore Virgil tells us) taught the use of Guns, to the Venetians, at the Battel of Fossa Claudia, when they obtained that notable Victory over the Genoueses, Anno 1380. For there is mention made, both of Salt-peter and Aqua fortis, in the Writings of Geber, a Spanish More, and an Alchymist; but at what time he lived is unknown, though it be certain, some hundreds of years before Raimund Lully, who a-
bount the year 1333. published some of his Books, wherein he treats of Salt-peter and Aqua fortis. It is no ill conjecture of Maierius, that the foresaid Monk, being a skilful Alchymist, had a design to draw a higher Spirit from Peter than the common Aqua fortis, and that he might better open the body of Peter, he ground it with Sulphur and Charcoal, by which Composition he soon became the Inventour of Gun-powder.

**The manner of making SALTPETER.**

In the first place you must be provided of eight or ten Tubs, so large, that they may be able to contain about ten Barrows full of Earth, each of them. These Tubs must be all open at the top; but in the bottom of every one of them, you must make a hole near to that side you intend to place outermost, which hole you must fit very well with a Tap and Spigot on the outside downward. On the inside of the Tub, near the tap-hole, you must carefully place a large wad of straw, and upon that a short piece of board, which is all to keep the earth from stopping up the tap-hole. When you have placed your Tubs on their stands, at such a distance one from the other, that you may come with ease between them, then fill them up with such Peter-earth as you have chosen for your work, leaving only void about a spans breadth between the Earth and the edge of the Tub; then lay on the top of
the Earth in each Tub, as near as you can to the 
middle, a rundle of Wicker, like the bottom of a 
Basket, and about a foot in diameter, and by it stick 
into the earth a good strong Cudgel, which must 
be thrust pretty near the bottom; the Wicker is to 
keep the Water, when it is poured on, from hollow-
ing and disordering the Earth, and the Cudgel is 
to be stirred about, to give the Water ingress to the 
Earth upon occasion: Then pour on your Earth 
common cold Water, till it stand a hand’s breadth 
over the Earth: When it hath stood eight or ten 
hours loosen the Spigots, and let the Water rather 
dribble, than run into half Tubs, which must be set 
under the taps: This Lixivium the Workmen call 
their Raw-liquor; and note that if it come not 
clear at the first drawing, you must pour it on again, 
and after some little time draw it off, till it come 
clear, and of the colour of Urine.

If you are curious to know how rich your Li-
quor is before boiling, you may take a Glass-vial, 
containing a quart, fill it with the common Water 
you use, then weigh it exactly; next fill the same 
Glass with your Liquor, and find the difference of 
weight, which compared with the quantity of all 
your Liquors, will give you a very near guess, how 
much salt-peter you are like to make by that boil-
ing.

Then pour on again, on the same Earth, more 
common Water, that it may bring away what is re-
maining in the Earth of the former Liquor. This 
second Liquor is of no other use, but to be 
poured on new Earth, instead of common Was-
ter, because it contains some quantity of salt-peter 
in it.

When
"When this is done, turn out the useless insipid Earth out of the Tubs, which you must fill with new Earth, and continue this Operation, till you have in the same manner lixiviated all the Earth: Then fill your Copper with your Liquor, which Copper, for one of the Profession, must be about two hundred weight, and set strongly in a Furnace of brick-work; besides, on one side of your Furnace, you are to place a Tub full of your Liquor, which at a tap below may dribble as fast into the Copper, as the force of the Fire doth waft your Liquor, which Invention is only to save charges in Fewel. When you have boyled it up to that height, that a little of it, flirted off the finger on a live Charcoal, will flash like Gun-powder (which for the most part falls out to be after two dayes and a nights boyling) at what time, upon tryal, a hundred weight of the Liquor contains about five and thirty pound weight of Peter. But the Workmen seldom make use of any further indication, than by finding the Liquor hang like oyl on the sides of the Brasen-scummer, when 'tis dipped into it, which is a sign it is fit to be passed through the Ashes, which is done in this manner.

"You must prepare two Tubs fitted after the manner of the first, where you put your Earth, saving that at the bottom of these Tubs, you must lay Reeds or Straw a foot high, over them place loole boards, pretty near one another, over them, a little more Straw (which is to keep the Ashes from the top, and to give the Liquor room to drein the better from them:) Then fill up your Tubs with any sort of Wood-ashes to half a foot of the top; Then pour on the foresaid Liquor, as it comes scal-
ding hot out of the Copper, on the Ashes contain-
ed in the first Tub; then after a while draw it off
at the top; and so continue putting on and draw-
ing off, first at one Tub of Ashes, then at the other,
till your Liquor grow clear, and lose the thick tur-
bid colour it had when it went on.

When all the Liquour hath in this manner past
through the Ashes of both Tubs, that by this means
all its greasie oyl is left behind in the Ashes, you
must keep it for the second boyling in a vessel by it
self: in the mean time pour upon your Ashes a suffi-
cient quantity of common Water very hot, once or
twice, to bring away what is remaining of the Li-
quor in the Ashes.

When you begin the second boyling, put first
into the Copper the Water that went last through
your Ashes, and as that waiteth, let your strong Li-
quor drop into the Copper, out of the Tub above
described, standing on the side of the Furnace, till
the Liquor in the Copper be ready to shoot or
chrystallise.

Note that toward the end of your boyling,
there will arise great store of Scum and Froth,
which must be carefully taken off with a great brass
Scummer, made like a Ladle, full of little holes, and
usually about that time it lets fall some common Salt
to the bottom, which you must take up with the
said Scummer, and lay it aside for another use.

To know when the Liquor is ready to shoot into
Peter, you need but drop a little of it on a knife, or
any other cold thing that hath a smooth superfi-
cies, and if it coagulate, like a drop of tallow, and
do not fall off the knife when it is turned down-
ward, which also may be judged by its hanging like
oyl.
"Oyl to the sides of the Scummer. When the Liquor
is brought to this pass, every hundred weight of it
containeth about threescore and ten pound weight
of Peter.

"When you find your Liquor thus ready to shoot,
you must with great Iron Ladles lade it out of the
Copper into a high narrow Tub for that purpose,
which the Workmen call their settling Tub; and
when the Liquor is grown so cool, that you can en-
dure your finger in it, you shall find the common or
cubick Salt begin to gravulate and stick to the sides
of the Tub, then at the tap, placed about half a
foot from the bottom, draw off your Liquor into
deep wooden Trays, or Brass-pans, and the cooler
the place is where you let them stand to shoot in,
the better and more plentifully will the Salt-peter,
be produc'd; but it will be of no good colour till
it be refined, but will be part white, part yellow,
and some part of it blackish.

"The Salt which sticketh to the sides and bottom
of the settling Tub is (as I have sayd) of the na-
ture of common Salt; and there is scarce any Peter
to be found but is accompanied with it, though no
doubt some of this is drawn out of the Ashes by the
second Liquors: If it be foul they refine it by it
self, and about London sell it at good rates to those
that sell Neats Tongues, Bacon, and Collar-Beef,
for besides a savoury taste, it gives a pleasing red co-
lour to most Flesh that is salted with it. Pliny sayes
Nitrum obsonia alba & deteriora reddit Olera viri-
diora, whether Salt-peter doth so, I have not yet
tried.

"When the Liquor hath stood two dayes and two
nights in the Pans, that part of the Liquor which is
not
ROYAL SOCIETY.

not coagulated but swims upon the Peter, must be carefully poured off, and being mingled with new Liquors must again pass the Athes before it be boil-ed, else it will grow so greasy it will never generate any Salt.

To Refine

SALT-PETER.

After you have made your Copper very clean, put in as much Water as you think will dissolve that quantity of Peter you purpose to Refine, when the Water is very hot cast in the Peter by little and little, stirring it about with a Ladle, that it may the sooner dissolve, then increase the Fire till your Liquor begin to boyle: In the mean time feel with the Scummer, whether there be at the bottom any Salt undisolved and take it out, for it is Common-Salt, and doth not so soon dissolve as the Peter; then as the Water boils scim of the Froth that swims at the top of it as fast as it riseth; when it hath boil-ed to the height that a drop of it will coagu-late on a Plate, (as hath been said above in the making of Salt-Peter,) then cast in by degrees either a Pint of the strongest Wine-Vinegar, or else four Ounces of Allom beaten to powder (some choose burnt Allom,) and you shall observe a black Scum to rise on the top of the Liquor, which when you have allowed some time to thicken, you may easily take off with the Scummer; repeat this so often till no more Scum arises. Some do use to throw in a Shovel full of quick-Lime, and say it makes Peter
the whiter, and Rock the better; you must take
great care all this while the Fire be not too strong,
for while this is doing, the Liquor will be apt to
boyl over, and will not easily be appeased without
your great los.
When this is done, lade out the Liquor into a
settling Tub, and cover it over with a Cloth, that it
cool not too soon, and within an hour or two a
thick yellow Faces will fall to the bottom of the
Tub, then quickly draw of the Liquor while it is
hot, into the shooting Trays or Pans, and do as you
did in making Peter, laying that you must cover the
Trays with a Cloth, for then the Liquor will begin
to shoot at the bottom, which will make the Peter-
Rock into much fairer Chrystals, than otherwise it
would: When no more Peter will shoot (which is
commonly after two days,) pour off the Liquor
that swims at the top, and put the Peter into a Tub
with a hole at the bottom for to drain, and when
it is dry, it is fit for use.
The Figure of the Chrystals is Sexangular, and
if it hath rightly shot, is fistulous and hollow like a
Pipe.
Before I proceed to tell you, how this darling
of Nature (the very Basis and Generation of Nu-
triment) is converted into Gun-powder (the most
fatal Instrument of Death that ever Mankind was
trueted withal) I will crave leave to acquaint you
with a few Speculations I have of this Salt, which
if I could clearly make out, would lead us into
the knowledge of many noble Secrets in Nature;
as also to a great improvement in the Art of ma-
king Salt-Peter.
First then you are to observe, that though Peter
go alway in Gun-powder, yet if you fulminate it in a Crucible, and burn of the volatile part with Powder of Coal, Brimstone, Antimony or Meal, there will remain a Salt, and yet so fixed (very unlike Common-Salt) that it will endure the force of almost the strongest Fire you can give it; which being dissolved into Water and Spirit of Nitre dropped into it, till it give over hissing (which is the same with the Volatile part that was seperated from it in the fulmination) it will be again reduced to Chrystals of Peter, as it was at first, which noble Experiment the World hath already been taught by an honourable Member of this Society; with a train of such important Observations, as never before were raised from one Experiment.

That which I aim at then is, that if the Spirit of the Volatile Salt of Soot, or of the Urine, Blood, Horns, Hoofs, Hair, Excrements, or indeed any part of Animals, (for all abound with such a Volatile Salt fixed, and Oyle as Peter doth) could by the same way or any like it, be reduced to Peter or some Nitrous Salt not much differing from it: It would excellently make out a Theory that I am much delighted with, till I am convinced in it; which is, that the Salt which is found in Vegetables and Animals, is but the Nitre which is so universally diffused through all the Elements, (and must therefore make a chief Ingredient in their Nutrition, and by consequence of their Generation) a little altered from its first Complexion: And that the reason why Animals that feed on Vegetables are obliged by Nature, to longer meals than those that feed on other Animals, is, because Animals are fuller of that Salt than Vegetables: And in-
deed such Animals are but Caterers of it for Man; and others whom Natures bounty gratifies with a more lusty and delicious Dyet.

I confess I have been the more confirmed in this fancy, since I have often seen a Friend of mine, with a Natural and Facile method, convert the greater part of Peter into a Salt so like the Volatile Salt of Urine, that they are Scarce to be distinguished by smell or taste, and yet he adds nothing to it that can possibly be suspected to participate of that Nature: But indeed all Volatile Salts are so alike, that it is not easy to distinguish them in any respect.
THE HISTORY
Of Making
GUN-POWDER.

"The materials of Gun-Powder are, Salt-Peter, Brimstone, and Coal; the Peter and Brimstone must be both refined if you mean to make good Powder, and the Coal must be Withy and Alder equal parts; for Withy alone is counted too soft, and some do commend Hazle alone to be as good as the other two.

"The whole Secret of the Art consists in the proportion of the Materials, the exact mixture of them, that in every the least part of Powder may be found all the Materials in their just proportion; then the Corning or making of it into Grains; and lastly the Drying and Dusting of it.

"The Proportion is very differently set down by several Authors; Baptista Porta tells us the ordinary Powder is made of Four parts of Peter, one of Sulphur, and one of Withy Coal: But the best Powder of 6, or 8, of Peter, and one a piece of the other, which agrees pretty well with Bonsadini a late Italian Writer, in his Book of the Art of Shooting flying, where to make the best Gun-Powder he prescribes Seven parts of Peter, one of Brimstone, and of Hazle Coal an ounce less in every pound: Cardan says; Constat ex tribus Halinietri partibus, duabus Saligni.
“Saligni Carbonis atque una Sulphuris, Convenitque
magnis Machinis: Sed Mediocribus Halinitri partes
decem, Saligni carbonis tres, Sulphuris duas, par-
vis verò Halinitri partes decem; Carbonis ligni una
Avellone fine nodis, tum Sulphuris partem unam sin-
gularem: Langius appoints three of Peter, two of
Withy Coal, and one of Brimstone: The English
Author of Fire-Works says, that the proportions
in England to make good, indifferent, and ordinary
Powder is, 5.4. and 3. parts of Peter, to two of Coal
and one of Brimstone. Our English Workmen are
generally so curious of their secret, that I could not
obtain the proportion of them without a promise of
Secrecy: But when all is done their secret is not so
much the way to make the best Powder, as the
best way to get most money by it; by subtracting
from the Peter, and making up weight with the
Coal; when indeed there is so great a Latitude,
that provided the Materials be perfectly mixt, you
make good Powder with any of the proportions a-
bove mention'd; but the more Peter you allow it,
it will still be the better, till you come to observe
Eight parts.

The next thing after the proportion, is the mix-
ture, about which most of the Workmen's time and
pains is bestowed: For first in a Horse-mill with
two stones (like that with which they grind their
Materials at the Glass-house) moving upon a Mar-
ble bottom, which is edged with boards set float-
ing, that what slips from under the stones may slide
back again.

They grind the Brimstone and Coal each of them
apart by themselves as fine as possibly they can;
then they sift each of them apart by themselves:
The Brimstone is sifted thoro'w Tiffany in a Bolt-ing-mill, such as the Bakers use for wheat-flower. The Coal is sifted thoro'w Lockram, in a bag made like a shirt sleeve; for the convenience of the Work-man it is done in a close Bin, with only two holes for him to put his arms in and shake the bag about. Whatsoever of each material is not small enough to sift thoro'w, is brought again to the Mill to be new ground.

As for the Peter, that must in the Copper be dissolved as much water as will just take it up, and then the water must be boiled away till the Peter comes to the thickness of hasty-pudding. The reason of this operation is, because when the Peter is thus soft, the other materials will the easilier incorporate with it, and in the next place it will not wear the wooden pestles so much when it comes to the Mill, as when it is hard and dry.

When the Materials are in this readiness, they are weighed (only the Peter is weighed before it is put to dissolve in the Copper) and by proportion are carried to the mingling Trough, which is made of boards, like a great Chest without a cover, being about eight foot long, four broad, and three foot high. The Coal is laid in first, the Brimstone next, and the Peter at top of all; Then two men with shovels stir and mingle them together for an hour, and then 'tis ready for the Mill.

The Powder-mills are seldom made to move with anything but water: The great water-wheel is made like that of an ordinary water-wheel, either over-shot or under-shot, according to the quantity of water they have: to the axis of this wheel, a little way within the Mill, is fastned a
The HISTORY of the

"lesser wheel called the Spar-wheel, with strong
"Cogs, which in their motion round take hold of
"the round flaves of another wheel of about the
"same diameter, set a little way above it, and fastned
"to the end of a beam of 15 or 16 foot long, laid
"parallel to the Horizon, with an iron gudgeon at
"the other end of it, to facilitate its motion round:
"This beam is called the round beam; out of it
"come a certain number of arms of about nine inch-
es long, and three inches broad, which in their go-
ing round meet with other lesser arms (called
"Tapes) coming out of the Pestles (for so they call
"certain small quarters of Timber placed perpendi-
cular to the Horizon, about nine foot long and four
"inches broad; they are set in a slight frame to keep
"them steady); by these small arms the Pestles are
"lifted up about two foot and a half, and then let
"fall into a strong wooden Trough set under them,
"wherein the powder is put to be pounded.

"Every Mill hath two Troughs, and about sixteen
"Pestles: every Pestle hath fastned to the lower end
"of it a round piece of Lignum Vite, of about five
"inches long and three and a half diameter; and in-
to the bottom of the Trough, just where the Pestle
"is to fall, is let in another piece of Lignum Vite, of
"the fashion and bigness of an ordinary Bowl,
"split according to its longest diameter: The Pestles
"are not lifted up all together, but alternatively, to
"make the Powder turn the better in the working;
"and for the same reason round Troughs are counted
"better than Square.

"To make excellent Powder it ought to be
"wrought thus thirty hours; but of late they will
"not afford it above eighteen or twenty hours: once
"in
in eight hours they use to moisten the Powder with a little fair water; others who are more curious, put water something thickened with quick-lime; others use White-wine Vinegar; others Aqua-vite.

But if it be not moistned with something once in eight hours, the Powder will grow dry, and in half an hour after it will take fire. As soon as the Powder grows dry, you may find it, though at a distance, by the noise of the Mill; for then the Pestles will rebound from the bottom of the Trough and make a double stroke. The only danger to the Mill is not from the Trough; for many times the iron Gudgeons grow hot for want of greasing, and then the dust that flies about will be apt to fire, and so the Mill blows up.

From the Mill the Powder is brought to the Corning-house, of a middle temper between moist and dry. The way of corning it is with two hair Sieves joyn'd together, the upper Sieve inclosing some part of the hoop of the lower Sieve: The upper Sieve hath holes of the size you will have the Powder grained at; the holes of the lower Sieve are much lesser: The upper Sieve they call their corning Sieve, the lower their wet Dustier. They lay the Powder upon the upper Sieve some two inches thick; upon that a piece of heavy wood made like a Trencher, of about eight inches diameter and two and a half in thickness, called a Runner, which when the Sieve is moved, by its weight and motion forces the Powder thorow the upper Sieve, and that corns it. Then the lower Sieve receives the Powder, and lets the dust go thorow into a Bin, over which the Sieve is shaken, called the Dusting-Bin.
“When the Powder is thus corned, it is laid about an inch and half thick on the drying Sieves, which are made of course Canvas fastned to light frames of Deal about an ell long and some twenty inches broad; and thus it is carried into Stoves to dry.

“The Stove is commonly a little Room about eighteen or twenty foot square, with ranges of small Firr poles about two foot one above another, to lay the drying Sieves upon, but only on that side the fire is made. Besides a glass window to give light, there must be a small lower hole at the top of the Room, to let out the steam, else the Powder will not only be the longer a drying, but often by the return of the steam on the Sieves, the top of the Powder will be so crusted that the lower part will not dry. The Rome is heated by an Iron of about a yard high and half a yard broad, cast in the form of an Arch equal to a Semy-quadrant, and placed in the back of a Chimney, the fore part whereof is like a Furnace; and to avoid danger, opens into another little Room apart called the Stoke-hole.

“The Powder is brought into the Stove before it be heated, and is not taken out again till the Stove be cold; and about eight hours is required to the drying of it. In hot Countries the Sun is the best Stove, and a great deal of danger and charges that way avoided.

“After the Powder is dried, it is brought again to the Corning-house, where it is again sifted over the dusting Bin in other double Sieves, but without any Runners. These Sieves have both of them smaller holes than the former: The upper Sieve is called the Separater, and serves to divide the great corns
corns from the lesser; the great corns are put by themselves, and serve for Cannon Powder: The lower Sieve is called the dry Duster, and retains the small corns (which serve for Musquet and Pistol) and lets fall the dust into the bin, which is to be mingled with fresh Materials, and again wrought over in the Mill.

So that good Powder differs from bad (besides the well working and mingling of the Materials) in having more Peter and less Coal; and lastly, in the well dusting of it.

The last work is to put the Powder into Barrels; every Barrel is to contain five score weight of Powder, and then 'tis ready for sale.
The HISTORY of the

AN APPARATUS TO THE

HISTORY

Of the Common Practices of

DYING.

By Sir WILLIAM PETTIT.

"IT were not incongruous to begin the History
with a Retrospect into the very nature of
Light itself (as to inquire whether the same
be a Motion or else a Body, nor to premise some
Theorems about the Sun, Flame, Glow-worms,
the eyes of some Animals, shining Woods, Scales
of some Fishes, the dashing of the Sea, stroaks
upon the eyes, the Bolonian Slate (called by some
the Magnet of Light) and of other light and lucid
bodies.

"It were also not improper to consider the very
essentials of Colour and Transparencies (as that the
most transparent bodies, if shaped into many ang
gles, present the eye with very many colours;)
That bodies having but one single superficies, have
none at all, but are sufficient of every colour laid
before
before them; That great depths of Air make a Blew, and great depths of Water a Greenish colour; That great depths or thicknesses of coloured Liquors do all look Blackish (red Wine in a large Conical Glass being of all reddish colours between black at the top and white at the bottom.)

That most Vegetables, at one time or other, are greenish; and that as many things passing the Sun are blackened, so many others much whitened by the same: Other things are whitened by acid Fumes, as red Roses and raw Silks by the smock of Brimstone.

Many Mettals, as Steel and Silver, become of various colours and Tarnish by the air, and by several degrees of heat.

We might consider the wonderful variety of colours appearing in Flowers, Feathers, and drawn from Mettals, their Calces and Vitrifications; and of the colours rising out of transparent Liquors artificially mixed.

But these things, relating to the abstracted nature of colours, being too hard for me, I wholly decline; rather passing to name (and but to name) some of the several sorts of Colorations now commonly used in Humane affairs, and as vulgar Trades in these Nations; which are these: viz.

1. "There is a whitening of Wax, and several sort of Linen and Cotton Cloathes, by the Sun, Air, and by reciprocal effusions of Water.


The HISTORY of the

distempering the colours with Ox-gall, and applying them upon a stiff gummed Liquor.

4. "Colouring, or rather Discolouring the colours of Silks, Tiffanies, &c. by Brimstone.

5. "Colouring of several Iron and Copper work, into Black, with Oyl.

6. "Colouring of Leather into Gold-colour, or rather Silver leaves into Gold by Varnishes, and in other cases by Urine and Sulphur.

7. "Dying of Marble and Alabaster with heat and coloured Oyls.

8. "Colouring Silver into Brass with Brimstone or Urine.


10. "Colouring of Glass (made of Sands, Flints, &c.) as also of Crystals and Earthen Ware, with the rusts and solutions of Metals.

11. "The colouring of live Hair, as in Poland, Horse and Mans Hair; as also the colouring of Furrs.


13. "Applying Colours as in the Printing of Books and Pictures, and as in making of playing Cards; being each of them performed in a several way.


15. "Colouring Metals, as Copper with Calamy into Brass, and with Zink or Spelter into Gold, or into Silver with Arsenick; And of Iron into Copper with Hungarian Vitriol.

16. "Making Painters Colours by preparing of Earth,
ROYAL SOCIETY.

Earth, Chalk, and Slates; as in Umber, Oker, Calen-earth, &c. as also out of the Calces of Lead, as Ceruse and Minium; by Sublimates of Mercury and Brimstone, as in Vermilion; by tinging of white Earths variously, as in Verdeter, and some of the Lakes; by concrete Juyces or Facula, as in Gambrugium, Indico, Pinks, Sap-green, and Lakes: As also by Rufts, as in Verdegrease, &c.

17. The applying of these colours by the adhesion of Ox-gall, as in the Marbled Paper aforesaid; or by Gum water, as in Limning; or by clammy drying Oyls, (such as are the Oyls of Linseed, Nuts, Spike, Turpentine, &c.)

18. Watering of Tabbies.

19. The last I shall name is the colouring of Wool, Linnen, Cotton, Silk, Hair, Feathers, Horn, Leather, and the Threads and Webs of them with Woods, Roots, Herbs, Seeds, Leaves, Salts, Limes, Lixiviunums, Waters, Heats, Fermentations, Macerations, and other great variety of Handling: An account of all which is that History of Dying we intend. All that we have hitherto said being but a kind of remote and scarce pertinent Introduction thereunto.

I begin this History by enumerating all the several Materials and Ingredients which I understand to be or to have been used in any of the last aforesaid mentioned Colorations, which I shall represent in various Methods, viz. out of the Mineral Family. They use Iron and Steel, or what is made or comes from them, in all true Blacks (called Spanish Blacks) though not in Flanders Blacks; viz. they use Copperas, Steel-filings, and Slippe, which is the stuff found in the Troughs of Grind-stones, whereon Edge-
"Edge-tools have been ground. They also use Pewter for Bow-dye, Scarlet, viz. they dissolve Bars of Pewter in the \textit{Aqua fortis} they use; and make also their Dying-kettles or Furnace of this Mettal.

"\textit{Litharge} is used by some, though acknowledged by few, for what necessary reason I cannot learn, other than to add weight unto Dyed Silk; \textit{Litharge} being a calx of Lead, one of the heaviest and most colouring Mettals.

"I apprehend \textit{Antimony} much used to the same purpose, though we know there be a very tingeable Sulphur in that Mineral, which affordeth variety of Colour by the precipitations and other operations upon it.

"\textit{Arsenick} is used in Crimson, upon pretence of giving Lustre, although those who pretend not to be wanting in giving Lustre to their Silks, do utterly disown the use of \textit{Arsenick}.

"\textit{Verdegrease} is used by Linen Dyers in their Yellow and Greenish Colours, although of it self it strike not deeper colour than of pale Straws.

"Of \textit{Mineral-Salts} used in \textit{Dying}; the chief is Allum; the very true use thereof seems to me obscure enough, notwithstanding all the Narrations I could get from Dyers about it: For I doubt,

"1. Whether it be used to make Common-water a fit \textit{Menstruum}, wherewith to extract the Tingent particles of several hard Materials; for I find Allum to be used with such Materials as spend easy enough, as Brasill, Logwood, \&c. And withal, that the Stuffs to be dyed are first boiled in Allum-liquors, and the Allum afterwards (as they say) cleared from the said Stuff again, before any Colour at all be applied.

"2. Whether it be used to scour the \textit{Sordes}, which may
may interpose between the Coloranda, and the
Dying Stuff; and so hinder the due adhesion of
the one unto the other: The boiling of several
things first in Allum seeming to tend this way. But
I find this work to be done in Cloth and Rugs, by
a due scouring of the same in the Fulling-mills with
Earth, and in Silk with Soaps, by which they boil
out the Gums and other Sordes, hindring or vitia-
ting the intended Colours.
3. Whether Allum doth interterminate the Hairs of
Wool, and Hair-Stuff, as Grograins, &c. Where-
by they may the better, receive and imbibe their
Colours? Unto which opinion I was led by the
Dyers, saying, that after their Stuffs were well
boyled in Allum, that they then cleared them of
the Allum again: But we find the most open Bo-
died-Cottons and Silks, to have Allum used upon
them; as well as the harder Hairs. Nor is Allum
used in many Colours, viz. In no Woad or Indico
Blews; and yet the Stuffs Dyed Blew, are with-
out any previous inteneration quickly tinged;
and that with a slight and short immersion thereof
into the Blew fat.
4. "Whether it contribute to the Colour it self,
as Copperas doth to Gals, in order to make a black;
or as Juice of Lemmons doth to Cocheneel in the
Incarnadives; or as Aqua-Fortis impregnated with
Pewter, doth in the Bow-Scarlet, changing it from
a red Rose-Crimson to flame Colour. This use is
certainly not to be denied to Allum in some cases;
but we see in other cases, that the same Colours may
be Dyed without Allum, as well as with it, though
neither so bright and lively, nor so lasting.
5. "Wherefore Fifthly, I conclude (as the most
O o.

"probable
The probable opinion) that the use of Allum is to be a
Vinculum between the Cloth and the Colour, as
clammy-Oyls and Gum-waters are in Painting and
Limming; Allum being such a thing, whose particles
and Aculei dissolved with hot Liquors will stick to
the Stuffs, and pitch themselves into their Pores; and
such also, as on which the particles of the Dying
Drugs will also catch hold, as we see the particles
of Copperas and other Crystallizing materials, do
of Boughs and Twigs in the Vessel, where such
Crystallization is made. A second use I imagine
of Allum in Dying, to be the extracting or drying
up of some such particles, as could not consist with
the Colour to be superinduced, for we see Allum
is used in the dressing of Alumine or white Leather,
the which is dryeth, as the Salt of Hen-dung doth,
in Ox-hides, and as common Salt doth in preserva-
tion of Flesh-meat; so we know, a Sheep-skin,
newly slayed could not be Colour'd as Brasis is, 
unless it were first dressed into Leather with Allum,
&c., which is necessary to the Colour, even although
the Allum be, as it is, cleared out of the Leather
again, before the said Colouration, with Bran,
yelks of Eggs, &c. Wherefore as Allum, as it
were by accident, makes a wet raw skin to take a
bright Colour by extracting some impedimental
particles out of it; so doth it also out of other ma-
terials, though perhaps less discernably.

Another use I suppose of Allum, which is to
brighten a Colour: For as we see the finest and
most Glassie materials to make the most orient
Colours, as Feathers, Flowers, &c. So certainly
if by boiling Cloth in Allum, it become incrusted
with particles, as it were of Glass, the tinging
of
of them yields more brightness, than the tinging of
a Scabrous matter, (such as unallumed Cloth is)
can do. Analogous hereunto I take the use of Bran,
and Bran-liquors in Dying to be; for Bran yielding
a most fine flower (as we see in the making of white-
Starch;) I conceive that this flower entering into
the pores of the Stuff, levigates their Superficies and
and so makes the Colour laid on it, the more beau-
tiful, just as we see, that all woods, which are to
be guilded are first smoothned over with white Co-
lours, before the Gold be laid on.

And indeed all other Woods are filled, not only
as to their greater holes and Asperities, with Putty;
but also their smaller Scabrities are cured by pri-
mimg Colours, before the Ultimate Colour intend-
ed be laid thereon.

The next Mineral Salt is Salt-Peter, not used by
ancient Dyers, and but by few of the modern.
And that not, till the wonderfull use of Aqua-fortis
(whereof Salt-Peter is an ingredient) was observ-
ed in the Bow-Scarlet: Nor is it used now, but to
brighten Colours by back-boiling them; for which
use Argol is more commonly used. Lime is much
used in the working of blew-fats, being of Lime-
stone calcined and called Calke, of which more
hereafter.

Of the Animal family are used about Dying,
Cochineel (if the same be any part of an Animal)
Urine of labouring men, kept till it be stale and
stinking; Honey, Yeiks of Eggs, and Ox-gall. The
three latter so rarely, and as the conceits of par-
ticular Work-men, and for Collateral ues (as to
increase weight, promote fermentation, and to
scour, &c.) That I shall say very little more of them
in
in this place, only saying of Urine that it is used to
scur, and help the fermenting and heating of
Woad; it is used also in the blew-fats instead of
Lime: It dischargeth the yellow (of which and
blew, most Greens are compounded) and there-
fore is always used to spend Weld withal. Lastly,
the stale Urine, or old mudd of pissing places, will
colour a well scoured small piece of Silver, into a
Golden colour, and it is with this (and not at all
with the Bath-water) wherewith the Boys at Bath
colour single pence; although the generality be-
lieve otherwise. Lastly it seems to me, that Urine
agreeth much in its Nature with Tartarous Lixivia;
not only because Urine is a Lye made of Vegeta-
tables in the body of Animals; nor because in the
Receptacles of Urine, Tartarous Stones are bred
like as in Vessels of Wine; nor because Urine dis-
charges and abrades Colours as the Lixivia of Tar-
tar, or the deliquated Salts of Tartar do; but be-
cause Tartar and Sulphur-Lixivia do colour the
superficies of Silver, as we affirmed of Urine; and
the difference I make between Urine and Tartarous
Lixivia is only this, that though the Salts of both
of them seem by their effects in Dying, in a manner
the same; yet that Urine is made and consists of
Salt and Sulphur both.

Before we enter upon the Vegetable materials for
Dying, we may interpose this Advertisement, That
there are two sorts of Water used by Dyers, viz.
River-water and Well-water: By the latter I mean
in this place the Pump-water in great Cities and
Towns, which is a harsh Water wherewith one can
scarcely wash one's hands, much less flour them clean;
nor will Soap dissolve in it, but remains in rolls and
"Lumps: moreover the Flesh boiled in it becomes hard and reddish. The Springs rising out of large covered spaces (such as are great Cities), yield this Water, as having been percolated thorow more ground than other Water, and consequently been divested of its fatty earthy particles, and more impregnated with saline substances in all the way it hath passed. The Dyers use this Water in Reds, and in other colours wanting refringency, and in the Dying of Materials of the slacker Contextures, as in Callico, Fultian, and the several species of Cotton-works. This Water is naught for Blews, and makes Yellows and Greens look rusty.

"River-water is far more fat and oylie, sweeter, bears Soap; that is, Soap dissolves more easily in it, rising into froth and bubbles, so as the Water thickens by it. This Water is used in most cases by Dyers, and must be had in great quantities for washing and rinsing their Cloathes after Dying.

"Water is called by Dyers White Liquor; but there is another sort of Liquor called Liquor absolutely, and that is their Bran liquor, which is one part of Bran and five of River-water, boiled together an hour, and put into leaden Cisterns to settle. This Liquor when it turns four is not good, which fourness will be within three or four days in the Summer time. Besides the uses afore-named of this Liquor, I conceive it contributes something to the holding of the Colour; for we know Starch, which is nothing but the flower of Bran, will make a clinging Paste, the which will conglutinate some things, though not every thing; viz. Paper, though neither Wood nor Mettals. Now Bran-liquors are used to mealy dying Stuffs, such as Mother is, being..."
"the Powder or *secula* of a Root; So as the flower
"of the Bran being joyned with the *Mater*, and
"made clammy and glutinous by boyling, I doubt
"not but both sticking upon the *villi* of the Stuff Dy-
"ed, the *Mater* sticks the better by reason of the
"starchy pastiness of the Bran-flower joyned with
"it.

"Gums have been used by Dyers about Silk, *viz.*
"*Gum Arabick*, *Gum Dragant*, *Mastick*, and *Sanguis
"Draconis*. These Gums tend little to the tincture
"of the said Silk, no more than Gum doth in ordina-
"ry writing Ink, which only gives it a consistence to
"stay just where the Pen delivers it, without run-
"ning abroad uncertainly. So Gum may give the
"Silk a glassiness, that is, may make it seem finer, as
"also stiffer; so as to make one believe the said stiff-
"ness proceeded from the quantity of Silk close wo-
"ven: And lastly to increase weight; for if an ounce
"of Gum, worth a penny, can be incorporated into a
"pound of Silk, the said penny in the Gum produ-
"ceth three shillings, the price of an ounce of Silk.

"Wherefore we shall speak of the use of each of the
"said four Gums, rather when we treat of Sizing and
"Stiffening, than now, in a Discourse of Dying,
"where also we may speak of Honey and Molasses.

"We refer also the Descriptions of Fullers-earth,
"Soaps, Linseed-oyl, and Ox-galls, unto the head of
"Scouring, rather than to this of Dying.

"Wines and *Aqua-vite* have been used by some
"particular Artists; but the use of them being nei-
"ther constant nor certain, I omit further mention of
"them. The like I say of Wheaten-flower and
"Leaven.

"Of *Cummin-seed, Fenugreek-seed, Senna, and A-
"garick,
garick. I have as yet no satisfactory account.

Having spoken thus far of some of the Dying stuffs, before I engage upon the main, and speak more fully of those which have been but slightly touched upon already, I shall more Synoptically here insert a Catalogue of all Dying Materials, as well such as I have already treated upon; as such as I intend hereafter to describe.

The three peculiar Ingredients for Black are Copperas, filings of Steel, and Slippe.

The Restraining binding Materials are Alder, Bark, Pomegranate Pills, Wallnut rinds and roots, Oaken Sapling Bark, and Saw-duft of the same; Crab-tree Bark, Galls, and Sumach.

The Salts are Allum, Argol, Salt-peter, Sul Armoniac, Pot-ashes, and Stone-lime; unto which Urine may be enumerated as a liquid Salt.

The Liquors are Well-water, River-water, Wine, Aqua-vite, Vinegar, juice of Lemmon, and Aqua fortis. There is Honey, used; and Molasses.

Ingredients of another class are Bran, Wheat-flower, Yelks of Eggs, Leaven, Cummin-seed, Pungreek-seed, Agarick, and Senna.

Gums are Gum Arabick, Dragant, Mastick, and Sanguis Draconis.

The Smecticks or Abstervatives are Fullers-earth, Soap, Linseed-oyl, and Ox-gall.

The other Metals and Minerals are Pewter, Verdegrease, Antimony, Litharge, and Arsenick.

But the Colorantia colorata are of three sorts, viz. Blew, Yellow, and Red; of which Logwood, old Fuflick, and Mather, are the Polychofta in the present & common practices, being one of each sort. The Blews are Wood, Indigo, and Logwood. The Yellows
The HISTORY of the

"Iows are Weld, Wood-wax, and old Fuystick, as also Turmerick now seldom used: The Reds are Red-wood, Brazel, Mather, Cochineel, Safflowrs, Ker-
mes-berries, and Sanders; the latter of which is seldom used, and the Kermes not often. Unto these Arnotta and young Fuystick, making Orange colours, may be added, as often used in these times.

"In Cloth Dying, wood-foot is of good use.

"Having presented this Catalogue, I come now to give or enlarge the Description and Application of some of the chief of them, beginning with Cop-
peras.

"Copperas is the common thing us'd to dye Blacks withal, and it is the salt of the Pyrites stone, where-
with old Iron (having been dissolved in it) is incor-
porated. The filings of Steel, and such small par-
ticles of Edge-tools as are worn away upon the Grindstone, commonly called Slipp, is used to the fame purpose in dying of Silks (as was said before) which I conceive to be rather to increase the weight than for any other necessity; the particles of Cop-
peras being not so heavy and crass as these are: for else why should not these later-named Materials be as well used about Cloth, and other cheaper Stuffs?

"We observe, That green Oaken-boards by affri-
dation of a Saw become black; and that a green four
Apple, cut with a knife, becomes likewise black;
and that the white greafe wherewith Coach-wheels are anointed becomes likewise black, by reason of the iron boxes wherewith the Nave is lined, besides the ustulation or affraction between the Nave and the Axel-tree. Moreover we observe, That an Oak-
en stick, by a violent affraction upon other wood in a Turning-Lath, makes the fame black.

"From
From all which we may observe, that the whole business of Blacking lies in the Iron, as if the salt of the Pyrites-stone in Copperas served only to extract the same; and withal it seems to lie in a kind of grinding and ustulation, such as rapid affictions do cause: For Allum seems to be of the same nature with Vitriol; and yet in no case that I know of is, it is used for black colours: And the black colour upon earthen Ware is made with scalings of Iron vitrified. Note, That where-ever Copperas is used, either Galls, Sumach, Oak-Sapling-barks, Alder-bark, Wallnut-rinds, Crabtree-bark, or green Oak saw-duft, must be used with it; All which things Physicians call Aultere and Stiptick.

Red-wood must be chopt into small pieces, then ground in a Mill between two heavy stones, as corn is. It is used also in Dying of Cloth and Rugs, and those of the Courser fort: The colour is extracted with much and long boyling, and that with Galls. The colour it makes is a kind of Brick-colour. Red; it holdeth much better than Brasil. The Cloth it dyeth is to be boyled with it: Wherefore only such matters as are not prejudiced by much boyling are dyed herewith.

Brasil is chopt and ground like as the Red-wood: It dyeth a Pink-colour or Carnation, imitating the colour of Cochineil the neareft: It is used with Allum for the ordinary colour it dyeth; and with addition of Pot-ashes, when it is used for Purples. Brasil steeped in Water giveth it the colour of Clarret-wine, into which a drop or two of Juyce of Lemmons or Vinegar being put, turneth it into the colour of Canary-Sack; in which particular it agreeeth with Cochineil. This Colour soon staineth,
as may appear by the easie change which so small a " quantity of acid liquor makes upon it. A drop of " Spirit of Vitriol turneth the infusion of Brasih into a " purplish violet-colour, even although it hath been " made yellow before, by the addition of Juyce of " Lemmons or Vinegar; and is the same effect which " Pot-ashes also produce, as we said before.

"Mather is a Root cultivated much in Flanders: " There be of it two sorts; Rise-Mather, which is " the coarsest; and Bake-Mather, otherwise called " Cran-Mather: This Mather used to the best advan- " tage, dyeth on Cloth a colour the nearest to our " Bow dye, or the new Scarlet; the like whereof " Safflower doth in Silk; in some much as the colours cal- " led Bastard-Scarlets are dyed with it. This colour " indures much boiling, and is used both with Allum " and Argol; it holdeth well. The brightest colours " dyed with this material are made by over-dying the " same, and then by discharging part of it by back- " boiling it in Argol.

"Mather is used with Bran-liquor, instead of " White-liquor or ordinary Water.

"Cochineel is of several sorts, viz., Silvester and Me- " stiequa: This also is used with Bran-liquor in Pew- " ter-Furnaces, and with Aqua-fortis, in order to the " Scarlet-dye. It is the colour whereof the like quanti- " tity effecteth most in Dying; and Colours dyed " with it, are said to be dyed in Grain. Rags dyed " in the dregs of this colour is called Turnsole, and 'tis " used to colour Wines; Cochineel being counted so " far from an wholesome thing, that it is esteemed a " Cordial. Any acid Liquor takes off the intense " Redness of this colour, turning it towards an O- " range, Flame, or Scarlet colour: With this colour " also
also the Spanish Leather and Flocks are dyed which
Ladies use. The extract or secula hereof makes the
finest Lake.

Arnott Dyeth of it self an Orang-colour, is used
with Pot-ashes upon Silk, Linnen, and Cottons,
but not upon Cloth; as being not apt to penetrate
into a thick substance.

Weld, called in Latin Luteola; when 'tis ripe
( that is to say, in the flower ) it Dyeth ( with the
help of Pot-ashes ) a deep Lemon colour, like un-
to Ranunculus, or Broom flower; and either by
the smallness of proportion put into the Liquor, or
else by the slighter tincture, it Dyeth all Colours
between White and the Yellow aforesaid.

In the use of this material, Dyers use a cross,
driven down into their Furnace with a screw to
keep it down, so as the Cloth may have liberty in
the supernatant Liquor, to be turned upon the
Winch and kept out with the staves: This weed is
much cultivated in Kent, for the use of the London-
Dyers, it holdeth sufficiently well but against U-
rine and Tartarous Liquors. Painters Pinke is made
of it.

Wood wax, or Genista Tinctoria ( commonly cal-
ced Grasing weed by the Dyers, ) produces the same
effect with Luteola, being used in greater quan-
tities: It is seldom made use of as to Silk, Linnen,
or Cottons, but only as to course Cloths: It is
also set with Pot-ashes or Urine, called by the Dy-
ers Sigge fusick; of it there be two sorts; the young
and the old; Fusick is chopt and ground, as the
other Woods aforesaid are.

The young Fusick Dyeth a kind of Reddish-
Orang-colour; the old, a Hair-colour with several
degrees
The HISTORY of the

degrees of yellowness between: It is used with
flaked Lime. The Colours Dyed with old Fun-
flack hold extremely; and are not to be discharg-
ed, will spend with Salts or without, and will work
hot or cold.

Soot of Wood. Soot containeth in itself both a
Colour and Salt; wherefore there is nothing add-
ed to it to extract its Colour, nor to make it strike
upon the Stuff to be Dyed; the natural Colour
which it Dyeth of itself, is the Colour of Honey;
but is the foundation of many other Colours upon
Wool and Cloth; for to other things 'tis not
used. Woad is made of a Weed, sown upon strong
new-broken Land, perfectly cleared from all stones
and weeds, cut several times by the top-leaves,
then ground, or rather chopt with a peculiar Mill
for that purpose; which being done several times,
it is made up in Balls and dried in the Sun; the
dryer the year is, the better the Woad.

When it is made up in Balls, it is broken again
and laid in heaps, where if it heat too fast, it is
sprinkled with ordinary water: but if it heat too
slowly, then they throw on it a quantity of Lime,
or Urine. But of the perfect cultivating and cu-
cring of Woad, we shall speak elsewhere.

English Woad is counted the strongest, it is com-
monly tried by staining of white Paper with it, or
"a white Limed wall, and if the Colour be a French-
green it is good.

Woad in use, is used with Pot-ashes commonly
called Ware, which if it be double refin'd, is cal-
ced hard Ware (which is much the same with Kelp)
or Sea-weeds, calcin'd and burnt into the hardness
of a stone, by reiterated Calcinations.

Lime
Lime, or Calke which is strong Lime, is used to accelerate the fermentation of the Woad, which by the help of the same Pot-ashes and warm liquors kept alwayes so, in three or four dayes will come to work like a Kive of Beer, and will have a blew or rather greenish froth or flowry upon it, answering to the Yeast of the Kive. Now the over quantity of Ware, fretting too much upon the Woad, is obtunded or dullsed by throwing in Bran sometimes loose, sometimes in Baggs.

The making and using Woad, is one of the most mysterious, nice, and hazardous operations in Dying: It is one of the most lasting Colours that is Dyed: An intense Woad-Colour is almost black, that is to say, of a Damson-colour; this Colour is the foundation of so many others in its degree, that the Dyers have a certain Scale, or number of Stalls, whereby to compute the lightness and deepness of this Colour.

Indico is made of a Weed of the same Nature with Woad, but more strong; and whereas Woad is the whole substance of the Herb, Indico is only a mealy concrete juice or fæcula dried in the Sun, sometimes made up in flat Cakes, sometimes into round-balls, there be several sorts of Indico.

Logwood is chopt and ground like other of the Woods abovementioned, it maketh a Purplish-blew; may be used without Allum: It hath been esteemed a most false and fading Colour; but now being used with Galls, is far less complained of.

General
The HISTORY of the
General Observations upon
DYING.

"First, that all the materials (which of themselves "do give Colour) are either Red, Yellow, or "Blew, so that out of them, and the primitive fun-
damental Colour, White; all that great variety "which we see in Dyed Stuffs doth arise.

"2. That few of the Coloring materials (as "Cochineal, Soot, Wood wax, Woad,) are in their "outward and first appearance of the same Colour, "which by the sliegest distempers and solutions in "the weakest Monsirne, the Dye upon Cloth, Silk, "&c.

"3. That many of the Colouring materials will "not yield their Colours without much grinding, "steeping, boyling, fermenting, or corrosion by pow-
erful Monsirne; as Red-wood, Weld, Woad, Ar-
notto, &c.

"4. That many of the said Coullouring materials "will of themselves give no Colouring at all, as "Copperas, or Galls, or with much disadvantage, "unless the Cloth or other Stuff to be Dyed, be as "it were, first covered or incrusted with some "other matter, though Colour-les, aforesaid, as "Mather, Weld, Brasif with Allum.

"5. That some of the said Colouring materials, "by the help of other Colour-les Ingredients, do "strike different Colours from what they would a-"lone, and of themselves; as Cochineil, Brasif, "&c.

"6. That
"6. That some Colours, as Mather, Indico, and Woad, by reiterated tinctures, will at last become black.

"7. That although Green be the most frequent and common of natural Colours, yet there is no simple ingredient, which is now used alone, to Dye Green with upon any Material; Sap green (being the condensed juice of the Rhamnus Berry) being the nearest; the which is used by Country people.

"8. There is no Black thing in use which dyes black; though both the coal and soot of most things burnt or scorched be of that colour; and the blacker, by how much the matter before it was burnt was whiter, as in the famous instance of Ivory-black.

"9. The Tincture of some Dying Stuffs will fade even with lying, or with the Air, or will stain even with Water; but very much with Wine, Vinegar, Urine, &c.

"10. Some of the Dyers Materials are used to bind and strengthen a Colour, some to brighten it, some to give lustre to the stuff, some to discharge and take off the colour either in whole or in part, and some out of fraud, to make the Material Dyed (if costly) to be heavier.

"11. That some Dying Ingredients or Drugs, by the courseness of their bodies, make the thread of the dyed Stuff seem courser; and some by shrinking them, smaller, and some by levigating their Asperities, finer.

"12. Many of the same colours are dyed upon several Stuffs with several Materials; as Red-wood used in Cloth, not in Silks; Arnotto in Silks, not in Cloth; and may be dyed at several prizes.

"13. That
13. That scouring and washing of stuffs to be dyed, is to be done with special materials; as sometimes with ox-galls, sometimes with fuller's earth, sometimes with soap. This latter being pernicious in some cases, where pot-ashes will stain or alter the colour.

14. Where great quantities of stuffs are to be dyed together, or where they are to be done with great speed, and where the pieces are very long, broad, thick, or otherwise, they are to be differently handled, both in respect to the vessels and ingredients.

15. In some colours and stuffs the tingent liquor must be boiling; in other cases blood-warm; in some it may be cold.

16. Some tingent liquors are fitted for use by long keeping; and in some the vertue wears away by the same.

17. Some colours or stuffs are best dyed by repeated dippings ever into the same liquor at several distances of time; and some by continuing longer, and others lesser whilsts therein.

18. In some cases the matter of the vessel wherein the liquors are heated, and the tinctures prepared, must be regarded; as the kettles must be pewter for bow-dye.

19. There is little reckoning made how much liquor is used in proportion to the dying drugs; the liquor being rather adjusted to the bulk of the stuff, as the vessels are to the breadth of the same: the quantity of dying drugs being proportioned to the colour higher or lower, and to the stuffs both; as likewise the salts are to dying drugs.

Concerning the weight which colours give to silk
"Silk (for in them 'tis most taken notice of, as being
sold by weight, and being a Commodity of great
price:) It is observed, That one pound of raw Silk
loseth four ounces by washing out the Gums and
natural Sordes.
"That the same scowred Silk may be raised to
above thirty ounces from the remaining twelve, if
it be dyed black with some Materials.
"The reason why Black colour may be most heavy
dyed, being because all gravitating Drugs may be
dyed black, being all of colours lighter than it:
whereas perhaps there are few or no Materials
wherewith to increase the weight of Silk, which
will consist with fair light colours; such as will hav-
ing been used, as white Arsenick to Incarnadives.
"Of a thing truly useful in Dying, especially of Blacks,
nothing increases weight so much as Galls, by reason
whereof Black Silks are restored to as much weight
as they lost by washing out their Gum: Nor is it
counted extraordinary, that Blacks should gain a-
bout four or six ounces in the Dying upon each
pound.
"Next to Galls old Fusick increases the weight
about 1 1/4 in 12.
"Mather about one ounce.
"Weld half an ounce.
"The Blew-fat, in deep Blews of the fifth stall,
gives no considerable weight.
"Neither doth Logwood, Cochineel, nor Arnotto:
Nor doth Copperas itself, where Galls are not.
"I conceive much light would be given to the
Philosophy of Dying, by careful Experiments of
the weight added by each Drug or Salt in Dying of
every colour.
slipp adds much to the weight, and giveth a
deeper Black than Copperas itself; which is a good
excuse for the Dyers that use it.

I have hitherto but mentioned the several Colo-
rations used in Humane Affairs, Enumerated: the
several Materials used in one of them, namely, Dy-
ing; and imperfectly described the several uses and
applications of them in Dying. I have also set
down some general Observations relating to that
whole Trade. It remains now that we describe the
several Vessels, Tools, and Utensils used in the same.
And particularly to shew how any Colour assigned
may be superinduced upon any kind of Material,
as Wool, Linnen, Hair, Feathers, Cotton or Silk:
And with what Advantages or Disadvantages of
Lasting, Brightness, Cheapness, and Variety, &c.
each may be performed. But this being infinite,
and almost unteachable by words, as being incom-
parably more difficult, than how to imitate and
compose any Colour assigned, out of the few, usually
furnishing a Painter's palat; I leave the whole to
the further consideration of this Learned Society.

THE
IN the Month of May the Oysters cast their Spaw

(which the Dredgers call their Spat;) it is

like to a drop of Candle, and about the big-

ness of a half-penny.

The Spat cleaves to Stones, old Oyster-shells,

pieces of Wood, and such like things, at the bot-

tom of the Sea, which they call Cultch.

'Tis probably conjectured, that the Spat in

twenty four hours begins to have a Shell.

In the Month of May the Dredgers (by the Law

of the Admiralty Court) have liberty to catch all

manner of Oysters, of what size soever.

When they have taken them, with a knife they

gently raise the small brood from the Cultch, and

then they throw the Cultch in again, to preserve

the ground for the future, unless they be so newly

Spat that they cannot be safely severed from the

Cultch, in that case they are permitted to take the

stone or shell, &c. that the Spat is upon, one Shell

having many times 20 Spats.

Qq 2
"After the Month of May it is Felony to carry a-
way the Cultch, and punishable to take any other
Oysters, unless it be those of size (that is to say) a-
bout the bigness of an half Crown piece, or when
the two shells being shut, a fair shilling will rattle
between them.

The places where these Oysters are chiefly catcht,
are called the Pont-Burnham, Malden, and Colne-
Waters; the latter taking its name from the Ri-
ver of Colne, which passeth by Colne-Chester, gives
the name to that Town, and runs into a Creek of
the Sea at a place called the Hythe, being the Sub-
brubs of the Town.

This Brood and other Oysters they carry to
Creeks of the Sea at Brickel-Sea, Mersey, Langno,
Fringrego, Wivenho, Tolesbury, and Salt-coafe, and
there throw them into the Channel, which they
call their Beds or Layers, where they grow and fat-
ten, and in two or three years the smallet Brood
will be Oysters of the size aforesaid.

Those Oysters which they would have green;
they put into Pits about three foot deep, in the
Salt-Marshes, which are overflowed only at Spring-
tides, to which they have Sluces, and let out the
Salt-water until it is about a foot and half deep.

These Pits from some quality in the Soil coope-
rating with the heat of the Sun, will become green,
and communicate their colour to the Oysters that
are put into them in four or five days, though they
commonly let them continue there six Weeks, or
two Months, in which time they will be of a dark
green.

To prove that the Sun operates in the greening,
Tolesbury Pits will green only in Summer; but that
"the Earth hath the greater power, Brickel-sea Pits
"green both Winter and Summer: and for a further
"proof, a Pit within a foot of a greening Pit will not
"green; and those that did green very well, will in
"time lose their quality.
"The Oysters when the Tide comes in lie with their
"hollow shell downwards, and when it goes out they
"turn on the other side; they remove not from their
"place unless in cold weather, to cover themselves in
"the Ouse.
"The reason of the scarcity of Oysters, and conse-
"quently of their dearness, is, because they are of
"late years bought up by the Dutch.
"There are great penalties by the Admiralty-
"Court, laid upon those that fish out of those grounds
"which the Court appoints, or that destroy the
"Culch, or that take any Oysters that are not of
"size, or that do not tread under their feet, or throw
"upon the shore, a Fish which they call a Five-finger,
"resembling a Spur-rowel, because that Fish gets in-
"to the Oysters when they gape, and sucks them out.
"The reason why such a penalty is set upon any
"that shall destroy the Culch, is because they find
"that if that be taken away the Ouse will increase,
"and then Muscles and Cockles will breed there, and
"destroy the Oysters, they having not whereon to
"stick their Spat.
"The Oysters are sick after they have Spat; but in
"June and July they begin to mend, and in August they
"are perfectly well: The Male-Oyster is black-flick,
"having a black substance in the Fin; the Female
"white-flick (as they term it) having a milky substance
"in the Fin. They are salt in the Pits, saltier in the
"Layers, but saltiest at Sea.
The HISTORY of the

In Composing Histories after this manner, they resolve to proceed, till they have not only obtained an Account of all the Great, and most substantial Trades; but also of all the less Works, and Private Productions, which are confin'd to some particular Sayls, or Corporations, or Families. As this Stock shall increase, they purpose to make it of General use; either by continual Printing the most remarkable of them, or by freely exposing them to the view of all, that desire such Informations; provided, that at the same time they receive some, they will also Communicate others: And they have assured grounds of confidence, that when this attempt shall be compleated, it will be found to bring innumerable benefits to all practical Arts: When all the secrets of Manufactures shall be discovered, their Materials describ'd, their Instruments figured, their Productions represented: It will soon be determin'd, how far they themselves may be promoted, and what new consequences may thence be deduc'd. Hereby we shall see whether all the parts of the most obvious Crafts have been brought to perfection; and whether they may not assist each other, more than has been hitherto in-avour'd: Hereby we shall discern the compass, the power, the changes, the degrees, the ages of them all; and speedily understand, whether their effects have been large enough, and the ways of producing them sufficiently compendious. In short, by this help the worst Artificers will be well instructed, by considering the Methods and Tools of the best: And the greatest Inventors will be exceedingly inlighten'd; because they will have in their view the labours of many men, many places, and many times, where-with to compare their own. This is the surest, and most
most effectual means, to enlarge the Invention: whose Nature is such, that it is apt to increase, not only by mens beholding the Works of greater, but of equal, nay of less Wits than themselves.

In the whole progress of this Narration, I have been cautious to forbear Commending the labours of any Private Fellows of the Society. For this, I need not make any Apology to them; seeing it would Part. have been an inconsiderable Honour, to be praised by so mean a Writer: But now I must break this Law, in the particular case of Dr. Christopher Wren: For doing so, I will not alledge the excuse of my Friendship to him; though that perhaps were sufficient; and it might well be allow'd me to take this occasion of Publishing it: But I only do it on the meer consideration of Justice: For in turning over the Registers of the Society, I perceiv'd that many excellent things, whose first Invention ought to be ascrib'd to him, were casually omitted: This moves me to do him right by himself, and to give this separate Account of his indeavours, in promoting the Design of the Royal Society, in the small time wherein he has had the opportunity of attending it.

The first instance I shall mention, to which he may lay peculiar claim, is the Doctrine of Motion, which is the most considerable of all others, for establishing the first Principles of Philosophy, by Geometrical Demonstrations. This Des Cartes had before begun, having taken up some Experiments of this kind, upon Conjecture, and made them the first Foundation of his whole Systeme of Nature: But some of his Conclusions seeming very questionable, because they were only deriv'd from the gross Trials of Balls meeting,
meeting one another at Tennis, and Billiards: Dr. Wren produc'd before the Society, an Instrument to represent the effects of all sorts of Impulses, made between two hard globous Bodies, either of equal, or of different bigness, and swiftness, following or meeting each other, or the one moving, the other at rest. From these varieties arose many unexpected effects; of all which he demonstrated the true Theories, after they had been confirm'd by many hundreds of Experiments in that Instrument. These he propos'd as the Principles of all Demonstrations in Natural Philosophy: Nor can it seem strange, that these Elements should be of such Universal use; if we consider that Generation, Corruption, Alteration, and all the Vicissitudes of Nature, are nothing else but the effects arising from the meeting of little Bodies, of differing Figures, Magnitudes, and Velocities.

The Second Work which he has advanc'd, is the History of Seasons: which will be of admirable benefit to Mankind, if it shall be constantly pursued, and deriv'd down to Posterity. His proposal therefore was, to comprehend a Diary of Wind, Weather, and other conditions of the Air, as to Heat, Cold, and Weight; and also a General Description of the Year, whether contagious or healthful to Men or Beasts; with an Account of Epidemical Diseases, of Blasts, Mill-dews, and other accidents, belonging to Grain, Cattle, Fish, Fowl, and Insects. And because the difficulty of a constant Observation of the Air, by Night, and Day seem'd invincible, he therefore devis'd a Clock to be annex'd to a Weather-Cock, which mov'd a rundle, cover'd with Paper, upon which the Clock mov'd a black-lead-Pencil; so that the Observer by the Traces of the Pencil on
the Paper, might certainly conclude, what Winds had blown in his absence, for twelve hours space: After a like manner he contriv'd a Thermometer to be its own Register: And because the usual Thermometers were not found to give a true measure of the extension of the Air, by reason that the accidental gravity of the liquor, as it lay higher or lower in the Glass, weigh'd unequally on the Air, and gave it a farther contraction or extension, over and above that which was produc'd by heat and cold; therefore he invented a Circular Thermometer, in which the liquor occasions no fallacy, but remains always in one height moving the whole Instrument, like a Wheel on its Axis.

He has contriv'd an Instrument to measure the quantities of Rain that falls: This as soon as it is full, will pour out itself; and at the years end discover how much Rain has fallen on such a space of Land, or other hard superficies, in order to the Theory of Vapours, Rivers, Seas, &c.

He has devised many subtil wayes for the easier finding the gravity of the Atmosphere, the degrees of drought and moisture, and many of its other accidents. Amongst these Instruments there are Balances which are usefull to other purposes, that shew the weight of the Air by their spontaneous inclination.

Amongst the new Discoveries of the Pendulum, these are to be attributed to him, that the Pendulum in its motion from rest to rest; that is, in one descent and ascent, moves unequally in equal times, according to a line of sines: That it would continue to move either in Circular, or Elliptical Motions; and such Vibrations would have the same Periods with those that are reciprocal; and that by a complication
The HISTORY of the

of several Pendulums depending one upon another, there might be represented motions like the Planetary Helical Motions, or more intricate: And yet that these Pendulums would discover without confusion (as the Planets do) three or four several Motions, acting upon one Body with differing Periods; and that there may be produced a Natural Standard for Measure from the Pendulum for vulgar use.

He has invented many ways to make Astronomical Observations more accurate and easy: He has fitted and hung Quadrants, Sextants, and Radii, more commodiously than formerly: He has made two Telescopes, to open with a joint like a Sector, by which Observers may infallibly take a distance to half minutes, and find no difference in the same Observation reiterated several times; nor can any warping or luxation of the Instrument hinder the truth of it.

He has added many sorts of Retes, Screws, and other devices to Telescopes, for taking small distances and apparent diameters to Seconds. He has made apertures to take in more or less light, as the Observer pleases, by opening and shutting like the pupil of the eye, the better to fit Glasses to Crepuscular Observations: He has added much to the Theory of Dioptrics; much to the Manufacture itself of grinding good Glasses. He has attempted, and not without success, the making of Glasses of other forms than Spherical. He has exactly measured and delineated the Spheres of the humors in the Eye, whose proportions one to another were only guessed at before. This accurate discussion produced the reason, why we see things rectified, and that Reflection conduces as much to Vision as Refraction.

He discoursed to them a Natural and easy Theory of Refraction,
Refraction, which exactly answer'd every Experiment. He fully demonstrated all Dioptrics in a few Propositions, shewing not only (as in Keplers Dioptrics) the common properties of Glasses, but the proportions by which the individual Raies cut the Axis, and each other; upon which the Charges (as they are usually called) of Telescopes, or the proportion of the Eye-glasses and Apertures are demonstrably discover'd.

He has made constant Observations on Saturn; and a Theory of that Planet, truly answering all Observations, before the printed Discourse of Huygens on that subject appear'd.

He has essay'd to make a true Selenography by measure; the world having nothing yet but pictures, rather than Surveys or Maps of the Moon. He has stated the Theory of the Moons Libration, as far as his Observations could carry him. He has compos'd a Lunar Globe, representing not only the spots, and various degrees of whiteness upon the surface, but the hills, eminencies, and cavities moulded in solid work. The Globe thus fashioned into a true model of the Moon, as you turn it to the light represents all the Menstrual phases, with the variety of appearances that happen from the Shadows of the Mountains and Valleys. He has made Maps of the Pleiades, and other Telescopical Stars; and propos'd Methods to determine the great doubt of the Earths motion or rest, by the small Stars about the Pole to be seen in large Telescopes.

In order to Navigation he has carefully pursu'd many Magnetical Experiments; of which this is one of the noblest and most fruitful of Speculation. A large Terella is plac'd in the midst of a Plane Board, with a hole in
to which the Terrella is half immers'd, till it be like a Globe, with the Poles in the Horizon. Then is the Plane dusted over with steel-filings equally from a Sieve: The Dust by the Magnetical virtue is immediately figur'd into Furrows, that bend like a sort of Helix, proceeding as it were out of one Pole, and returning into the other: And the whole Plane is thus figur'd like the Circles of a Planisphere.

It being a Question amongst the Problems of Navigation, very well worth resoluing, to what Mechanical powrs the Sailing (against the wind especially) was reducible; he shew'd it to be a Wedge: And he demonstrated, how a transient Force upon an oblique Plane, would cause the motion of the Plane against the first Mover. And he made an Instrument, that Mechanically produce'd the same effect, and shew'd the reason of Sayling to all Winds.

The Geometrical Mechanics of Rowing, he shew'd to be a Velatis on a moving or sedent Fulcrum. For this end he made Instruments, to find what the expansion of Body was towards the hindrance of Motion in a Liquid Medium; and what degree of impediment was produce'd, by what degree of expansion: with other things that are the necessary Elements for laying down the Geometry of Sailing, Swimming, Rowing, Flying, and the Fabricks of Ships.

He has invented a very curious and exceeding speedy way of Etching. He has started several things towards the emendation of Water-works. He has made Instruments of Respiration, and for straining the breath from fuliginous vapours, to try whether the same breath to purify'd will serve again.

He was the first Inventor of drawing Pictures by Microscopical Glasses. He has found out perpetual, at least
ROYAL SOCIETY.

least long-liv'd Lamps, and Registers of Furnaces, and the like, for keeping a perpetual temper, in order to various uses; as hatching of Eggs, Insects, production of Plants, Chymical Preparations, imitating Nature in producing Fossils and Minerals, keeping the motion of Watches equal, in order to Longitudes and Astronomical uses, and infinite other advantages.

He was the first Author of the Noble Anatomical Experiment of Injecting Liquors into the Veins of Animals. An Experiment now vulgarly known; but long since exhibited to the Meetings at Oxford, and thence carried by some Germans, and publish'd abroad. By this Operation divers Creatures were immediately purg'd, vomited, intoxicated, kill'd, or reviv'd, according to the quality of the Liquor injected: Hence arose many new Experiments, and chiefly that of Transfusing Blood, which the Society has prosecuted in sundry Instances, that will probably end in extraordinary Success.

This is a short account of the Principal Discoveries which Dr. Wren has presented or suggested to this Assembly. I know very well, that some of them be did only start and design; and that they have been since carry'd on to perfection, by the Industry of other hands. I purpose not to rob them of their share in the honour: Yet it is but reasonable, that the original Invention should be ascrib'd to the true Author, rather than the Finishers. Nor do I fear that this will be thought too much, which I have said concerning him: For there is a peculiar reverence due to so much excellence cover'd with so much modesty. And it is not Flattery but honesty, to give him his just praise; who is so far from usurping the fame of other men, that
that he indeavours with all care to conceal his own.

I have now perform'd my Promise, and drawn out of the Papers of the Society, an Epitome of the chief Works they have conceiv'd in their minds, or reduce'd into Practice. If any shall yet think they have not usefully employ'd their time, I shall be apt to suspect, that they understand not what is meant by a diligent and profitable labouring about Nature. There are indeed some men who will still condemn them for being idle; unless they immediately profess to have found out the Squaring of the Circle, or the Philosophers Stone, or some other such mighty Nothings. But if these are not satisfied with what the Society has done, they are only to blame the extravagance of their own Expectations. I confess I cannot boast of such pompous Discoveries: They promise no Wonders, nor endeavour after them: Their Progress has been equal, and firm, by Natural degrees, and through small things, as well as great: They go leisurely on; but their slowness is not caus'd by their idleness, but care. They have contriv'd in their thoughts, and courageously begun an Attempt, which all Ages had despair'd of. It is therefore fit that they alone, and not others, who refuse to partake of their burden, should be Judges by what steps, and what pace, they ought to proceed.

Such men are then to be intreated not to interrupt their Labors with impertinent rebukes; they are to remember, that the Subject of their Studies is as large as the Universe: and that in so vast an Enterprise, many intervals and disappointments must be reckon'd upon. Though they do not behold that the Society has already fill'd the world with perfect Sciences; yet
yet they are to be inform'd, that the nature of their Work requir'd that they should first begin with immediate Collections and indigested Experiments, before they go on to finish and compose them into Arts. In which Method they may well be justified, seeing they have the Almighty Creator himself for an Example: For he at first produc'd a confus'd and scatter'd Light; and reserv'd it to be the work of another day, to gather and fashion it into beautiful Bodies.

The End of the Second Part.
Though it be certain, that the promoting of Experiments according to this Idea, cannot injure the Virtue, or Wisdom of Mens minds, or their former Arts, and Mechanical Practices; or their establish'd ways of life: Yet the perfect innocence of this design, has not been able to free it from the Cavill of the Idle, and the Malicious; nor from the jealousies of Private Interests. These groundless prejudices of the particular Professions, and Ranks of Men, I am now in the last place to remove; and to shew that there is no Foundation for them: To suspect the Change, which can be made by this Institution; or the new things it is likely to produce.

That it will probably be the Original of many new things, I am so far from denying, that I cheerfully acknowledge it. Nor am I frighted at that, which is wont to be objected in this Case, the hazard of alteration, and Novelty. For if all things that are new
be destructive, all the several means, and degrees, by which Mankind has risen to this perfection of Arts, were to be condemn'd. To be the Author of new things, be a crime; how will the first Civilizers of Men, and makers of Laws, and Founders of Governments escape? Whatever now delights us in the Works of Nature, that excels the rudeness of the first Creation, is New. Whatever we see in Cities, or Houses, above the first wildness of Fields, and meaness of Cottages, and nakedness of Men, had its time, when this imputation of Novelty, might as well have bin laid to its charge. It is not therefore an offence, to profess the introduction of New things, unless that which is introduced prove pernicious in itself; or cannot be brought in, without the extirpation of others, that are better.

And that Experimental Knowledge, will not expose us to these dangers, I am next to declare, in a Universal Apology for its intentions, and effects. This was the Third Portion, which I at first reserv'd, for the Conclusion of my Discourse. Yet casting my eyes back, I find, that I have already on several occasions prevented my self; and said many things as I came along, which would have bin more proper for this place. But I desire that my Reader would interpret this to have proceeded from the Nature of my Subject, of which it is hard to Write a plain History, without falling sometimes unawares into its Praise. And now I will proceed to a fuller, and more solemn Defence: In which, I will try to prove, that the increase of Experiments will be so far from hurting, that it will be many wais advantageous, above other Studies, to the wonted Courses of Education; to the Principles, and instruction of the minds of men.
Men in general; to the Christian Religion, to the Church of England; to all Manual Trades; to Physic; to the Nobility, and Gentry; and the Universal Interest of the whole Kingdom.

In all which Particulars, I hope I shall represent this Model, to be inoffensive to all the various ways of Living, already in use: and thereby I shall secure all the Ancient Proprietors in their Rights: A work as necessary to be done, in raising a new Philosophy as we see it is in building a new London.

The First prejudice I am to wipe away, concerns the usual ways of Education. For it is an obvious doubt; whether so great a change in Works, and Opinions, may not have some fatal consequence, on all the former Methods of Teaching, which have been long settled, and approved by much Custom. And here many Good Men of severe, and ancient manners, may seem to have reason, when they urge against us; that the Courses of Training up of Youth, ought to be still the same; that if they be subverted, or multiplied, much confusion will follow; and that this our Universal Inquiry into things hitherto unquestioned, can never be made, without disturbing such established Rules of Discipline, and Instruction.

For a General Answer to this, it might suffice to declare, that in this Institution, Men are not ingaged in these Studies, till the Course of Education be fully compleated: that the Art of Experiments, is not thrust into the hands of Boyes, or set up to be performed by Beginners in the School; but in an Assembly of Men of Ripe years: who while they begin a new Method of Knowledge, which shall consist of Works, and is therefore most proper for Men:
they still leave to Learners, and Children; the old talkative Arts which best suit the younger Age. From hence it must follow, that all the various manners of Education, will remain undisturb'd, because the practises of them, and the labors of this, are not appointed to meet in the same Age, or Persons. But if this will not satisfy our Adversaries, let us proceed to consider the different Parts of Education: and then we shall be able to make the surer Conjectures, what manner of Influence, new Experiments will have upon it.

Education Consists in divers Rules, and Practises, whereby men are furnish'd for all the several Courses of Life, to which they may apply themselves. Of these preparatory Arts, some concern the Body, some the Mind. Those of the Body have no relation to my present Argument: Of those of the Mind, some intend the purity, and Ornament of Speech: Some the Knowledge of the Actions of former, and present Times: Some the Government, and Virtue of our Lives: Some the Method of reasoning: Some the Skill in the motions and measures of the Heavens, and the Earth, and all this great Frame of Visible things.

First then I will make no scruple to acquit Experimental Philosophy, from having any ill effects, on the usual Arts, whereby we are taught the Purity, and Elegance of Languages. Whatever discoveries shall appear to us afresh, out of the hidden things of Nature, the same words, and the same waies of Expression will remain. Or if perhaps by this means, any change shall be made herein; it can be only for the better; by supplying mens Tongues, with very many new things, to be nam'd, and adorn'd, and describ'd in their discourse.
Nor can there be any more jealousie concerning the Moral, and Political Rules of ordering mens lives. But they may still have the same influence, and authority, and may be propos'd to our imitation, by the same præcepts, and arguments, of persuasion.

It is also as manifest, that the Art of teaching the Actions of former Ages; can from hence receive no damage, or alteration. This cannot be otherwise; seeing the Subjects of Natural, and Civil History do not cross each other; nor does the New Philosophy of Nature more interfere, with the Historys of Men, and Government, than the Old, of which this doubt was never rais'd.

Thus far then we are secure. These great, and fundamental Parts of Education, the Instruments of mens Expressing, and Ruling their own minds, and searching into the Actions of others, will be unalter'd, whatever new changes of Opinions may arise about Natural Things. Let us next go on to consider the Arts of Demonstration, and Argumentation, in which consists one of the most weighty Parts of youthful Studies.

First for all the Mathematical Sciences, they will still remain the same, and still continue to be learn'd, and taught, in the same Systems, and Methods as before. Nothing that can now be discover'd will subvert, but rather Confirm what is already well-built on those immoveable principles. As they came down to us without detriment, through all the corrupt Times of Learning; so they will certainly now continue uncorrupt, at this present, when Learning is restor'd.
restor'd. Seing they could not be destroy'd in the Ignorant Ages, they will be in no fear, at this time, by this Institution, which designs not only to inlarge them, but to promote the same rigid way of Conclusion in all other Natural things, which only the Mathematics have hitherto maintained.

Now then, this whole controversy is reduc'd to the alteration, which the Logic, and physics of the Ancients, may receive by this change. As for their Metaphysics, they scarce deserve to have a place allow'd them in this consideration.

Nor does that prevail with mee, which the Lovers of that Cloudy Knowledge are wont to boast, that it is an excellent instrument to refine, and make subtile the minds of men. For there may be a greater Excess in the subtilty of mens wits, than in their thickness: as we see those threads, which are of too fine a spinning, are found to be more useless, than those which are homespun, and gros.

Logic is the Art of conceiving, Arguing, and Method. And notwithstanding all the progress which may happen in Natural Knowledge, all the several parts of Reas'ning, which it teaches in all manner of busines, will continue the same. The operations, and powers of the mind will still be the same: they will still be subject to the same errors: they will still use the same degrees of Arguing from particular things, to propositions, and conclusions; and therefore they will still require the same means, and exercises for direction. It is not the complaint of the promoters of Experiments, that men have bin wanting to themselves, in regulating, disposing, or judging of their own thoughts. Nay they rather condemn them, for being wholly imployd
impoyd about the productions of their own minds, and neglecting all the works of Nature, that are without them. It cannot therefore be suspected that these Inquisitive Men, should busy themselves, about altering the Art of Discours, wherein they judge that mankind has bin already rather too Curious, than negligent.

The Last part that I shall mention, of the Learning that is taught, is the Systems of Natural Philosophy. And it is in this alone, that I can allow, there will be any alteration made, by this reformation of Knowledge. But yet the change will be so advantageous, that I have no reason to dissemble it. I grant indeed that the greatest part of the former Body of Physics, may hereby chance to fall to the ground. But to what sum will the damage amount? What can we lose, but only some few definitions, and idle questions, and empty disquisitions? Of which I may say as one did of Metaphors, Poterimus vivere sine illis. Perhaps there will be no more use of Twenty, or Thirty obscure Terms, such as Matter, and Form, Privation, Entelichia, and the like. But to supply their want, and infinit variety of Inventions, Motions, and Operations, will succeed in the place of words. The Beautiful Bosom of Nature will be Expos'd to our view: we shall enter into its Garden, and taste of its Fruits, and satisfy our selves with its plenty: instead of idle talking, and wandring, under its fruitless shadows; as the Peripatetics did in their first institution, and their Successors have done ever since.

Thus.
Thus far I have briefly examin'd the influence of new Experiments, or all the chief Parts of Education. And after all the Innovation, of which they can be suspected, we find nothing will be indanger'd, but only the physics of Antiquity: wherein we also behold, that many things of greater concernment, will arise, to supply the place of what shall be cut away. By this discours, I hope, I have said enough, to manifest the innocence of this Design in respect of all the present Schools of Learning; and especially our own Universities. And it was but just, that we should have this tenderness, for the Interest of those magnificent Seats of humane Knowledge; and divine; to which the Natural Philosophy of our Nation, cannot be injurious without horrible ingratitude; seeing in them it has been principally cherish'd, and reviv'd. From thence the greatest part of our Modern Inventions have deduc'd their Original. It is true such Experimental Studies are largely dispers'd at this time: But they first came forth thence, as the Colonies of old did from Rome: and therefore as those did, they should rather intend the strength, than the destruction of their Mother-Cities.

I confess there have not bin wanting some forward Assertors of new Philosophy, who have not us'd any kind of Moderation towards them: But have presently concluded, that nothing can be well-done in new Discoveries, unless all the Ancient Arts be first rejected, and their Nurseries abolish'd. But the rashness of these mens proceedings, has rather prejudic'd, than advanc'd, what they make shew to promote. They have come as furiously to the purging of Philosophy, as our Modern Zealots did to the Reformation.
reformation of Religion. And the one Party is as justly to be condemn'd, as the other. Nothing will suffice either of them, but an utter Destruction, Root and Branch, of whatever has the face of Antiquity. But as the Universities have withstood the fierceness of the ones zeal without knowledge; so there is no doubt, but they will also prevail against the violence of the others pretences to knowledge without pru-

But now after I have shewn that all the receiv'd forms of Education will be safe, I shall make no scruple to add my conjecture, that it could be no hindrance to the minds of men, if besides those courses of Studies which are now follow'd, there were also trial made of some other more practical ways, to prepare their minds for the world, and the businesies of human life. It is not enough to urge against this, that the multiplicity of Methods would hinder and confound the Spirits of young men; for it is apparent that nothing more suppresses the Genius of Learners, than the formality, and the confinement of the Precepts, by which they are instructed. To this purpose I will venture to propose to the consideration of wise men, whether this way of Teaching by Practise and Experiments, would not at least be as beneficial, as the other by Universal Rules? Whether it were not as profitable to apply the eyes, and the hands of Children, to see, and to touch all the several kinds of sensible things, as to oblige them to learn, and re-

This certainly is no new device: For it was that
which *Plato* intended, when he injoin'd his *Scholars* to begin with *Geometry*; whereby, without question, he design'd, that his *Disciples* should first handle *Material Things*, and grow familiar to *visible Objects*, before they enter'd on the retir'd *Speculations* of other more abstractive *Sciences*.

According to this counthoil of the *Father of Philosophers*, it would not be amiss, if before yong Scholars be far ingag'd in the beaten tracks of the Scholes, the Mysteries of *Manual Arts*, the names of their *Instruments*, the secrets of their *Operations*, the effects of *Natural causes*, the several kinds of *Beasts*, of *Birds*, of *Fishes*, of *Plants*, of *Stones*, of *Minerals*, of *Earths*, of *Waters*, and all their common *Virtues* and *Qualities*, were propos'd to be the subjects of their first thoughts and observations. It may be here suggested, That the vast number of such particulars will soon overwhelm their tender minds, before they are well establish'd by time, and use. But on the contrary it is evident, that the *Memories* of *Youth* are fitter to retain such *sensible images*, than those of a fuller age. It is *Memory* that has most vigour in Children, and *Judgment* in Men: which if rightly consider'd, will confirm what I said, that perhaps we take a *preposterous cours* in *Education*, by teaching *General Rules*, before *Particular Things*; and that therein we have not a sufficient *Regard* to the different advantages of *Youth* and *Manhood*. We load the minds of Children with *Doctrines* and *Præcepts*, to apprehend which they are most unfit, by reason of the weakness of their understandings; whereas they might with more profit be exercis'd in the consideration of *visible* and *sensible things*; of whose impressions they are most capable, because of the strength of
of their Memories, and the perfection of their Senses.

The first years of men being thus freed from any apprehensions of mischief by new Experiments: I will now proceed more boldly to bring them in midst the Throgs, and Crowds of human business; and to declare to all Professions, and practical Lives, that they can receive no ill impressions from them, but that they will be the most beneficial and proper Studies, for their preparation and direction. And to this purpose, I will treat of their usefulness, both in respect of mens public practice, and the privat government of their own minds.

As to the first, it has bin an old complaint, that has bin long manag'd by men of business, against many sorts of Knowledge, that our thoughts are thereby infect'd with such conceptions, as make them more unfit for action, than they would have bin, if they were wholly left to the force of their own Nature. The common Acculations against Learning are such as these; That it inclines men to be unsetled, and contentious; That it takes up more of their time, than men of business ought to bestow; That it makes them Romantic, and subject to frame more perfect images of things, than the things themselves will bear; That it renders them overweening, unchangeable, and obstinat; That thereby men become averse from a practical cours, and unable to bear the difficulties of action; That it employs them about things, which are no where in use in the world; and, That it draws them to neglect and contemn their own present times, by doting on the past. But now I will maintain, that in every one of these dangers Experimental Knowledge
The next accusation is, That so many intricate paths, and spacious windings of Learning, will require more time than can be spared by men of active and busy
busy lives. The belief of this has always made a wide divorce between men of knowledge and action; while both have thought, that they must either be wholly Scholars, or wholly men of business; and that an excellence in both these courses can never be obtain'd by human wit. 'Tis true indeed, there is no Knowledge or Science that can be acquitted from being too large, if their Professors have not the discretion to know how far to proceed, and what moderation is to be us'd in every Study. There is in the least Art enough matter, about which if men shall resolve to trouble their brains all their lives, one question and difficulty will perpetually beget another, and so (as one of the Ancients sayes) Ipsi tractatio,quisque quotidie ex se signet aliquid, quod cum desidioso deletione vestigios.

To this danger perhaps Experiments may seem most expos'd; by reason of the infinit multitude of particulars, and innumerable variations of inquiries, that may be made. But the Royal Society has prevented this mischief, by the number and succession of those that shall undertake the work. They require not the whole time of any of their Members, except only of their Curators: From the rest they expect no more but what their business, nay even their very recreations can spare. It is the continuance and perpetuity of such Philosophical labours, to which they principally trust; which will both allow a sufficient relaxation to all the particular laborers, and will also give good assurance of the happy issue of their work at the last: For though that be true, which the Great Physician laments, That Art is long, and Life is short; yet many Lives of studious and industrious men in one Age, and the succession of many Lives of such men in all future
future Ages, will undoubtedly prove as long as Art itself.

Sect. VIII.
The third objection, That it makes our minds too lofty and Romantic.

They farther object against Learning, That it makes our minds too lofty and Romantic, and inclines them to form more perfect imaginations of the matters we are to practice, than the matters themselves will bear. I cannot deny, but a mere contemplative man is obnoxious to this error: He converses chiefly in his Closet, with the heads and notions of things, and so discerns not their bottoms nearer and distinctly enough: And thence he is subject to overlook the little circumstances, on which all human actions depend. He is still reducing all things to standing Doctrines; and therefore must needs be liable to neglect the opportunities, to set upon business too soon, or too late; to put those things together in his mind, which have no agreement in Nature. But this above all is his greatest danger, that thinking it still becomes him to go out of the ordinary way, and to refine and heighten the conceptions of the vulgar, he will be ready to disdain all the Natural and easy ways of Practice, and to believe that nothing ought to be done, though never so common, but by some device of Art, and trick of unusual wisdome.

From these inconveniences the Experimenter is secure: He invents not what he does out of himself; but gathers it from the footsteps and progress of Nature. He looks on every thing standing equal to it, and not as from a higher ground: He labors about the plain and undigested objects of his senses, without considering them as they are joyn'd into common Notions. He has an opportunity of understanding the most natural ways by which all things are produc'd.
duc'd. He clearly beholds all the secret accidents and turnings, advantages and failings of Nature. He indevors rather to know, than to admire; and looks upon admiration, not as the end, but the imperfection of our knowledge.

The next hindrance of Action, is an obstinacy of resolution, and a want of Dexterity, to change our apprehensions of things according to occasions. This is the more destructive, because it carries with it the most solemn appearance of Wisdom. There is scarce any thing that renders a man so useless, as a pervers sticking to the same things in all times, because he has somtimes found them to have bin in season. But now in this, there is scarce any comparison to be made, between him who is only a thinking man, and a man of experience. The first does commonly estabish his constant Rules, by which he will be guided: The latter makes none of his opinions irrevocable. The one if he mistakes, receives his errors from his Understanding; the other only from his Senses; and so he may correct, and alter them with more ease. The one fixes his opinions as soon; the other doubts as long as he can. The one chiefly strives to be unmovable in his mind: The other to enlarge, and amend his knowledge: And from hence the one is inclin'd to be presumptuous, the other modest in his judgement.

The next pretence, on which men of Learning are wont to be vilified, is, that they use to be so much affected, with the pleasanat musings of their own thoughts, as to abhor the roughness, and toy of business. This accuvalation I confess, is not altogether groundless. The solitary imaginations of speculative.
culative Men are of all other the most easy: there a
man meets with little stubbornness of matter: he may
choose his subject where he likes; he may fashion and
turn it as he pleases: whereas when he comes abroad
into the world, he must indure more contradiction:
more difficulties are to be overcome; and he cannot
always follow his own Genius: so that it is not to be
wonder'd, that so many great Wits have despis'd the
labor of a practical cours; and have rather chosen
to shut themselves up from the nois and preferments
of the World, to convers in the shadow with the
pleasant productions of their own fancies.

And this perhaps is the reason why the most extra-
ordinary men of Arts in all Ages, are generally ob-
serv'd to be the greatest Humorists: They are so full
of the sweetness of their own conceptions, that they
become morose, when they are drawn from them,
they cannot easily make their minds ductil and plia-
ble to others tempers, and so they appear untracta-
ble, and unskilful in conversation.

From this I shall also free the Experimental Philoso-
pher. The satisfaction that he finds, is not imagina-
ry, but real: It is drawn from things that are not out
of the world, but in it: It does not carry him farther
off, but brings him nearer to Practice. 'Tis true,
that Knowledge which is only founded on thoughts
and words, has seldom any other end, but the breed-
ing and increasing of more thoughts and words: But
that which is built on Works (as his will be) will na-
turally desire to discover, to augment, to apply, to
communicate it self by more Works.

Nor can it be thought, that his mind will be made
to languish by this pleasure of observation, and to
have any aversion from the difficulty and tediousness
of human affairs; seeing his way of observation itself is so laborious. It is a good Precept, which is wont to be given, in respect of all sorts of Exercíses, that they should be at least as hard and toilsom, as that Art which we strive to gain by them. And by this rule Experiments are an excellent preparation towards any habit or faculty of life whatsoever. For what thing, which can be effected by mortal Industry, can seem impossible to him who has been ingag'd in these Studies, which require such an indefatigable watchfulness? What can overcome his diligence, who has bin able to sustain with patience the escapes, the delays, the labyrinths of Nature? Whom the repetition of so many labors, so many failings, with which he meets, and so long attendance could not tire?

Another Principal mischief to be avoided, is the conformity of our Actions to times past, and not the present. This extravagance is generally imputed to studious men; and they cannot be wholly acquitted from it. For while they continue heaping up in their Memories the customs of past Ages, they fall insensibly to imitate them, without any manner of care how suitable they are to Times and Things. The grounds of this mistake will be worth our discovering, because in mens opinions it does so much prejudice to the learned part of the World. In the ancient Authors which they turn over, they find descriptions of Vertues more perfect than indeed they were: the Governments are represented better, and the wais of life pleasanter than they deserv'd. Upon this, these Bookish wise men strait compare what they read with what they see: and here beholding nothing so heroically transcendent, because they are able to mark all
the spots, as well as beauties of every thing, that is so close to their sight, they presently begin to despise their own times, to exalt the past, to contemn the virtues and aggravate the vices of their Country; not indeavoring to amend them, but by such examples as are now unpracticable, by reason of the alteration of Men and Manners.

For this defect, Experiments are a sovereign cure: They give us a perfect sight of what is before us; they bring us home to our selves; they make us live in England, and not in Athens or Sparta; at this present time, and not three thousand years ago: though they permit us to reflect on what has bin done in former Ages; yet they make us chiefly to regard and contemplate the things that are in our view. This certainly is conformable to the Design of Nature it self; which though it has fram'd our bodies in that manner, that we may easily upon occasion turn about to look behind us; yet it has plac'd the Eyes, the chief instruments of observation, not in our Backs, but in our Foreheads.

The last failing which is wont to be imputed to Learned men, is want of use, and fear of practice, and a conversing with things in their Studies, which they meet with no where else. It may now perhaps be thought, that an Experimenter is as inclinable to these weaknesses, as he that only contemplates; because they both keep out of the way, in the shadow; the one in his Library, arguing, objecting, defending, concluding with himself; the other in his Work-bome, with such Tools and Materials, whereof many perhaps are not publickly in use. Let us then consider which of them is most to be blam'd for conversing with matters unlike
like those that we meet with in *Civil affairs*? and which most abounds with *fears* and *doubts*, and mistaken ideas of *things*?

It cannot be denied, but the men of Reading do very much busy themselves about such *conceptions*, which are nowhere to be found out of their own Chambers. *The sense, the custom, the practice, the judgement of the world,* is quite a different thing from what they imagine it to be in private. And therefore it is no wonder, if when they come abroad into business, the sight of *Men, the Tumult and nois of Cities,* and the very brightness of Day itself affright them: *Like that Rhetorician,* who having bin us’d to declaim in the shade of a *School,* when he came to plead a true cause in the open *Air,* desir’d the Judges to remove their Seat under some roof, *because the light offended him."

But now on the other side, *the men of Works and Experiments* perhaps do not alwaies handle the very same *subjects* that are acted on the stage of the *World,* yet they are such as have a very great resemblance to them. *It is matter, a visible and sensible matter,* which is the *object of their labors:* *And the same is also us’d by men of practical lives.* This likeness of their *Employments will soon make the one excel in the other.* For it is far easier for him who has been conversant in one sort of *works,* to apply himself to any other; than for him who has only thought much, to turn a *man of Practice:* *as he that can paint the face of a Man or a Lion,* will much sooner come to draw any other Creature; than he who *has all the Rules of Limning in his head,* but never yet us’d his hand to lay on a *Colour.*

And as for the *terrors and misapprehensions* which...
commonly confound weaker minds, and make mens-hearts to fail and boggle at Trifles; there is so little hope of having them remov'd by Speculation alone, that it is evident they were first produc'd by the most contemplative men amongst the Ancients; and chiefly prevail'd of late years, when that way of Learning flourisht. The Poets began of old to impose the deceit. They to make all things look more venerable than they were, devis'd a thousand false Chimeras; on every Field, River, Grove, and Cave, they bestow'd a Fantasm of their own making: With these they amaz'd the world; these they cloath'd with what shapes they pleas'd; by these they pretended, that all Wars, and Counsels, and Actions of men were administred. And in the modern Ages these Fantastical Forms were reviv'd, and possess'd Christendom, in the very height of the Scholemens time: An infinite number of Fairies, haunted every house; all Churches were fill'd with Apparitions; men began to be frighted from their Gradles, which fright continu'd to their Graves, and their Names also were made the causes of scaring others. All which abuses if those acute Philosophers did not promote, yet they were never able to overcome; nay, even not so much as King Oberon and his invisible Army.

But from the time in which the Real Philosophy has appear'd, there is scarce any whisper remaining of such horrors: Every man is unshaken at those Tales, at which his Ancestors trembled: The course of things goes quietly along, in its own true channel of Natural Causes and Effects. For this we are beholden to Experiments; which though they have not yet completed the discovery of the true world, yet they have already vanquisht those wild inhabitants of the false worlds,
worlds, that us'd to astonish the minds of men. A Blessing for which we ought to be thankful, if we remember, that it is one of the greatest Curses that God pronounces on the wicked, That they shall fear where no fear is.

From what I have said, may be gather'd; That Experimental Philosophy will prevent mens spending the strength of their thoughts about Disputes, by turning them to Works: That it may well be attended by the united Labors of many, without wholly devouring the time of those that labor: That it will cure our minds of Romantic swelling, by shewing all things familiarly to them, just as large as they are: That it will free them from perversity, by not permitting them to be too peremptory in their Conclusions: That it accustoms our hands to things which have a neer resemblance to the business of life; and, That it draws away the shadows which either inlarge or darken human affairs. And indeed, of the usual titles by which men of business are wont to be distinguish'd, the Crafty, the Formal, and the Prudent; The Crafty may answer to the Empyric in Philosophy; that is, he is such a one who has a great collection of particular Experiences, but knows not how to use them but to base and low ends. The Formal man may be compar'd to the meer Speculative Philosopher: For he vainly reduces every thing to grave and solemn general Rules, without discretion, or mature deliberation. And lastly, the Prudent man is like him who proceeds on a constant and solid cours of Experiments. The one in Civil life neither wholly rejects the Wisdom of Ancient or Modern times: The other in Philosophy has the same reverence for former Ages, and regard for the present. The one does not rest upon empty.
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empty prudence, but designs it for action: the other does the same with his discoveries: upon a just, severe, and deliberate examination of things, they both rays their observations, which they do not suffer to lye idle, but use them to direct the actions, and supply the wants of human life.

Sect. XIII. Besides what I have said of the help, which experiments will bring to our public duties, and civil actions: I promis'd to add something, concerning the assistance, that they are able to give, towards the management of the privat motions, and passions of our minds: Of this I need say the less, because there is amongst the philosophers, a particular science appointed for this purpose, to prescribe rules for calming our affections, and conquering our vices. However I will not wholly pass it over in silence. But I will try in few words to make appear, that the Real Philosophy will supply 'our thoughts with excellent medicines, against their own extravagances, and will serve in some sort, for the same ends, which the moral professes to accomplish.

If we shall cast an eye on all the tempests, which arise within our breasts, and consider the causes, and remedies of all the violent desires, malicious envies, intemperate joyes, and irregular griefs, by which the lives of most men become miserable, or guilty: we shall find, that they are chiefly produc'd by idleness, and may be most naturally cur'd by diversion. Whatever Art shall be able to busy the minds of men, with a constant cours of innocent Works, or to fill them with as vigorous, and pleasant Images, as those ill impressions, by which they are deluded; it will certainly have a surer effect in the composing, and purifying
purifying of their thoughts, than all the rigid precepts of the Stoical, or the empty distinctions of the Peripatetic Moralists.

Now then it is requir'd in that study, which shall attempt, according to the force of Nature, to cure the diseases of the mind, that it keep it from idleness by full, and earnest employments, and that it possess it with innocent, various, lasting, and even sensible delights.

How active, and industrious the Art of Experiments ought to be, may be concluded from the whole tenour of my discourse: wherein I have often prov'd, that it can never be finish'd by the perpetual labours of any one man, nay scarce by the successive force of the greatest assembly.

That therefore being taken for granted, that it will afford eternal employments: It is also as true that its labors will contain the most affecting, and the most diverting Delights: and that thence it has power enough to free the minds of men from their vanities, and intemperance, by that very way which the greatest Epicure has no reason to reject, by opposing pleasure against pleasure.

And I dare challenge all the corrupt Arts of our Senses, or the devices of voluptuous wits, to provide fuller, more changeable, or nearer objects, for the contentment of mens minds. It were indeed to be wish'd, that severe virtue itself, attended only by its own Authority, were powerful enough to establish its domination. But it cannot be so. The corruptions, and infirmities of human Nature stand in need of all manner of allurements, to draw us to good, and quiet manners. I will therefore propose for this end this course of study, which will not affright us with
with rigid precepts, or sou'r looks, or peevish commands, but consists of sensible pleasure, and besides will be most lasting in its satisfaction, and innocent in its remembrance.

What raptures can the most voluptuous men fancy to which these are not equal? Can they relish nothing but the pleasures of their senses? They may here enjoy them without guilt or remors. Are they affrighted at the difficulties of Knowledge? Here they may meet with a Study, that as well suits the most negligent minds, as the most industrious. This consists of so many Works, and those so obvious, and facil, that the most laborious will never find cause to be idle, and the most idle may still have something to do with the greatest ease. In this they need not weary themselves by searching for matter. Whatever they feel, or see, will afford them Observations. In this there is no tedious preparation requir'd to fit them for such indeavors. As soon as they have the use of their bands, and eies, and common sense, they are sufficiently furnish'd to undertake them: Though we cannot comprehend the Arts of men without many previous Studies, yet such is the indulgence of Nature, that it has from the beginning, out of its own store, sufficiently provided every man, with all things, that are needful for the understanding of itself.

Thus neither the sensual mind, has any occasion to contemn Experiments as unpleasant, nor the idle as burdensome, or intollerable, nor the virtuous as unworthy of his labors. And the same influence they may have, on all other moral imperfections of human Nature. What room can there be for low, and little things in a mind so usefully and successfully employd?

What
What ambitious disquiets can torment that man, who has so much glory before him, for which there are only requir'd the delightful works of his hands? What dark, or melancholy passions can overshadow his heart, whose senses are always full of so many various productions, of which the least progress, and success, will affect him with an innocent joy? What anger, envy, hatred, or revenge can long torment his breast, whome not only the greatest, and noblest objects, but every sand, every pible, every grass, every earth, every fly can divert? To whom the return of every season, every month, every day, do suggest a circle of most pleasant operations? If the Antients prescrib'd it as a sufficient remedy, against such violent passions, only to repeat the Alphabet over: whereby there was leisure given to the mind, to recover itself from any sudden fury: then how much more effectual medicines, against the same distempers, may be fetch'd from the whole Alphabet of Nature, which represents itself to our consideration, in so many infinit volumes!

I will now proceed to the weightiest, and most sect. XIV. solemn part of my whole undertaking; to make a defence of the Royal Society, and this new experimental learning, in respect of the Christian Faith. I am not ignorant, in what a slippery place I now stand; and what a tender matter I am enter'd upon. I know that it is almost impossible without offence, to speak of things of this Nature, in which all mankind, each country, and now almost every family, do so widely disagree among themselves. I cannot expect that what I shall say will escape misinterpretation, though it be spoken with the greatest simplicity,
plcity, and submission, while I behold that most men do rather value themselves, and others, on the little differences of Religion, than the main substance itself; and while the will of God is so variously distracted, that what appears to be Piety to some Christians, is abhorred as the greatest superstition, and hereby by others.

However to smooth my way as much as I can, and to prepare all our several Spiritual Interests, to read this part with some tolerable moderation; I do here in the beginning most sincerely declare, that if this design should in the least diminish the Reverence, that is due to the Doctrine of Jesus Christ, it were so far from deserving protection, that it ought to be abhorred by all the Politic, and Prudent; as well as by the devout Part of Christendom. And this I profess, I think they were bound to do, not only from a just dread of the Being, the Worship, the Omnipotence, the Love of God, all which are to be held in the highest veneration: but also out of a regard to the peace, and prosperity of men. In matters that concern our opinions of another World, the least alterations are of wonderful hazard: how mischievous then would that enterprise be, whose effects would abolish the command of Conscience, the belief of a future life; or any of those Heavenly Doctrines, by which not only the eternal condition of men is secured, but their natural Reason, and their Temporal Safety advanced? Whoever shall impiously attempt to subvert the Authority of the Divine Power, on false pretences to better Knowledge, he will unsettle the strongest foundations of our hopes: he will make a terrible confusion in all the offices, and opinions of men: he will destroy the most prevailing Argument to virtue: he
he will remove all human actions, from their firmest center: he will even deprive himself, of the prerogative of his Immortal Soul; and will have the same success, that the Antient Fables make those to have had, who contended with their Gods, of whom they report, that many were immediately turn'd into Beasts.

With these apprehensions I come to examin the Objections, which I am now to satisfy: and having calmly compar'd the Arguments of some devout men against Knowledge, and chiefly that of Experiments; I must pronounce them both, to be altogether inoffensive. I did before affirm, that the Royal Society is abundantly cautious, not to intermeddle in Spiritual things: But that being only a general plea, and the question not lying so much on what they do at present, as upon the probable effects of their Enterprise; I will bring it to the test through the chief Parts of Christianity; and shew that it will be found as much averse from Atheism, in its issue and consequences, as it was in its original purpose.

The public Declaration of the Christian Religion, is to propose to mankind, an infallible way to Salvation. Towards the performance of this happy end, besides the Principles of Natural Religion, which consists in the acknowledgment and Worship of a Deity: It has offer'd us the merits of a glorious Saviour: By him, and his Apostles Ministry, it has given us sufficient Examples, and Doctrines to acquaint us with divine things, and carry us to Heven. In every one of these, the Experiments of Natural things, do neither darken our eyes, nor deceive our minds, nor deprave our hearts.

X x 2

First
First there can be no just reason assign'd, why an Experimenter should be prone to deny the essence, and properties of God, the universal Sovereignty of his Dominion, and his Providence over the Creation. He has before him the very same argument, to confirm his judgment in all these; with which he himself is wont to be abundantly satisfy'd, when he meets with it in any of his Philosophical Inquiries. In every thing that he tries, he believes, that this is enough for him to rest on, if he finds, that not only his own, but the universal Observations of men of all times and places, without any mutual conspiracy have consented in the same conclusion. How can he then refrain from embracing this common Truth, which is witness'd by the unanimous approbation of all Countries, the agreement of Nations, and the secret acknowledgment of every man's breast?

'Tis true his employment is about material things. But this is so far from drawing him to oppose invisible Beings, that it rather puts his thoughts into an excellent good capacity to believe them. In every work of Nature that he handles, he knows that there is not only a gross substance, which presents itself to all mens eyes; but an infinit subtily of parts, which come not into the sharpest sense. So that what the Scripture relates of the Purity of God, of the Spirituality of his Nature, and that of Angels, and the Souls of men, cannot seem incredible to him, when he perceives the numberless particles that move in every mans Blood, and the prodigious streams that continually flow unseen from every Body: Having found that his own senses have been so far assisted by the Instruments of Art, he may soonest admit,
mit, that his mind ought to be rays'd higher, by a
Heavenly light, in those things wherein his senses do
fall short. If (as the Apostle says) the invisible things
of God are manifested by the visible; then how much
stronger Arguments has he for his belief, in the
eternal power, and Godhead, from the vast number
of Creatures, that are invisible to others, but are
expos'd to his view by the help of his Experiments?

Thus he is prepar'd to admit a Deity, and to em-
brace the consequences of that concession. He is
also from his Experiments as well furnisht'd with Ar-
guments to adore it: he has always before his eyes the
beauty, contrivance, and order of Gods Works: From
hence, he will learn to serve him with all reverence,
who in all that he has made, consult'd Ornament, as
well as Use.

From hence he will best understand the infinit di-
stance between himself, and his Creator, when he
finds that all things were produc'd by him: whereas
he by all his study, can scarce imitate the least effects,
nor hasten, or retard the common cours of Nature.
This will teach him to Worship that Wisdom, by which
all things are so easily sustaine'd, when he has look'd
more familiarly into them, and beheld the chances,
and alterations, to which they are expos'd. Hence
he will be led to admire the wonderful contrivance
of the Creation; and so to apply, and direct his
praises aright: which no doubt, when they are of-
fer'd up to Heaven, from the mouth of one, who has
well studied what he commends, will be more suta-
ble to the Divine Nature, than the blind applause
of the ignorant. This was the first service, that Adam
perform'd to his Creator, when he obey'd him in mu-
tering,
string, and naming, and looking into the Nature of all the Creatures. This had been the only Religion, if men had continued innocent in Paradise, and had not wanted a Redemption. Of this the Scripture itself makes so much use, that if any devout man shall reject all Natural Philosophy, he may blot Genesis, and Job, and the Psalms, and some other Books, out of the Canon of the Bible. God never yet left himself without witness in the World: And it is observable, that he has commonly chosen the dark and ignorant Ages, wherein to work Miracles; but seldom or never the times when Natural Knowledge prevail’d: For he knew there was not so much need to make use of extraordinary signs, when men were diligent in the works of his hands, and attentive on the impressions of his footsteps in his Creatures.

It is almost a proverbial speech, That the most Learned Ages are still the most Atheistical, and the ignorant most devout. Whoever devis’d this distinction at first, the true Piety is little beholden to him for it: For instead of obeying the Jewish Law, which forbids us to offer up to God a Sacrifice that has a Blemish, he has bestow’d the most excellent of all the Race of men on the Devil; and has only assign’d to Religion those Men and those Times, which have the greatest Blemish of human Nature, even a defect in their Knowledge and Understanding.

If there can be found any colour for this observation, That the light of Reason should produce a spiritual darkness; it can only then hold good, when the knowledge of men, and not that of Nature abounds. Whether the first be true, or no, let the Politicians consider: But of the second, this is a sufficient conviction, that in most Countries God has been worship’d
ship'd in a form proportionable to that kind of Natural Philosophy in which they excell'd. In Persia, where the skill of the heavenly Motions first began, they had their Temples on the Top of Hills, and open to the Air. In Egypt they had the best opportunities of studying the Nature of living Creatures; by reason of that variety which their River and their Land produc'd. And their Religious Mysteries were contain'd in Hieroglyphics, which were most of them borrow'd from Beasts. And why should Natural Philosophy be now condemned, for contempt of all Divinity, when of old it did rather incline them to Superstition, which is the other extreme? It is true indeed, by that knowledge which they had of many Creatures, they were drawn to adore them; but that was only because it was imperfect: If they had understood them thoroughly, they had never done it: So true is that saying of my Lord Bacon, That by a little knowledge of Nature men become Atheists; but a great deal returns them back again to a sound and Religious mind. In brief, if we rightly apprehend the matter, it will be found, that it is not only sottishness, but prophaness, for men to cry out against the understanding of Nature: For that being nothing else but the instrument of God, whereby he gives being and action to things; the knowledge of it deserves so little to be esteem'd impious, that it ought rather to be reckon'd as Divine.

But the chief part of our Religion, on which the certainty of all the rest depends, is the Evangelical Experiments of Salvation by Jesus Christ. In this there is not prejudicion; from which he that converses much with Natural to the doctrine, can be thought to be more avers than others; nay,
The HISTORY of the

may, to which he may not be concluded to be more
inclinable, on this very account; seing it has all
bin prov'd to him his own way. Had not the appear-
ance of Christ bin strengthen'd by undeniable signs of
almighty Power, no age nor place had bin oblig'd to
believe his Message. And these Miracles with which
he asserter'd the Truths that he taught (if I might be
allow'd this boldness in a matter so sacred) I would
even venture to call Divine Experiments of his God-
head.

What then can there be in all this Doctrine, at
which a Real and impartial Inquirer into Natural
Things, should be offended? Does he demand a
Testimony from Heaven? he has it: He reads effects
produc'd, that did exceed all mortal skill and force:
And of this he himself is a better judge than others:
For to understand aright what is supernatural, it is a
good step first to know what is according to Nature.

Does he require that this should be testified, not
by men of Craft or Speculation; but rather by men of
Honesty, Trades, and Business? The Apostles were such.
Will he not consent to any mans Opinions, unless he
sees the operations of his hands agree with them? 
Christ himself requires no more of any of his Follow-
ers: For he commanded his Disciples not to believe
him, but the Works that he did. Does he think that
it is the most honorable Labor to study the benefit
of Mankind? to help their infirmities? to supply
their wants? to ease their burdens? He here may be-
hold the whole Doctrine of Future Happiness, intro-
duc'd by the same means, by feeding the Hungry, by
curing the Lame, and by opening the eyes of the
Blind: All which may be call'd Philosophical Works,
perform'd by an Almighty band.

What
What then can hinder him from loving and admiring this Saviour, whose Design is so conformable to his own, but his Ability so much greater? What jealousy can he have of an imposture in this Messiah? Who though his Doctrine was so pure and venerable, though his Life was so blameless, though he had the power of Heaven and Earth in his hands, though he knew the thoughts of men, and might have touch'd and mov'd them as he pleas'd; did yet not rely on his Doctrine, on his Life, on the irresistible assistance of Angels, or on his own Divinity alone; but stoop'd to convince men by their Senses, and by the very same cours by which they receive all their Natural Knowledge.

The last Doctrinal part of our Religion, I shall mention, consists of those Doctrines which have been long since deduc'd by consequences from the Scripture, and are now settled in the Body of that Divinity, which was deliver'd down to us by the Primitive Doctrine of Church, and which the generality of Christendom embraces. It may here be suggested, that the sensible knowledge of things may in time abolish most of these, by insinuating into mens minds, that they cannot stand before the impartiality of Philosophical Inquisitions. But this surmise has no manner of foundation. These Superstructures are of two sorts: either those of which a man may have a clear apprehension in his thoughts, upon a rational account, and which are intelligible to any ordinary Reader; or else such as exceed the common measures of our Reason and Senses. There will be no fear that an Experimenter should reject the first, seeing they may be conceiv'd by the meanest capacity, and have that stamp upon Y y them,
them, which he for the most part esteems the character of Truth; that they are vulgar. But now towards the consenting to the last, there is nothing better than to believe them in gross: And for this he is as well prepared as any other Philosopher. If we suppose him sufficiently convinced of the authority of the Deliverer (as I have already shown he may be) he cannot be suspected for disavowing his word, though never so mystical; or for resisting the voice of him, whose Arm he has found to be Omnipotent. This submission of his judgment he may make, notwithstanding the severity of his Inquiries: And the most subtle Speculative man in the world can do no more. After all his acute Arguings in Divinity, he can never render any one point, which is the proper object of Faith, to be plain, and equal, and expressible to our Reason. What good can he then do? being he is not able to make it any way fitter for our Faith, by all his Transcendental Notions, than it was before, on the base account of the wondrous Works of the Author.

This is the place in which the Peripatetic Philosophy has long triumphed: But I cannot imagine on what right. The spiritual and supernatural part of Christianity no Philosophy can reach: And in the plain things there is no need of any at all: So that it is excluded on both accounts. In some Doctrines it is useless, by reason of their sublimity; in others, because of their commonness. How small assistance it brings, may be seen in those very points, in which its Empire seems most to be placed, in God's Decrees, his Immateriality, his Eternity, and the holy Mystery of the Trinity: In all which we are only brought into a more learned darkness by it; and in which unfathomable Depths
Depths a plain Believing is at last acknowledg'd by all to be our only Refuge. The truth is, notwithstanding the great stir they have made about Religion, if we had only follow'd their light, we had still worshipp'd the Creator and Redeemer of the World, under the same title by which their Prædecessors did formerly at Athens, as the Unknown God.

This I have urg'd so far, because I am confident that the reducing of Christianity to one particular Sect of Philosophy, and confining it to that, is one of the most destructive Engines that ever was manag'd against it. Of this the Church of Rome for her share has already found the ill effects; And the danger is apparent: For by this means the benefit of Religion will become very narrow, seeing where Reason takes place it will only convince them who are of the same opinions in Philosophy with those that convert them. And also (that which is worse) if ever by any fate of Times, or change of Governments, or succession of new Arts, that Sect shall chance to be quite broken, the Doctrine of Christ, relying upon it, were inevitably ruin'd, unless God were pleas'd to support it a supernatural way, or to restore it again by new Miracles. Religion ought not to be the subject of Disputations: It should not stand in need of any devices of reason: It should in this be like the Temporal Laws of all Countries, towards the obeying of which there is no need of Syllogisms or distinctions; nothing else is necessary but a bare promulgation, a common apprehension, and sense enough to understand the Grammatical meaning of ordinary words. Nor ought Philosophers to regret this divorce: seeing they have almost destroy'd themselves, by keeping Christianity so long under their guard: By fetching Religion out of the Church,
and carrying it Captive into the Schools, they have made it suffer banishment from its proper place; and they have withal thereby very much corrupted the substance of their own Knowledge: They have done as the Philistims by setting on the Ark: who by the same action, depriv'd the People of God of their Religion, and also brought a Plague amongst themselves.

Sect. XIX.

Thus far I trust it will be confess'd, that Experiments are unblameable. But yet there is much more behind, of which many pious men are wont to express their jealousy. For though they shall be brought to allow, that all these Doctrines, which I have nam'd, may seem to remain safe amidst the studies of Natural things: yet they still whisper, that they may chance by degrees, to make the sincerity of devotion appear ridiculous, and to bring the strictness of holy life out of fashion: and that so they will silently, and by piece-meals, demolish Religion, which they dare not openly encounter. I will therefore next endeavor the removal of these scruples, though I sufficiently understand, that it is a very difficult Work, to confute such popular, and plausible errors, which have the pretence of the cause of God to confirm them.

The chief substance of Real, and Sober Piety, is contain'd in the devout observation of all those ways, whereby God has bin pleas'd to manifest his Will; and in a right separation of our minds from the lusts, and desires of the World. The most remarkable means, whereby he has made known his pleasure, are those, which have been fix'd, and reveal'd in his Word; or else the extraordinary signs of his Authority: and Command.
Concerning our acknowledgment of his reveal'd Will in the Scripture, I have already spoken. And our obedience to the latter consists chiefly of two kinds: an humble submission to Divine Prophecies, and a careful observance of all remarkable Providences. In both which Experimental Philosophy may well be justify'd. It may perhaps correct some excesses, which are incident to them: But it declares no enmity against the things themselves.

The sum of the whole Doctrine of Prophecies is this, that the Great Creator of the World has the Prærogative of foreseeing, appointing, and praedicting all future Events: that he has often in former Ages made use of this power, by the Visions, and raptures of holy men inspir'd from above: that his infinit Wisdom has still the like ability to do the same: that whenever such praedictions are accompanied, with undeniable Testimonies of their being sent from Heaven, they ought to be prafer'd before all human Laws.

The true Foundation of Divine Prodigies, is much of the same Nature with the other. It relies on these suppositions, that all the Creatures are subject to God's Word, by which they were made: that he can alter their Courses, exalt, or destroy their Natures, and move them to different ends from their own, according to his pleasure: that this he has often done heretofore: that still his Arm it not weaken'd, nor the same omnipotence diminish'd: that still he may change the wonted Law of the Creation, and dispole of the Beings, and motions of all things, without controul: and that when this is done, it is with a peculiar design of punishing, or rewarding, or forewarning mankind.
The HISTORY of the

To the belief and assertion of these Doctrines, we are oblig'd by the very end of Religion itself. But yet their counterfeit colors have seduced many virtuous minds into manifold mischiefs.

The mistakes about Prophecies may arise, either from our abusing of the old, or a vain setting up of new. We err in the first, when we translate the ancient Prophecies from those times, and Countries, which they did properly regard, to others, which they do not concern. And we offend in the second, when we admit of New Prophetical Spirits in this Age, without the uncontrollable tokens of Heavenly Authority.

We are guilty of false interpretations of Providences, and Wonders; when we either make those to be Miracles that are none; or when we put a false sense on those that are real, when we make general events to have a privat aspect, or particular accidents to have some universal signification. Though both these may seem at first to have the strictest appearance of Religion, yet they are the greatest usurpations on the secrets of the Almighty, and unpardonable presumptions on his high Prerogatives of Punishment, and reward.

Sect. XX.

Experiments will not destroy the Doctrine of Prophecies, and Prodigies.

And now if a moderating of these extravagances must be esteem'd prophane, I profess, I cannot absolve the Experimental Philosopher. It must be granted, that he will be very scrupulous, in believing all manner of Commentaries on Prophetical Visions, in giving liberty to new predictions, and in assigning the causes, and marking out the paths of God's Judgments, amongst his Creatures.

He cannot suddenly conclude all extraordinary events
events to be the immediat Finger of God, because he familiarly beholds the inward workings of things: and thence perceives that many effects, which use to affright the Ignorant, are brought forth by the common Instruments of Nature. He cannot be suddenly inclin'd, to pass censure on mens eternal condition, from any Temporal Judgments, that may befall them; because his long convers with all matters, times, and places, has taught him, the truth of what the Scripture says, that all things happen alike to all. He cannot blindly consent to all imaginations of devout men, about future Contingencies: seing he is so rigid, in examining all particular matters of Fact: He cannot be forward to assent to Spiritual Raptures, and Revelations: becaus he is truly acquainted with the Tempers of mens Bodies, the Composition of their Blood, and the power of Fancy: and so better understands the difference, between Diseases, and Inspirations.

But in all this, he commits nothing, that is Irreli-
gious. 'Tis true, to deny that God has heretofore warn'd the World of what was to come, is to contra-
dict the very Godhead itself: But to reject the sense, which any privat man shall fasten to it, is not to dis-
dain the Word of God, but the opinions of men like our selves. To declare against the possibility, that new Prophets may be sent from Heaven, is to insinuat that the same infinit Wisdom, which once shew'd it-
sell that way, is now at an end. But to flight all pretenders, that come without the help of Miracles, is not a contempt of the Spirit, but a just circumpe-
tion, that the Reason of men be not over-reach'd. To deny that God directs the cours of human things, is stupidity: But to hearken to every Prodigy, that men
men frame against their Enemies, or for themselves, is not to reverence the Power of God, but to make that serve the Passions, and interests, and revenges of men.

It is a dangerous mistake, into which many Good men fall; that we neglect the Dominion of God over the World, if we do not discover in every Turn of human Actions many supernatural Providences, and miraculous Events. Whereas it is enough for the honor of his Government, that he guides the whole Creation, in its wonted course of Causes, and Effects: as it makes as much for the reputation of a Prince’s wisdom, that he can rule his subjects peaceably, by his known, and standing Laws, as that he is often forc’d to make use of extraordinary justice to punish, or reward.

Let us then imagin our Philosopher, to have all slowness of belief, and rigor of Trial, which by some is miscall’d a blindness of mind, and hardness of heart. Let us suppose that he is most unwilling to grant that any thing exceeds the force of Nature, but where a full evidence convinces him. Let it be allow’d, that he is always alarm’d, and ready on his guard, at the noise of any Miraculous Event; lest his judgment should be surpriz’d by the disguises of Faith. But does he by this diminish the Authority of Antient Miracles? or does he not rather confirm them the more, by confining their number, and taking care that every falsehood should not mingle with them? Can he by this undermine Christianity, which does not now stand in need of such extraordinary Testimonies from Heaven? or do not they rather in danger it, who still venture all its Truths on so hazardous a chance? Who require a continuance of Sign,
Signs, and Wonders, as if the works of our Savior and his Apostles had not bin sufficient: who ought to be esteem'd the most carnally minded? the Enthusiast, that pollutes his Religion, with his own passions? or the Experimenter, that will not use it to flatter, and obey his own desires, but to subdue them? who is to be thought the greatest enemy of the Gospel? He that loads mens Faiths, by so many improbable things, as will go neer to make the reality itself suspected? or he that only admits a few Arguments, to confirm the Evangelical Doctrines, but then chuses those, that are unquestionable? It cannot be an ungodly purpose to strive to abolish all Holy Cheats: which are of fatal consequence, both to the Deceivers, and those that are deceiv'd: to the Deceivers, because they must needs be Hypocrites, having the artifice in their keeping: to the deceiv'd, because if their eyes shall be ever open'd, and they chance to find, that they have been deluded in any one thing, they will be apt not only to reject that, but even to despise the very Truths themselves, which they had before bin taught by those deluders.

It were indeed to be confess'd, that this severity of Censure on Religious things, were to be condemn'd in Experimenters, if while they deny any wonders, that are falsely attributed to the True God, they should approve those of Idols or false Deities. But that is not objected against them. They make no comparison between his power, and the works of any others, but only between the several ways of his own manifesting himself. Thus if they lessen one heap yet they still increas the other: In the main they diminish nothing of his right. If they take from the Prodigies, they add to the ordinary Works of the same
same Author. And those ordinary Works themselves, they do almost raise to the height of Wonders, by the exact Discovery, which they make of their excellencies: while the Enthusiast goes neer to bring down the price of the True, and Primitive Miracles, by such a vaft, and such a negligent augmenting of their number.

By this I hope it appears, that this Inquiring, this scrupulous, this incredulous Temper is not the disgrace, but the honor of Experiments. And therefore I will declare them to be the most seasonable study, for the present Temper of our Nation. This wild amusing men's minds, with Prodigies, and conceits of Providences, has been one of the most considerable causes of those spiritual distractions, of which our Country has long bin the Theater. This is a vanity, to which the English seem to have bin always subject above others. There is scarce any Modern Historian, that relates our Forein Wars, but he has this Objection against the disposition of our Countrymen, that they us'd to order their affairs of the greatest importance, according to some obscure Omens, or predictions, that pass'd about amongst them, on little or no foundations. And at this time, especially this last year, this gloomy, and ill-boding humor has prevail'd. So that it is now the fittest season for Experiments to arise, to teach us a Wisdome, which springs from the depths of Knowledge, to shake off the Shadows, and to scatter the mist, which fill the minds of men with a vain consternation. This is a work well-becoming the most Christian Profession. For the most apparent effect, which attended the passion of Christ, was the putting of an eternal silence,
on all the false oracles, and displeased inspirations of Antient Times.

There have bin'tis true, some peculiar occasions, wherein God was pleas'd to convince the World from Heven, in a visible manner. But if we consider the Arguments that us'd to move him to it, we may conclude, that such wonderful signs are not often now to be expected.

He has either done it, in Times of gross ignorance, or in the beginning of a new way of Religion, or for the peculiar punishment of some prevailing wickedness: Upon the account of the two first, we have no reason to expect Wonders in this Age: because all sorts of Knowledge do so much abound; and because we have a Religion already establish'd, against which the Gates of Hell shall never prevail.

The Third Time has bin, when God has taken to himselfe, the Exemplary Punishment of some haynous Sin. From this indeed our Age is no more exempted, than it is free from those vices, that are wont to provoke the Divine Vengeance. This then we confess, that even at this present, God may declare himselfe, against the Iniquities of men, by the supernatural Tokens of his displeasure. But yet the Interpretation of such punishments ought to be handled, with the greatest tenderness. For as it is said of the last, and General Judgment, that no man knows the time, when it shall happen; so we may also affirm of these particular Judgments: that there is no man, who understands the Circumstances, or occasions of their infliction, but they are one of the deepest parts of God's unsearchable Counsails.

Whenever therefore a heavy calamity falls from Heven on our Nation, a universal Repentance is requir'd;
quir'd; but all particular applications of privat men, except to their own hearts, is to be forborn. Every man must bewail his own Transgressions, which have increased the Public misery. But he must not be too hasty, in assigning the Causes of Plagues, or Fires, or inundations to the sins of other men. Whoever thinks that way to repent, by condemning the miscarriages of those parties, that differ from his own, and by reproving them, as the Authors of such mischief, he is grossly mistaken: For that is not to repent, but to make a Satyr: That is not an Act of humiliation, but the greatest Spiritual Pride.

It is indeed a disgrace to the Reason, and honor of mankind, that every fantastical Humorist should presume to interpret all the secret Ordinances of Heaven; and to expound the Times, and Seasons, and Fates of Empires, though he be never so ignorant of the very common Works of Nature, that lye under his Feet. There can be nothing more injurious than this, to mens public, or privat peace. This withdraws our obedience, from the true Image of God the rightfull Soveraign, and makes us depend on the vain Images of his pow'r, which are fram'd by our own imaginations. This weakens the constancy of human actions. This affects men with fears, doubts, irresolutions, and terrors. It is usually observ'd, that such presaging, and Prophetical Times, do commonly fore-run great destructions, and revolutions of human affairs. And that it should be so is natural enough, though the presages, and prodigies themselves did signify no such events. For this melancholy, this frightful, this Astrological humor disarms mens hearts, it breaks their courage; it confounds their Councils, it makes them help to bring such
such calamities on themselves: First they fancy, that such ill accidents must come to pass: And so they render themselves fit subjects to be wrought upon, and very often become the instruments to bring those effects about, which they fondly imagin'd were inevitably threaten'd them from Heven.

The last accusation concerns that which is necessary to a holy life, the mortifying of our earthly desires. And here the men of a retir'd, and severe devotion are the loudest: For they tell us, that we cannot conquer, and despise the World while we study it so much; that we cannot have sufficient leisure to reflect on another life, while we are so taken up about the Curiosities of this: that we cannot be strict enough in correcting the irregularities of our own thoughts, while we give them so much liberty to wander, and to pleasant a Rode wherein to travail; and that it is in vain to strive after the Purity, and Holiness of our minds, while we suffer them to spend so much time, on the labors of our Senses. This Objection appears at first sight somewhat terrible: But I come the more boldly to answer it, because there are involv'd in the same indictment, all the most innocent Arts, and civil Actions of men, which must either stand, or fall with Experiments in this Trial.

First then I will allege, that if this sort of study should be acknowledg'd not to be proper, for the promoting of the severer offices of Christianity, yet it would sufficiently recompence for that, by the assistance, it may bring to some other kinds of Christian Virtues: If it shall not fill our minds, with the most mortifying Images, which may rise from the terrors...
of God's Justice, yet it will make amends for that, by inclining us to adore his Goodness. If it suits us not so well for the secrecy of a Closet: It makes us serviceable to the World. If it shall not seem to contribute towards Godly Sorrow, or Contrition: It will give us more opportunities of Charity, Affability, Friendship, and Generosity, which are all of them divine Graces, as well as Faith, and Repentance.

It is a great error to think that Religion does only consist in one sort of Duties. It is as various as the Dispositions, the Qualities, the Conditions of men: With some, the severe, the strict, the retir'd are best: with others, the bountiful, the assable, the cheerful, the friendly: Of both which kinds I will not say whether is to be prefer'd: But this is true, that while the first are chiefly limited to the regulating of our own Hearts, the influence of the last extends much farther; to spread the same of the Gospel in the World; to make it appear lovely in the eyes of all beholders; and to allure them to submit to the honorableness, the gentleness, the easiness of its yoke. And this methinks is evident in our Saviour's life: For whenever he intended to convert any to his Faith, he did it by some visible Good Work, in the sight of the Multitude. But he never gain'd any Disciple by the conflicts, which he was pleas'd to undergo in his own mind; for he perform'd his Fast, and his Agony alone, in the Wilderness, and the Garden.

In the next place I will affirm, That it is improbable that even the hardest and most rigorous parts of Mortification itself should be injur'd by these Studies more than others; seeing many duties of which it is compos'd, do bear some resemblance to the qualifications
cations that are requisite in Experimental Philosophers. The spiritual Repentance is a careful survey of our former Errors, and a resolution of amendment. The spiritual Humility is an observation of our Defects, and a lowly sense of our own weakness. And the Experimenter for his part must have some Qualities that answer to these: He must judge aright of himself; he must misdoubt the best of his own thoughts; he must be sensible of his own ignorance, if ever he will attempt to purge and renew his Reason: So that if that be true, which is commonly observ’d, that men are wont to prove such kinds of Christians as they were men before; and that Conversion does not destroy, but only exalt our Tempers; it may well be concluded, that the doubtful, the scrupulous, the diligent Observer of Nature, is neerer to make a modest, a severe, a meek, an humble Christian, than the man of Speculative Science, who has better thoughts of himself and his own Knowledge.

But I need not take so great a compass in this vindication, when it may be fairly maintain’d, that the true and unfaire’d Mortification is not at all inconsistent with mens consulting of their happiness in this world, or being emplo’ed about earthly affairs. The honest pursuit of the conveniences, decences, and ornaments of a mortal condition, by just and regular ways, is by no means contradictory to the most real and severe duties of a Christian. It is true indeed, the irregular prosecution of such things is an offence to Religion: But so it is also to right Reason, and Nature itself.

It is a wrong conception of the state of Grace, if men believe, that when they enter upon it, they must presently cast away all the thoughts and desires of
of humanity. If this were so, to sanctifie our Natures were not to renew, but to destroy them. When we are commanded to put off the old man, we are not injoin'd to renounce our Faculties of Reason. When we are bidden not to think our own thoughts, it is not intended that we should forbear all Natural Actions and Inclinations. Such Scriptures as these are to be understood in a moderate sense: By such expressions the irregularity of the Lust, and not the Natural Desire is condemn'd: The Piety and Innocence of our Lives, and not the utter change of our Estate, is recommended. Seeing the Law of Reason intends the happiness and security of mankind in this life; and the Christian Religion pursues the same ends, both in this and a future life; they are so far from being opposite one to another, that Religion may properly be stily'd the best and the noblest part, the perfection and the crown of the Law of Nature.

I will therefore first demand, Whether it be not lawful for the strictest Christian to provide for the necessities of this life? This Request is modest enough: For if they deny it, they will reduce mankind into a condition which is literally worse than that of the Beasts that perish; seeing to them it is natural to seek out for all the ways of their own preservation. I will go on to ask them, Whether it be a breach of the Law of Christianity to labor for the advantages of Living, which are injoy'd by others? If this be refused me, we shall not deprive it of that honor which now justly belongs to it, that there is little civility at present amongst men without the Pale of the Christian Church.

But in few words, let them tell me, Whether it be indispensably necessary for us to be always thinking of
of hevenly things? If so, how far short were the
very Apostles of this character of Sanctity, which
these men would prescribe us? What Traffic, what
Commerce, what Government, what secular Em-
ployment could be allow'd? Where should we at last
make an end of refining? What would become of all
the men of Trade themselves, of whom this Age has
shewn so many pretenders to the purest Religion?

Let it only therefore be granted, that we are Men,
and not Angels: Let it be confess'd, that there may
be an excess, as well as defect, in mens opinions of ho-
liness: And then I will make no scruple to say, that
the Philosopher defiles not his mind when he labors in
the works of Nature; that the Diversion they give
him, will stand with the greatest constancy, and the
delight of pursuing them, with the truth and reality
of Religion. But to say no more, How can it be ima-
gin'd to be a sinful and carnal thing, to consider the
objects of our Senses; when God, the most Spiritual
Being, did make them all? Since they first were con-
ceiv'd in his unspotted mind, why may they not in-
ocently enter into ours? For if there be any pollu-
tion which necessarily flows from thinking of them,
it might as well be concluded to stick on the Author,
as on the Souls of them that only observe them.

And now having insisted so long on the parts of the
Christian Religion in general, it will be less needful
that I should be large in vindicating this Design from
the imputation of being prejudicial to the Church of
England: For this has the same Interest with That,
and differs in nothing from its Primitive Pattern, but
only in the addition of some circumstances, which
make it fit for this Age and this Place: And therefore
they

Sect. XXIII. Experi-
ments not
dangerous to
the Church
of England.
they will both be strengthen'd by the same benefits, and weaken'd by the same mischiefs.

What I have then to add concerning our Church, shall be compriz'd in these particulars: That it can never be prejudic'd by the light of Reason, nor by the improvements of Knowledge, nor by the advancement of the Works of men's hands.

For the proof of the First, it will be sufficient to consider its True Design, what Opinions it principally incounters, and by what Arguments it ought to defend itself.

The true and certain interest of our Church is to derive its Doctrine from the plain and unquestion'd parts of the Word of God, and to keep itself in a due submission to the Civil Magistrate. The Extremes which it opposes are implicit Faith, and Enthusiasme: And it is a great mistake, if men think it cannot be maintain'd against these, but by the mutual Arguments of its Enemies; that it cannot withstand the Separatists, but by the Authority of the Church of Rome; nor different from the Church of Rome, but on the Tenents of the Separatists. The grounds on which it proceeds are different from Both: And they are no other but the Rights of the Civil Power, the imitation of the First uncorrupt Churches, and the Scripture expounded by Reason: From whence may be concluded, that we cannot make War against Reason, without undermining our own strength, seing it is the constant weapon we ought to employ.

From this I will farther urge, That the Church of England will not only be safe amidst the consequences of a Rational Age, but amidst all the improvements of Knowledge, and the subversion of old Opinions about Nature, and introduction of new ways of
of Reasoning thereon. This will be evident, when we behold the agreement that is between the present Design of the Royal Society, and that of our Church in its beginning. They both may lay equal claim to the word Reformation; the one having compass'd it in Religion, the other purposing it in Philosophy. They both have taken a like course to bring this about; each of them passing by the corrupt Copies, and referring themselves to the perfect Originals for their instruction; the one to the Scripture, the other to the large Volume of the Creatures. They are both unjustly accus'd by their enemies of the same crimes, of having forsaken the Ancient Traditions, and ventur'd on Novelties. They both suppose alike, that their Ancestors might err; and yet retain a sufficient reverence for them. They both follow the great Precept of the Apostle, of trying all things. Such is the Harmony between their Interests and Tempers. It cannot therefore be suspected, that the Church of England, that arose on the same method, though in different works; that Heroically pass'd thorow the same difficulties, that relies on the same Sovereign's Authority, should look with jealous eyes on this Attempt, which makes no change in the principles of mens consciences, but chiefly aims at the increases of Inventions about the works of their hands.

This was the last Particular in this Subject which I undertook to make good, That our Church can never be impair'd by the growth of the useful Arts of Life. But now I come nearer to it, I find that I may safely omit it: For the thing itself is so manifest, that there can be no ground of raising a Question about it. If our Church should be an Enemy to Commerce, Intelligence, Discovery, Navigation, or any sort of Mechanics;
nics; how could it be fit for the present Genius of this Nation? What greater advantage could its adversaries have against it? How should we be able to reconcile these two titles, which so justly belong to our King, of Defender of the Faith, and Patron of Experimental Knowledge.

But in this I am not only incourag’d to promise, that our Church will be out of all danger; but to recommend this Enterprize to it, as that which will become its other excellencies, and is most worthy of its protection. And I shall most humbly represent to its consideration, that this is not only an honorable Work, but even a necessary Duty, to which it is oblig’d by Natural Affection. The present Inquiring Temper of this Age was at first produc’d by the liberty of judging, and searching, and reasoning, which was us’d in the first Reformation. Though I cannot carry the Institution of the Royal Society many years back, yet the seeds of it were sown in King Edward the Sixth’s, and Queen Elizabeth’s Reign: And ever since that time Experimental Learning has still retain’d some vital heat, though it wanted the opportunities of ripening itself, which now it injoys. The Church of England therefore may justly be stily’d the Mother of this sort of Knowledge; and so the care of its nourishment and prosperity peculiarly lyes upon it.

And indeed this is an honor which seems reserv’d for it alone. From all the several sorts of Enthusiasts, I fear, there cannot much help be expected towards such Works, till they shall have left off to abhor them under the Title of vain Philosophy.

The Reformed Churches of other Countries, though they have given us many men, who have been eminent in this way, yet are not in a condition to pro-
mote it by themselves: For either they have not the
incoragement of the Magistrate; or those that have,
are cut so short in their Revenue, that they have
scarcely enough to support the Decence of their own
Public Worship.

The Church of Rome has indeed of late look'd
more favorably upon it. They will now condemn no
man for asserting the Antipodes: The severity with
which they handled Galileo, seems now very much
abated: They now permit their Jesuits to bestow
some labors about Natural Observations, for which
they have great advantages by their Travails; and
their Clergy may justly claim some share in this honor,
as long as the Immortal Names of Mercenius and Gasp
fendus shall live.

But still it is a question, Whether that Church does
not rather connive at, than really intend its pro-
gress. They have indeed seiz'd on some parts of New
Philosophy; but perhaps it is only with the same po-
licy that we often see great Monarchs use, in retain-
ing some out-Province of their Empire; who, though
they find that the benefit does not countervail the
charge of keeping it, yet will not wholly quit their
Interest in it, lest their Neighbours should get possessi-
on, and fortifie it against them. Thus it is likely,
they have cherish'd some Experiments, not out of
zeal to the continuance of such Studies, but that the
Protestants might not carry away all the glory, and
thence withal get new strength to oppose them.

This undertaking therefore is wholly cast on the
Church of England, which can have no jealousie of
its effects, to which Ignorance is not a support, but
an Enemy; which aims not at the captivity, but the
freedom of mens minds, which is lately return'd to
a prosperous condition, and having suffer'd with the
Crown in its misfortunes, does now partake of the
happy Fruits of its Restoration.

Nor will Experimental Philosophy be unthankful for
the assistance it shall receive: For it will enable us to
provide before hand, against any alterations in Reli-
gious affairs, which this Age may produce. If we
compare the changes to which Religion has bin always
subject, with the present face of things, we may safe-
ly conclude, that whatever vicissitude shall happen
about it in our time, it will probably neither be to
the advantage of implicit Faith, nor of Enthusiasm,
but of Reason. The fierceness of violent Inspirations
is in good measure departed: the remains of it will
be soon chac'd out of the World, by the remem-
brance of the terrible footsteps it has every where
left behind it. And though the Church of Rome still
preserves its pomp, yet the Real Authority of that
too is apparently decaying. It first got by degrees
into Temporal Power, by the means of its Spiritual;
but now it only upholds some shadow of the Spiritual,
by the strength of the Temporal Dominion it has
obtain'd.

This is the present state of Christendom. It is now
impossible to spread the same clouds over the World
again: The universal Disposition of this Age is bent
upon a rational Religion: And therefore I renew my
affectionat request, That the Church of England
would provide to have the chief share in its first ad-
vventure; That it would persist, as it has begun, to
incourage Experiments, which will be to our Church as
the British Oak is to our Empire, an ornament and
defence to the soil wherein it is planted.

Thus I have finish'd what I intended concerning
Religion;
Religion, wherein I desire it might not be thought that I have defended every particular Searcher into Nature. That could not be justly expected from me: For there is no man that makes an Apology for any General way, who will take upon him to make good all the actions of all privat men who profess it. It is enough for my purpose, if it shall be granted, that however some Experimenters may be inclinable to irreligion; yet this rather proceeds from their own Genius, than from any corruption that could be contracted from these Studies; and that if the same men had profess'd Physic, or Law, or even Divinity itself, they would have bin in like manner disaffected towards hevenly things.

I cannot deny, but that some Philosophers, by their carelessness of a Future Estate, have brought a discredit on Knowledge itself: But what condition of men is free from such accusations? or why must we strait believe that their Impiety proceeds from their Philosophy? It is easy for men to fall into gross errors, and to mistake the wrong causes for the True, in the judgement which they make of others opinions and inclinations: When they behold them addicted to such or such Vices, and to have withal some good Qualities, in which they themselves do not excel, they presently are apt to imagin the bad to arise from the good, and so condemn both together; whereas perhaps it sprung from some other hidden cause, of which they took no notice.

But let it be a true Observation, That many Modern Naturalists have bin negligent in the Worship of God: yet perhaps they have bin driven on this prophaneess by the late extravagant excesses of Enthusiasm. The infinit pretences to Inspiration, and immediat Commu-
nation with God, that have abounded in this Age, have carry'd several men of wit so far, as to reject the whole matter; who would not have bin so exorbitant, if the others had kept within more moderat Bounds. This is Natural enough to be suppos'd; for so it has commonly happen'd, that the greatest degrees of all contrary Opinions have met in the same Age, and have still heighthen'd and increas'd each other.

From hence it may be gather'd, That the way to reduce a real and sober sense of Religion, is not by indeavoring to cast a veil of Darkness again over the minds of men; but chiefly by allaying the violence of spiritual madness: and that the one extreme will decreas proportionably to the less'ning of the other.

It is apparent to all, That the influence which Christianity once obtain'd on mens minds, is prodigiously decay'd. The Generality of Christendom is now well-nigh arriv'd at that Fatal condition, which did immediatly precede the destruction of the worships of the Ancient World; when the Face of Religion in their public Assemblies, was quite different from that apprehension which men had concerning it in privat: In public they observ'd its Rules with much solemnity, but in privat regarded it not at all. It is difficult to declare by what means and degrees we are come to this dangerous point: But this is certain, that the spiritual vices of this Age have well-nigh contributed as much towards it, as the Carnal: And for these, the most efficacious Remedy that man of himself can use, is not so much the sublime part of Divinity, as its intelligible, and natural, and practicable Doltrines. The Medicines for Religious distempers must be changeable according to the Diseases: And in this we
ROYAL SOCIETY.

we may imitate Christ himself in his Method of healing mens Bodies: Some Cures he perform'd by his Voice, some by Prayer, but some by the Touch of his hands, and even by his Spittle mingled with Earth. In a gross and a sensual Age, the deepest Mysteries of our Religion may be proper, to purify the Stupidity of mens spirits: But there must be an application of quite different and more sensible prescriptions, in a subtil, refining, or Enthusiasticall time.

Such is the present humor of the World; and such must be the course of its cure. Men must now be told, that as Religion is a heavenly thing, so it is not utterly avers from making use of the Rules of human Prudence. They must be informed, that the True Holiness is a severity over our selves, and not others: They must be instructed, that it is not the best service that can be done to Christianity, to place its chief Precepts so much out of the way, as to make them unfit for men of business. They must remember, that the chief of the Apostles became all things to all men, that he might gain some. But above all, there must be caution given, that men do not strive to make themselves and their own opinions ador'd, while they only seem zealous for the honor of God. This is a fault which is very incident to men of devotion: For when they have once form'd in themselves a Perfect Model of the Will of God, and have long confirm'd their minds by continual thinking upon it, they are apt to contemn all others that agree not with them in some particulars. Upon this, they have strait the reprochful Term of Atheist to cast upon them; which though it be a Title that ought only to be employ'd against the bold and insolent defyers of Heaven in their words and actions, yet it is too frequently us'd to express
the malice of any eager and censorious spirit, that has the confidence to object it.

This, and all other the like Principles of uncharitableness, are to be oppos'd by asserting the duties of the Law of Nature, by the use of past, and present Times, by the Analogy of human things, by Moral Virtu, by the offices of Society, by the contemplation of Gods visible Works, and such easy and rational Arguments. Next to the succor of divine Power, this is the most probable way to preserve the Christian Faith amongst us: If God has not in his wrath resolv'd to transplant it into some other quarter of the Earth, which has not so much neglected his Goodness. This indeed were a revolution, which cannot be thought on without horror. The subversion of all Europe would attend it. The departure of the Christian Profession would be accompanied with as frightful effects, as those which follow'd on the Death of its Founder: When the Heavens were darken'd, the Temple shook, the Veil was Rent, the Earth trembled, and the Philosopher had reason to cry out, that either Nature was dissolving, or the God of Nature dying.

Sect.XXIV.

Experiments advantageous to Manual Arts.

I will now enter on the next member of my Division, to consider the purpose of the Royal Society, and the probable effects of Experiments, in respect of all the Manual Trades, which have been heretofore found out, and adorn'd. And I will dispatch this Argument in the resolution of these Four Questions. Whether the Mechanic Arts are still improvable by human Industry?

Whether it be likely, that they may be advanced by any others, besides the Mechanic Artists themselves? When-
Whether there be any ground of hope from experiments, towards this Work?

And whether if such Arts shall hereby happen to multiply, they will not ruine those Trades, that are already settled?

If in these particulars I shall Answer my Readers doubts, I trust it will be granted me, that it is not a vain or impossible Design, to indeavor the increase of Mechanic contrivances: that the enterprize is proper for a mixt Assembly: that the cours, which they observe towards it will be effectual: and that the increas of such Operations will be inoffensive to others of the same kind, that have been formerly discover'd.

Before I examin these several heads apart, perhaps it will not be an impertinent labor, to take one general survey of the Principal Degrees, and occasions, by which the several Manufactures have risen, which beautify the face of the Earth, and have brought forth so much pleasure, and plenty amongst men.

The First of all human Race, when they were dispers'd into several Lands, were at first sustain'd by the Fruits of the Earth, which fell to their share. These at first they cherish'd, and us'd, not by any Rules of Art, but by that Natural sagacity which teaches all men, to indeavor their own preservation. For the peaceable enjoyment of these, they combin'd into Families, and little Leagues, which were the beginnings of Civil Government. But finding that all places did not bring forth all things, for Clothing, Food, and Defence; they either violently seiz'd on what their Neighbours posses'd, or else they fairly agreed on a mutual exchange of the productions of their soyls. This Traffic was at first made in kind:

And
And the Fruits that were thus barter'd, were either
spent, or planted in other Grounds. By this
means mankind was maintain'd: and several Earths
were furnish'd by Labor, with what Nature bestow'd
not upon them. For this Commutation of their Fruits,
and of the rude effects of their first industry, they
began to devise the conveniencies of Carriage by
Land, and Water: And to make it still easier, and
larger; they agreed on some common things, to be
the universal standard of value, and price: whence
arose the use of Money.

This was the first Original of Trade, which from
a narrow commerce between the Hills, the Vallies,
the Woods, the Plains, and the Rivers, that bor-
der'd one upon another, is since extended to the
whole compass of the Earth. For in course of Time,
the small Clans, and Natural Commonwealths, were
devour'd by the strength of the greater; or else some
of the wiser men reduc'd the Rude multitude into
one place, and persuaded them to live quietly under
Laws. From thence Mankind began to have the face
of Civility, which arose at first, by that which is the
best means of preserving it now, by the greatness, and
enlargement of Dominion.

Then first, all the differences of Living, and the
advantages of Strength, and Empire did shew them-
selves. Then some took on them to Rule, some to
assist, or counsel those that Rul'd, and some were
forc'd to be subject to their Power. Thus the Riches,
and Dominion, that were at first in common, were
unequally divided: The Great, the Wise, or the
Strong obtain'd a Principal share; and either persuad-
ed, or constrain'd all the rest to serve them with
their Bodies. Thence sprung all the Arts of conveni-
ence,
ence, and pleasure, while the one part of men would not be content to live according to the first plainness of Nature: and the other were compell'd to work with their hands, for the case, and pleasure of their Masters lives, and the support of their own. From these beginnings the Inventions of peace, and war, the delights of Cities, and Palaces, the delicacies of Food, the Curiosities of Clothing, the varieties of recreations took their rise. And these have still continued to increase, either by some casual discoveries, or by Luxury, or else as men have been driven by some new necessities, to pass on farther to attempt new ways of maintaining themselves.

This is the most Natural Method of the foundation, and progress of Manual Arts. And they may still be advanced to a higher perfection, than they have yet obtain'd, either by the discovery of new matter, to employ men's hands; or by a new Transplantation of the same matter, or by handling the old subjects of Manufactures after a new way, in the same places.

And First, we have reason to expect, that there may still arise new matter, to be manag'd by human Art, and diligence: And that from the parts of the Earth, that are yet unknown: or from the new discover'd America: or from our own Seas, and Lands, that have bin long search'd into, and Inhabited.

If ever any more Countries, which are now hidden from us, shall be reveal'd, it is not to be question'd, but there will be also opened to our Observation, very many kinds of living Creatures, of Minerals, of Plants, nay of Handicrafts, with which we have been hitherto unacquainted... This may well be expected if.
if we remember, that there was never yet any Land, discover'd, which has not given us divers new sorts of Animals, and Fruits, of different Features, and shapes, and virtues from our own, or has not supply'd us with some new artificial Engine, and Contrivance.

And that our Discoveries may still be inlarg'd to farther Countries, it is a good proof, that so many Spacious shores, and Mountains, and Promontories, appear to our Southern, and Northern Sailors; of which we have yet no account, but only such as could be taken by a remote prospect at sea. From whence, and from the Figure of the Earth, it may be concluded, that almost as much space of ground remains still in the dark, as was fully known in the Times of the Assyrian, or Persian Monarchy. So that without assuming the vain prophetic Spirit, which I lately condemn'd, we may foretell, that the Discovery of another new World is still behind.

To accomplish this, there is only wanting the Invention of Longitude, which cannot now be far off, being it is generally allow'd to be feasible, being so many rewards are ready to be heap'd on the Inventors; and (I will also add) being the Royal Society has taken it into its peculiar care. This if it shall be once accomplish'd, will make well-nigh as much alteration in the World, as the invention of the Needle did before. And then our Posterity may outgo us, as much as we can travail farther than the Ancients; whose Demi-Gods, and Heroes did esteem it one of their chief exploits, to make a Journey as far as the Pillars of Hercules. Whoever shall think this to be a desperat business, they can only use the same Arguments, wherewith Columbus was at first made ridiculous: if he had bin discourag'd by the Raillery of his
his adversaries, by the judgment of most Astronomers of his time, and even by the intreaties of his own Companions, but three days before he had a sight of Land, we had lost the knowledge of half the World at once.

And as for the new-discover'd America: 'Tis true that has not bin altogether useless to the Mechanic Arts. But still we may guess, that much more of its bounty is to come, if we consider, that it has not yet bin shewn above two hundred years: which is scarce enough time, to travail it over, describe, and measure it, much less to pierce into all its secrets. Besides this, a good part of this space was spent in the Conquest, and setting the Spanish Government, which is a Reason improper for Philosophical discoveries. To this may be added, that the chief design of the Spaniards thither, has bin the transportation of Bullion: which being so profitable, they may well be thought to have overseen many of its Native Riches. But above all let us reflect on the temper of the Spaniards themselves. They suffer no strangers to arrive there: they permit not the Natives, to know more than becomes their slaves. And how unfit the Spanish humor is, to improve Manufactures, in a Country so distant as the West-Indies; we may learn by their practice in Spain itself: where they commonly disdain to exercise any Manual Crafts, and permit the profit of them, to be carry'd away by strangers.

From all this, we may make this Conclusion, that if ever that vast Tract of Ground shall come to be more familiar to Europe, either by a free Trade, or by Conquest, or by any other Revolution in its Civil affaires: America will appear quite a new thing to us; and:
and may furnish us with an abundance of Rarities both Natural, and Artificial; of which we have bin almost as much depriv'd by its present Masters, as if it had still remain'd a Part of the unknown World.

§. XXVII. But Lastly to come nearer home, we have no ground to despair, but very much more matter, which has bin yet unhandled, may still be brought to light, even in the most civil, and most Peopled Countries: whose Lands have bin throughly measur'd, by the hands of the most exact Surveyors; whose underground Riches have bin accurately pry'd into; whose Cities, Islands, Rivers, and Provinces, have bin describ'd by the labors of Geographers. It is not to be doubted, but still there may be an infinit number of Creatures, over our heads, round about us, and under our Feet, in the large space of the Air, in the Caverns of the Earth, in the Bowels of Mountains, in the bottoms of Seas, and in the shades of Forests: which have hitherto escap'd all mortal Senses. In this the Microscope alone is enough to silence all opposers. Before that was invented, the chief help that was given to the eyes by Glasses, was only to strengthen the dim Light of old Age: But now by the means of that excellent Instrument, we have a far greater number of different kinds of things reveal'd to us, than were contain'd in the visible Univers before: And even this is not yet brought to perfection. The chief labors that are publish'd in this way, have bin the Observations of some Fellows of the Royal Society. Nor have they as yet apply'd it to all subjects, nor tried it in all materials, and Figures of Glasses.

To the eyes therefore there may still be given a vast addition of Objects: And proportionably to all the
all the other senses. This Mr. Hook has undertaken
to make out, that Tasting, Touching, Smelling, and
Hearing, are as improvable as the Sight: And from
his excellent performances in the one, we may well
rely on his promise in all the rest.

The next Increase of Manual Arts, which is proba-
ble to succeed, may happen by the farther Trans-
planting, and Communicating of the several Natural Improvable
Commodities of all Nations, to other Airs, and other
Soils, and other ways of Cultivation. That this is not
yet finish’d is evident, in that there is no Land so well
furnish’d, as to produce all the various sorts of things,
which their ground and Temperature is capable to re-
ceive: and also because many of the most fertile
Countries contain large spaces, that are utterly barren.

This Work then may be farther advanced, by three
kinds of endeavors.

The First by Transplanting out of one Land into
another, of the same situation in respect of the He-
vens. This may be tri’d by conveying the Eastern
Spices, and other useful Vegetables, into our Western
Plantations. Nor can it be imagin’d, why they should
thrive in one Indies, and not in the other; why the
soil should not be as good where the Sun sets, as
where it rises: Seing there are parts of both, which
lie under the same influence of that, and the other
Celestial Bodies, to whose kindly heat and Neighbor-
hood, the Oriental Nations are supposed to owe their
advantages. This also may be attempted in our
Northern Climates: As for instance, the Flax of which
we stand so much in need, may prosper in Ireland, in
many vast Tracts of Ground, now only possessed by
wild Beasts, or Tories almost as wild.

The
The second Advancement of this Work may be accomplish'd by carrying and transplanting living creatures and Vegetables from one Climat to another. This will be very beneficial, though it will be perform'd with a various success. Sometimes the Soil and the Air being chang'd, will give a new force to the new Guests; as the Arabian Horse, by mingling with our Breed, produces a more serviceable Race than either of them single. And sometimes the alteration will be for the worse; as the Vine of France brought into England, and the Horses and Dogs of England into France; both which are found to degenerate exceedingly: Their Soil, and their Sun, it seems, being fitter to produce things of pleasure and delight; and our Air and our Earth being more proper to beget valor and strength.

The third way of communication to be try'd, is by removing the Plants and the productions of the same Country from one part of it into another; and by practising every where all the sorts of Husbandry, which are us'd in some places with success. That this is not enough perfected even in England, is manifest to every one that beholds the Kentish Orchards, and the Herefordshire Hedges; which seem to upbraid the laziness of other Countries, whose High-ways are only fenc'd with Thorns and Briars, or at the best with Hasel; while theirs are beautify'd with Apples, Pears, and Cherries.

Now then, in every one of these Transplantations, the chief Progress that has hitherto bin made, has bin rather for the collection of Curiosities to adorn Cabinets and Gardens, than for the solidity of Philosophical Discoveries: Yet there may be a prodigious advantage made in them all, both for the one end and the
the other. And in this it will be found, as in many
other things, that if men only intend a little curiosity
and delight, they will reap not much more by their
pains: But if they regard real use, not only the pro-
fit, but a greater delight will also follow thereon.

And for our incoragement, whatever attempts of
this Nature have succeeded, they have redounded
to the great advantage of the Undertakers. The
Orange of China being of late brought into Portugal,
has drawn a great Revenue every year from London
alone. The Vine of the Rhene taking root in the
Canaries, has produc'd a far more delicious juyce, and
has made the Rocks and the Sun-burnt Ashes of those
Islands, one of the richest spots of Ground in the
World. And I will also instance in that which is now
in a good forwardness: Virginia has already given
Silk for the clothing of our King; and it may hap-
pen hereafter to give Cloaths to a great part of Eu-
rope, and a vast Treasure to our Kings: If the Silk-
worms shall thrive there (of which there seems to be
no doubt) the profit will be inexpressible. We may
gues at it, by considering what numbers of Caravans,
and how many great Cities in Persia, are maintain'd
by that Manufacture alone, and what mighty Customs
it yearly brings into the Sophis Revenew.

But if both these helps should chance to fail; if nothing new should ever come into our hands; and if
there could be no farther alteration made by Trans-
planting; yet we may still take comfort, and rely on
the old matter itself, on which all our present Arts
have bin devis'd. This certainly will take away all
distrust in this business: For it may be observ'd, that
the greatest part of all our New Inventions have not
been bin
bin raised from Subjects before untouched (though they also have given us very many) but from the most studied and most familiar things, that have bin always in mens hands and eies. For this I shall only instance in Printing, in the Circulation of the Blood, in Mr. Boyle's Engine for the sucking out of Air, in the making of Guns, in the Microscopical Glasses, and in the Pendulum Clocks of Hugenius. What might we have believ'd to be perfect, if not the Art of mens Communicating their thoughts one to another? What was neerer to them than their Blood, by which their Life subsists? And what more ready to be found out than its Motion? In what Subject had the wit of Artificers bin more shewn, than in the variety of Clocks and Watches? What thing was more in mens view than Glasses, thorow which in the East-Countries the very Light itself is admitted, whereby we discern all things else? What more natural to us than the Air we breath? with which we form every word to express other things? What was more studied than the Art of Fighting? What little Stratagem, or Fortification, or Weapon, could one have thought to have bin conceal'd from the Greeks and Romans, who were so curious in the Discipline of War? And yet in all these the most obvious things, the greatest changes have bin made by late Discoveries; which cannot but convince us, that many more are still to come from things that are as common, if we shall not be wanting to ourselves.

Sect. XXX. And this we have good reason to trust will be effec
ted, if this Mechanic Genius, which now prevails in
these parts of Christendom, shall happen to spread
wider amongst our selves, and other Civil Nations;
or if by some good Fate it shall pass farther on to other Countries that were yet never fully civiliz'd. We now behold much of the Northern Coasts of Europe and Asia, and almost all Africa, to continue in the rude state of Nature: I wish I had not an instance neerer home, and that I did not find some parts of our own Monarchy in as bad a condition. But why may we not suppose, that all these may in course of Time be brought to lay aside the untam'd wildness of their present manners? Why should we use them so cruelly as to believe, that the goodness of their Creator has not also appointed them their season of polite and happy life, as well as us? Is this more unlikely to happen, than the change that has been made in the World these last seventeen hundred years? This has bin so remarkable, that if Aristotle, and Plato, and Demosthenes, should now arise in Greece again, they would stand amaz'd at the horrible devastation of that which was the Mother of Arts. And if Caesar and Tacitus should return to life, they would scarce believe this Britain, and Gaul, and Germany, to be the same which they describ'd: they would now behold them cover'd over with Cities and Palaces, which were then over-run with Forests and Thickets: they would see all manner of Arts florishing in these Countries, where the chief Art, that was practis'd in their time, was that barbarous one of painting their Bodies, to make them look more terrible in Battel.

This then being imagin'd, that there may some lucky Tyde of Civility flow into those Lands, which are yet savage, there will a double improvement thence arise, both in respect of our selves and them. For even the present skilful parts of mankind, will be thereby made more skilful; and the other will not only.
The HISTORY of the
only increase those Arts which we shall bestow upon
them, but will also venture on new searches them-
selves.
If any shall doubt of the first of these Advanta-
ges, let them consider, that the spreading of Know-
ledge wider, does beget a higher and a clearer Genius
in those that enjoy'd it before.
But the chief Benefit will arise from the New Con-
verts: For they will not only receive from us our old
Arts, but in their first vigour will proceed to new ones
that were not thought of before. This is reasonable
enough to be granted: For being they come fresh
and unwearied, and the thoughts of men being most
violent in the first opening of their Fancies; it is pro-
bable they will soon pass over those difficulties about
which these people that have bin long Civil, are al-
ready tyr'd. To this purpose I might give as many
Examples as there have bin different periods of Civil-
izing; that those Nations which have bin taught,
have prov'd wiser and more dextrous than their
Teachers. The Greeks took their first hints from the
East; but out-did them in Music, in Statuary, in Gra-
ving, in Limning, in Navigation, in Horfmanship, in
Husbandry, as much as the Egyptians or Assyrians ex-
ceeded their unskilful Ancestors in Architecture, Astro-
nomy, or Geometry. The Germans, the French, the
Britains, the Spaniards, the modern Italians, had their
light from the Romans; but surpass'd them in most of
their own Arts, and well-nigh doubled the ancient
stock of Trades deliver'd to their keeping.

So then, the whole Prize is not yet taken out of
our hands: The Mechanic Invention is not quite
worn away; nor will be, as long as new Subjects may
be
be discovered, as long as our old materials may be alter'd or improv'd, and as long as there remains any corner of the World without Civility. Let us next observe, whether men of different ways of life are capable of performing any thing towards it, besides the Artificers themselves. This will quickly appear undeniable, if we will be convinc'd by Instances: For it is evident, that divers sorts of Manufactures have been given us by men who were not bred up in Trades that resembled those which they discover'd. I shall mention Three; that of Printing, Powder, and the Bow-Dye. The Admirable Art of Composing Letters was so far from being started by a man of Learning, that it was the Device of a Soldier: And Powder (to make recompence) was invented by a Monck, whose cours of life was most avers from handling the Materials of War. The ancient Tyrian Purple was brought to light by a Fisher; and if ever it shall be recover'd, it is likely to be done by some such accident. The Scarlet of the Moderns is a very beautiful Color; and it was the production of a Chymist, and not of a Dyer.

And indeed the Instances of this kind are so numerous, that I dare in general affirm, That those men who are not peculiarly conversant about any one sort of Arts, may often find out their Rarities and Curiosities sooner, than those who have their minds confin'd wholly to them. If we weigh the Reasons why this is probable, it will not be found so much a Paradox, as perhaps it seems at the first Reading. The Tradesmen themselves, having had their hands directed from their Youth in the same Methods of Working, cannot when they pleas so easily alter their custom, and turn themselves into new Rodes of Practice. Besides this, they
they chiefly labor for present livelihood, and therefore cannot defer their expectations so long, as is commonly requisite for the ripening of any new contrivance. But especially having long handled their instruments in the same fashion, and regarded their materials, with the same thoughts, they are not apt to be surpriz'd much with them, nor to have any extraordinary fancies, or raptures about them.

These are the usual defects of the artificers themselves: whereas the men of freer lives, have all the contrary advantages. They do not approach those trades, as their dull, and unavoidable, and perpetual employments, but as their diversions. They come to try those operations, in which they are not very exact, and so will be more frequently subject to commit errors in their proceeding; which very faults, and wanderings will often guid them into new light, and new conceptions. And lastly there is also some privilege to be allow'd to the generosity of their spirits, which have not bin subdued, and clogg'd by any constant toyl, as the others. invention is an heroic thing, and plac'd above the reach of a low, and vulgar genius. It requires an active, a bold, a nimble, a restless mind: a thousand difficulties must be contemn'd, with which a mean heart would be broken: many attempts must be made to no purpose: much treasure must sometimes be scatter'd without any return: much violence, and vigor of thoughts must attend it: some irregularities, and excesses must be granted it, that would hardly be pardon'd by the severe rules of prudence. All which may persuade us, that a large, and an unbounded mind is likely to be the author of greater productions, than the calm, obscure, and setter'd endeavors of the mechanics themselves: and that
that as in the *Generation of Children*, those are usually observ'd to be most sprightly, that are the stolen Fruits of an unlawful Bed; so in the Generations of the Brains, those are often the most vigorous, and witty, which men beget on other Arts, and not on their own.

This came seasonably in, to stop the undeserv'd clamors, which perhaps in this humorous Age, some Tradesmen may raise against the Royal Society, for entring within the compass of their Territories. Wherefore I proceed to my Third Particular, which I have aym'd at in the Two former, that the surest increas remaining to be made in Manual Arts, is to be perform'd by the conduct of Experimental Philosophy. This will appear undeniable when we shall have found, that all other causes of such Inventions are defective: and that for this very reason, because the Trials of Art, have bin so little united with the plain labors of mens hands.

I have already given this account of the former Arts that we use, that the greatest Part of them has bin produc'd, either by Luxury, or chance, or necessity: all which must be confess'd to be mean, and ignoble causes of the Rational Mechanics.

The First of these has bin, that vanity, and intemperance of life, which the delights of Peace, and greatness of Empire have alwayes introduc'd. This has bin the original of very many extravagant Inventions of Pleasure: to whose Promotion, it is not requisite that we should give any help, seing they are already too excessive. And indeed, if we consider the vast number of the Arts of Luxury, compar'd to the sound, and the substantial ones of use: we shall find that the wit of men has bin as much defective in the
The one, as redundant in the other. It has been the constant error of men's labors in all Ages, that they have still directed them to improve those of pleasure, more than those of profit. How many, and how extravagant have been the Ornaments about Coaches? And how few Inventions, about new frames for Coaches, or about Carts, and Ploughs? What prodigious expense has been thrown away, about the fashions of Cloaths? But how little inducements have there been, to invent new materials for Cloathing, or to perfect those we have? The Furniture, and magnificence of Houses, is risen to a wonderful beauty within our memory: but few or none have throughly studied the well ordering of Timber, the hardening of Stone, the improvement of Mortar, and the making of better Bricks. The like may be shewn in all the rest: wherein the solid Inventions are wont to be overwhelm'd by gameliness, and superfluity; which vanity has been caus'd by this, that the Artists have chiefly bin guided, by the fancies of the rich, or the yong, or of vain humorists, and not by the Rules, and judgments of men of Knowledge.

The Second occasion that has given help to the increas of Mechanics has bin Chance: For in all Ages by some casual accidents, those things have bin revealed, which either men did not think of, or else sought for in vain. But of this the Benevolence is irregular, and most uncertain: This indeed can scarce be stily'd the work of a man. The Hart deserves as much prayl of Invention, for lighting on the herb, that cures it; as the man who blindly stumbles on any profitable Work, without foresight, or consideration.

The last that I shall allege is necessity. This has given
given rise to many great Enterprises: and like the cruel Step-Mother of Hercules, has driven men upon Heroic Actions, not out of any tender affection, but hard usage. Nor has it only bin an excellent Mistress to particular men, but even to whole States and Kingdoms. For which reason some have preferr'd a Barren Soil, for the Seat of an Imperial City, before a Fruitful: because thereby the inhabitants being compell'd to take pains, and to live industriously, will be secure from the dangerous enchantments of plenty, and ease; which are fatal to the beginnings of all Commonweals. Yet the defects of this severe Author of great Works, are very many. It often indeed ingages men in brave attempts, but seldom carryes them on to finish what they begin: It labors at first for want of Bread; and that being obtain'd it commonly gives over: It rather sharpenes than enlarges mens Wits: It sooner puts them upon small shifts, than great designs: It seldom rises to high, or magnanimous things: For the same necessity which makes men inventive, does commonly depress, and fetter their Inventions.

And now these Principal causes of Mechanic discoveries being found for the greatest part to be either corrupt, or weak: It is but just, that Reason itself should interpose, and have some place allow'd it in those Arts, which ought to be the chief works of Reason. It is a shame to the dignity of human Nature itself, that either mens lusts should tempt them, or their necessities drive them, or blind fortune should lead them in the dark, into those things in which consists the chief Prerogative of their condition. What greater Privilege have men to boast of than this; that they have the pow'r of using, directing, changing,
or advancing all the rest of the Creatures? This is the Dominion which God has given us over the Works of his hands. And if we will either answer the expectations of Heaven, or deserve so high an honor, we ought rather to manage this Dominion by diligence, and Council, than by Chance, or Luxury, or Compulsion.

It is impossible for us to administer this power aright, unless we prefer the light of men of Knowledge, to be a constant overseer, and director, of the industry, and Works of those that labor. The Benefits are vast, that will appear upon this conjunction. By this means the Inventions of chance will be spread into all their various uses, and multiply'd into many new advantages: By this the Productions of necessity, will be amplify'd; and compleated: By this those of Luxury, and Wantonness may be reduc'd to some solid ends: By this may be rays'd almost as certain a Method to invent new Mechanics, as now any particular Mechanics can practise, to produce their own Operations: By this the weak minds of the Artists themselves will be strengthen'd, their low conceptions advanc'd, and the obscurity of their shops inlighten'd: By this their thoughts will be directed to better Instruments, and Materials: By this their Poverty will be assist'd, and they will be enabled to attempt more costly Trials: By this that will be amended, which has bin hitherto the misfortune of such Inventions, that they have commonly fallen into mens hands, who understand not their Natures, uses, or improvements: By this the conceptions of men of Knowledge, which are wont to soar too high, will be made to descend into the material World: And the slegmatick imaginations of men of Trade, which use to grovell too much on the ground, will be exalted. It
It was said of Civil Government by Plato, that then the World will be best rul'd, when either Philosophers shall be chosen Kings, or Kings shall have Philosophical minds. And I will affirm the like of Philosophy. It will then attain to perfection, when either the Mechanic Laborers shall have Philosophical heads; or the Philosophers shall have Mechanical hands: For the proof of this I need only propose one instance, with which I am furnish'd by Antiquity; and it is of Archimedes: by this example alone, we may at once chastise the sloth of all Ages since his time, and confute the present contemners of Mechanic Knowledge. This Great man was one of the first who apply'd his skill, in the Mathematics, and Physics, to the practices and motions of Manual Trades. And in these his success was so prodigious, that the true contrivances of his hands did exceed all the Fabulous Strength, which either the Ancient stories, or modern Romances have bestow'd on their Heroes. The weights he mov'd were so vast, and the Engines he fram'd had such dreadful effects, that his force could neither be resisted, by Seas, or Mountains, or Fleets, or Armies, which are the greatest powers of Nature, and Men. He alone sustain'd the burden of his falling Country: He alone kept the Romans at a Bay, to whom the whole World was to yield. And perhaps he had come off victorious at last, if he had not contended with the Fatal valour of Marcellus: amongst all whose exploits, these are recorded as the Two greatest, that he first shew'd that Hannibal might be subdu'd; and that he vanquish'd Syracuse, though it was defended by Archimedes.

Thus
§. XXXIII.
The invention of new Mechanics will not injure the old.

Thus far I hope the way is clear: as I go: I have some confidence that I have sufficiently prov'd, that the Invention of Trades may still proceed farther, and that by the help of men of free lives, and by this course of Experiments. But yet the main difficulty continues unremov'd. This arises from the suspicions of the Tradesmen themselves: They are generally infected with the narrowness that is natural to Corporations, which are wont to resist all new comers, as professed Enemies to their Privileges: And by these interested men it may be objected, That the growth of new Inventions and new Artificers, will infallibly reduce all the old ones to poverty and decay.

But to take off their fears in this particular, they are to be inform'd, That there are two sorts of Experiments which the Royal Society attempts in Mechanical matters. The first will be employ'd about the revising, changing, and correcting of the old Mechanics themselves: The second, about inventing of New. In the first of these they can have no ground of jealousy; for they are not intended to bring others over their heads, but only to beautify and fasten those which they already enjoy. And even this is a work so necessary to be done, that if there were not a continual reparation made in them, they would soon languish, and insensibly consume away into Barbarism: For the Arts of men's hands are subject to the same infirmity with Empire, the best Art of their minds, of which it is truly observ'd, that whenever it comes to stand still, and ceases to advance, it will soon go back and decreas.

Hence it appears, that one part of Experiments, and that a very considerable part, is free from their Cavils.
CAVILS. Let us then go on to the other kinds, which purpose the striking out of New Mechanics: Of these I will also assert the Innocence, in respect of their predecessors. In few words, the Old Arts are so far from being indanger'd by the New, that they themselves will receive a proportionable increase, as the New shall arise. The warmth and vigour which attends new Discoveries, is seldom wont to confine itself to its own Sphere, but is commonly extended farther to the ornament of its Neighbors. This is apparent in the degrees by which all Nations use to attain to a higher civility. The ordinary method wherein this happens, is the introduction of some one or two New Arts: For they appearing with great activity in the beginning, do not only establish themselves; but also by stirring and inflaming mens minds, by disgracing the laziness of other Artizans, and provoking them to an emulation, they are wont to bring an Universal light and Beauty on those Inventions into whose company they are brought.

It is said of the Moral Virtues, that they have such a mutual dependance, that no man can attain to perfection in any one of them, without some degree of the other. And this also is certain in the Mechanic Arts: The connexion between them is so close, that they generally use to increase in the same measure. There is no Time, nor great City, which perfectly excels in any one of them, but it is thereby made more capable of admitting the rest, or of advancing them higher if they were admitted before.

It is true indeed, the increase of Tradesmen is an injury to others, that are bred up in particular Trades, where there is no greater Employment than they can master: But there can never be an overcharge of Trades.
Trades themselves. That Country is still the richest and most powerful, which entertains most Manufactures. The hands of men employ'd are true Riches: The saving of those hands by inventions of Art, and applying them to other Works, will increase those Riches. Where this is done, there will never a sufficient matter for profit be wanting: For if there be not vent for their productions at home, we shall have it abroad. But where the ways of Life are few, the fountains of Profit will be possess'd by few; and so all the rest must live in Idleness on which inevitably insues Beggery: Whence it is manifest, that Poverty is caus'd by the fewness of Trades, and not by the multitude.

Nor is it enough to overthrow this, to tell us, that by this addition of Laborers all things will become dearer, because more must be maintain'd: For the high rate of things is an Argument of the flourishing, and the cheapness of the scarcity of Money, and ill peopling of all Countries. The first is a sign of many Inhabitants, which are true Greatness: The second is only a fit subject for Poets to describe, and to compare to their Golden Age: For where all things are without price or value, they will be without Arts, or Empire, or Strength.

I will explain all this by a Familiar and Domestic Instance. It is probable that there are in England a hundred times more Trades than the Saxons or the Danes found here in their Invasions; and withal the particular Traders live now more plentifully, and the whole Nation is wonderfully stronger than before. This also may be seen in every particular City: The greater it is, the more kinds of Artificers it contains; whose neighborhood and number is so far from be
ing an hindrance to each others gain, that still the
Tradesmen of most populous Towns are welthier than
those who profes the same Crafts in Country Merc-
cats.

In England it has of late bin a universal Murmur,
that Trade decays; but the contrary is evident, from
the perpetual advancement of the Customs: Whence
then arises the complaint? From hence, that Traders
have multiplied above the proportionable increas of
Trades: By this means all the old ways of gain are
over-stock'd, which would soon be prevented by a
constant addition of new.

The want of a right apprehending this, has always
made the English aver from admitting of new Inven-
tions, and shorter ways of labor, and from naturallizing
New-people: Both which are the fatal mistakes that
have made the Hollanders exceed us in Riches and
Traffic: They receive all Projects, and all People, and
have few or no Poor: We have kept them out and
suppres'd them, for the sake of the Poor, whom we
thereby do certainly make the poorer.

And here there is suggested to me a just occasion of
lamenting the ill Treatment which has bin most com-
monly given to Inventors; not only here in England,
but in all Ages and Countries. Nor do they only meet
with rough usage from those that envy their honour;
but even from the Artificers themselves; for whose
sakes they labor: while those that add some small
matter to things begun, are usually enrich'd thereby;
the Discoverers themselves have seldom found any
any other entertainment than contempt and impo-
verishment. The effects of their Industry are wont
to be decry'd while they live: The fruits of their
Studies are frequently alienated from their Children:

E e e

The
The little Tradesmen conspire against them, and in-
deavor to stop the Springs from whence they them-
selves receive nourishment: The common titles with
which they are wont to be defam’d, are those of
Cheats and Projectors. I cannot deny, but many such do
often mingle themselves in the noble Throng of Great
Inquirers: As of old there were some that imitated
Philosophers only in Beard and austerity; so I grant
at this time there may false Experimenters and Inven-
tors arise, who will strive to make themselves admir’d
by the loud talking of Mathematical Engines, and
Glassers, and Tools; and by sounding in every place
such goodly words as Chymistry, and Agriculture, and
Mechanics. But though the folly of such Pretenders
cannot be avoided, we must not therefore reject the
sober and the judicious Observers. It is better some-
times to endure vanities, than out of too much nice-
ness to lose any real Invention. We ought to do with
Philosophical Works, as Ministers of State with Intel-
ligence. It is the wilest cours to give incoragemant
to all; left by shewing our selves too scrupulous of
being impos’d on by fallhods, we chance to be de-
priv’d of the knowledge of some important Truths.

The next Particular which I resolv’d to handle, is
the advantage of Experiments in respect of Physic.
On this I intended to dilate in many words, both be-
cause of the great weight of the Subject, which con-
cerns the very welfare and health of our lives, and
also because it would afford me abundant matter for
discours: For certainly it were easy to prove, that
there may still a vast progress be made in the Tru
Art of Medicine, if either we consider the imperfe-
tion of the Method of the Ancient Physicians; or if
we observe the nature of Diseases, which alter, and
multiply
multiply upon us every Age; or if we reflect on the
Cures themselves, and how little the Invention of
new ones has hitherto bin regarded.

But as I was entering on this Subject, I perceiv'd
that I might safely omit it, seeing it is already better
perform'd by Mr. Boyle, in his Book of the Usefulness
of Experimental Philosophy. I will therefore with-
draw my Pen from this matter, which this Noble
Gentleman has manag'd in the best and most power-
ful way, by using not only the force of Reason, but
the conviction of particular Instances.

And now with so good an omen as this Gentlemans
Example, who has not disdain'd to adorn the honor
of his Family with the Studies of Nature; I will go
on to recommend them to the Gentry and Nobility of
our Nation. And I am the more encourag'd to make this
Address, because I behold, that what I would advise
is already in good measure accomplish'd; so that I
shall not only have an occasion to exhort them to pro-
ceed, but to commend them also, for their present
zeal towards these endeavors.

In this indeed I have much reason to applaud the
generous Breeding which has been given to the Expe-
riental Knowledge of this Age and Country, above
the base and contemptible Education of the Opini-
ons of all former Sects: For now Philosophy being ad-
mittet into our Exchange, our Church, our Palaces,
and our Court, has begun to keep the best Company,
to refine its fashion and appearance, and to become
the Employment of the Rich, and the Great, instead
of being the Subject of their scorn: Whereas it was
of old for the most part only the Study of the fitten,
and the poor, who thought it the gravest part of

§. XXXIV.
Experi-
ments a pro-
per Study
for the Gen-
tlemen of our
Nation.

E e e 2

Science
Science to content the use of mankind, and to differ in habit and manners from all others, whom they slighted as madmen and fools. From this arrogant fordidness of such Principles, there could not be expected any Magnificent Works, but only ill-natur'd and contentious Doctrines. Whatever the Poets say of the Moral Wisdom, that it thrives best in Poverty; it is certain the Natural cannot: for in such mean and narrow conditions men perhaps may learn to despise the World, but never to know it.

Now then, I will proceed not so much to exhort, as to confirm the Gentlemen of our Nation, in the prosecution of this Art, to which their Purposes and their generous Labors are most necessary. And for their encouragement in this way, I will briefly lay before them the Privileges they have for such Inquiries, above all the Gentry of our neighbour Nations, and above all the Nobility of former Ages in this Kingdom.

One Principal help that they enjoy, for the promoting of these Studies of Peace, is the present constitution of the Interest of our Government. The chief design of the Antient English was the glory of spreading their Victories on the Continent: But this was a magnanimous mistake: For by their very Conquests, if they had maintain'd them, this Island had bin ruin'd, and had only become a Province to a greater Empire. But now it is rightly understood, that the English Greatness will never be supported or increased in this Age, by any other Wars but those at Sea: and for these the Service of the Multitude is fitter than of Gentlemen. This we have beheld practis'd these last twenty years, wherein our Naval Strength has more than trebled it self: For though some few Gentlemen
Gentlemen have still mingled themselves in those gallant actions; yet the gros of our Fleets have consisted of common men, and of Mariners, who are bred up in the rude toils of such a life.

As this Observation may raise us to the greater admiration of their Valor, that such Magnanimity should be found amongst the meanest of the people; so it should also suggest to our Gentlemen, who by this means are at liberty from the employments of greatest danger, that they ought to undertake these, which will give them as great, though a secure honor. Nor will it be a disgrace to them, that the fighting for their Country is cast on men of lower ranks, if in the mean time they shall strive to inlighten and adorn, while the other defend it: For the same is ordain'd by Nature itself in the order and offices of her works: The Heavenly Bodies appear to move quietly above, to give light, and to cherish the World with a gentle influence; while the Instruments of War and offence are taken out of the Bowels of the Earth.

For the improvement of these Arts of peaceable Fame, they have indeed another Privilege, which can scarce be equall'd by any Kingdom in Europe: and that is the convenience and benefit of being scatter'd in the Country. And in truth, the usual cours of life of the English Gentlemen is so well plac'd between the troublesome nois of pompous Magnificence, and the baseness of avaricious Sordidness; that the true happiness of living according to the rules and pleasures of uncrupt Nature, is more in their power than any others. To them, in this way of life, there can nothing offer itself, which may not be turn'd to a Philosophical Use. Their Country Seats being remov'd from the Tumults of Cities, give them the best opportunity
portunity, and freedom of *Observations*. Their *Hospitality*, and familiar way of conversing with their Neighborhood, will always supply them with Intelligence. The leisure which their retirements afford them is so great, that either they must spend their thoughts about such attempts, or in more chargeable and less innocent *divertisements*. If they will consider the *Heavens*, and the motions of the *Stars*, they have there a quieter *Hemisphere*, and a clearer *Air* for that purpose. If they will observe the generations, breedings, diseas’es, and Cures of *living Creatures*: their Stables, their Stalls, their Kennels, their Parks, their Ponds, will give them eternal matter of inquiry. If they would satisfy their minds with the advancing of *Fruits*, the beautifying, the ripening, the bettering of *Plants*: their Pastures, their Orchards, their Groves, their Gardens, their Nurseries, will furnish them with perpetual *contemplations*. They may not only make their *business* but their very *sports* most serviceable to *Experimental Knowledge*. For that if it be rightly educated, will stand in need of such recreations, as much as the *Gentlemen* themselves: from their hunting, hawking, fishing, and fowling, that is able to receive as much solid profit, as they delight.

On both these accounts, the *English Gentry* has the advantage of those of *France, Spain, Italy*, or *Germany*: who are generally either shut up in *Towns*, and dream away their lives in the diversions of *Cities*: or else are ingag’d to follow their *Princes* Wills to foreign *Wars*.

Nor do they only excel other *Nations* in such opportunities, but our own *Nobility* of all former Times. First they are now far more numerous, and so more may be spar’d from the civil *business* of their Country.
ROYAL SOCIETY.

try. Besides this, they are now bred up, and live in a quite different fashion. The course of their Ancestors lives was grave, and reserv'd: They convers'd with few, but their own Servants: and seldom Travell'd farther than their own Lands: This way serv'd well enough to keep up their State, and their Port: But not to help their understandings. For the formalities of life do often counterfeit Wisdom, but never beget it. Whereas now they are ingag'd in freer rodes of Education: now the vast distance between them, and other orders of men is no more observ'd: now their conversation is large, and general: now the World is become more active, and industrious: now more of them have seen the use, and manners of men, and more apply themselves to Traffic, and business than ever.

This alteration has bin caus'd in our memorie, either by so many Families being advance'd to the highest degrees of Nobility, for their excelling in the Arts of the Gown: or by their frequent intermarriages with Citizens: or by the travails of the King, and the Royal Family: or else by the Civil War itself; which is always wont to be the cruelest Tyrant, or the best Reformer: either utterly to lay waste, or to civilize, and beautify, and ripen the Arts of all Countries. And still we have reason to expect, that this change will proceed farther, for the better: if our Gentlemen shall more condescend to engage in commerce, and to regard the Philosophy of Nature.

The First of these since the King's return, has bin carry'd on with great vigour, by the Foundation of the Royal Company: to which as to the Twin-Sister of the Royal Society, we have reason as we go along, to wish all Prosperity. In both these Institutions begun together,
together, our King has imitated the two most famous Works of the wisest of antient Kings: who at the same time sent to Opbir for Gold, and compos'd a Natural History, from the Cedar to the Shrub.

Nor ought our Gentry to be averse from the promoting of Trade, out of any little jealousy, that thereby they shall debase themselves, and corrupt their Blood. For they are to know, that Traffic, and Commerce have given mankind a higher degree than any title of Nobility, even that of Civility, and Humanity itself. And at this time especially above all others, they have no reason to despise Trade as below them, when it has so great an Influence on the very Government of the World. In former ages indeed this was not so remarkable. The Seats of Empire, and Trade were seldom, or never the same. Tyre, and Sydon, and Cades, and Marseille had more Traffic, but less command than Rome, or Athens, or Sparta, or Macedon. But now it is quite otherwise. It is now most certain that in those Coasts, whither the greatest Trade shall constantly flow, the greatest Riches, and Power will be establish'd. The cause of this difference between the antient times, and our own, is hard to be discover'd: perhaps it is this, that formerly the greatest part of the World liv'd rudely, on their own Natural Productions: but now so many Nations being Civiliz'd, and living splendidly, there is a far greater consumption of all foreign Commodities; and so the gain of Trade is become great enough to overbalance all other strength: Whether this be the reason, or no, it matters not: But the observation is true. And this we see is sufficiently known to all our Neighbors, who are earnestly bent upon the advancing of Commerce, as the best means, not only to enrich particular Merchants, but to enlarge their Empire.
The next thing to be recommended to the Gentlemen of England, has a near kindred with the other: and that is the Philosophy of Nature, and Arts. For the want of such an easy course of studies, so many of them have miscarried in their first years, and have ever after abhorred all manner of sober Works. What else do signify the universal complaints of those who direct the Education of great men's Children? Why do they find them so hard to be fix'd to any manner of Knowledge? Their Teachers indeed are wont to impute it to the delicacy of their breeding, and to their Mothers fondness. But the chief cause of the mischief lies deeper. They fill their heads with difficulty, and unintelligible Notions, which neither afford them pleasure in learning, nor profit in remembrance of them: they chiefly instruct them in such Arts, which are made for the beaten tracks of professions, and not for Gentlemen. Whereas their minds should be charm'd by the allurements, of sweeter and more plausible Studies: And for this purpose Experiments are the fittest. Their Objects they may feel and behold: Their productions are most popular: Their Method is intelligible, and equal to their capacities: So that in them they may soon become their own Teachers.

Nor are they to condemn them for their plainness, and the homely matters, about which they are often employ'd. If they shall think scorn to soil their fingers about them on this account, let them cast their eyes back on the Original Nobility of all Countries. And if that be true, that every thing is preserved and restored by the same means which did beget it at first: they may then be taught, that their present Honor cannot be maintain'd by intemperate pleasures, or the gaudy shews of pomp; but by true Labors, and
and Industrious Virtue: Let them reflect on those great men who first made the name of Nobility venerable. And they shall find that amidst the Government of Nations, the dispatch of Armies, and noise of Victories, some of them disdain'd not to work with a Spade, to dig the Earth, and to cultivate with Triumphant hands, the Vine, and the Olive. These indeed were times, of which it were well if we had more footsteps, than in antient Authors. Then the minds of men were innocent, and strong, and bountiful as the Earth in which they labor'd. Then the vices of human Nature were not their Pride, but their Scorn. Then Virtue was itself, neither adulterated by the false Idols of Goodness; nor puff'd up by the empty forms of Greatness: as since it has bin in some Countries of Europe, which are arriv'd at that corruption of manners, that perhaps some severe Moralists will think it had bin more needful for me to persuade the men of this Age, to continue Men, than to turn Philosophers.

But in this History I will forbear all farther complaints, which are scarce acceptable to the humor of this time, even in our Divine, and Moral works, in which they are necessary. I therefore return to that which I undertook, to the agreeableness of this design to all conditions, and degrees of our Nobility. If they require such Studies as are proportionable to the greatness of their Titles: they have here those things to consider, from whence even they themselves fetch the distinctions of their Gentility. The Minerals, the Plants, the Stones, the Planets, the Animals, they bear in their Arms, are the chief Instruments of Heraldry, by which those Houses are exalted above those of the vulgar. And it is a shame for them to boast
of the bearing of those Creatures they do not understand. If they value the Antiquity of Families, and long race of Pedigrees: What can be more worthy their consideration, than all the divers lineages of Nature? These have more proof of their antient descent that any of them can shew. For they have all continued down in a right line, from Cause to Effect, from the Creation to this day. If they shall confine themselves to the Country, they have this for there cheap diversion. If they return to the City, this will afford them in every Shop occasions to inform their judgments, and not to devour their Estates. If they go forth to public service, to the leading of Armies, or Navies, they have this for their perpetual Counselor, and very often for their preserver. There are so many Natural, and Mechanical things, to be accurately observ'd by the greatest Captains, as the advantages of different Arms, and ammunitions, the passages of Rivers, the streights of Mountains, the court of Tydes, the signs of Weather, the Air, the Sun, the Wind, and the like: that though I will not determin the Knowledge of Nature, to be absolutely necessary to the great office of a General; yet I may venture to affirm that it will often prove a wonderful assistance and ornament, to the court of Glory which he pursues.

All Histories are full of Examples of the great accidents, which have happen'd by the ignorance of chief Commanders in Natural Motions, and effects; of these I will only instance in Three: The First is of Cæsar himself, who had Conquer'd more Countries than most Travailers have seen, and gain'd more Battels than others have read of; yet he had like to have put a period to all his Victories, by the want of
an exact skill in one of the commonest Works of Na-
ture. This he himself relates in his second passage
into Britain; when his Army was so dismay'd at the
ebbing of the Sea from their Fleet, believing it to be
a Stratagem of their Enemies, that scarce the courage
and conduct of Caesar, could hinder them from being
terrify'd to their own overthrow; which had bin a
fatal misfortune to the Britains, as well as Romans;
because from his victorious Arms, we first receiv'd the
dawn of Civil Arts. The next instance of this kind
is the mischance which befell the Christian Army in
Egypt, in the time of the Holy Wars. Their strength
was great and irresistible, if they had only under-
stood that which every Egyptian could have taught
them the course, and the Time of the overflowing of
the Nile. For the want of that slender knowledge,
the bravest men of all Christian, were led up to
the neck in the River, and were forc'd to yield to
their Enemies conditions without striking a stroke.
This was occasion'd by the stupidity of the Cardinal;
who commanded them; if he had bin less skillful in
the Scholemen, and more in Nature, that dreadful dis-
aster had never happen'd. My Third Example of this
kind is to be found in the Roman History: The Roman
Army was just ready to join Battel, with one of their
Enemies: the sign was given for their onset: their
force was equal: a terrible combat had like to have
insu'd: when on a sudden the Sun was Eclips'd:
of this the Romans were warn'd the day before. But
this surpriz'd the other with so great affright, that
they were immediately vanquis'd. So that not the
bravest Men, nor the greatest Army, nor the best pro-
visions of War got the Victory: but that Party which
had the best Natural Philosopher on its side.
To this address which I have made to our Nobility, and Gentry, I will add as an appendix another beneficent of Experiments, which perhaps it will scarce become me to name amidst so many matters of greater weight: and that is, that their discoveries will be very serviceable to the Wits, and Writers of this, and all future Ages. But this I am provok'd to mention by the consideration of the present Genius of the English Nation; wherein the Study of Wit, and humor of Writing prevails so much, that there are very few conditions, or degrees, or Ages of Men who are free from its infection. I will therefore declare to all those whom this Spirit has posses'd, that their is in the Works of Nature an inexhaustible Treasure of Fancy, and Invention, which will be reveal'd proportionably to the increas of their Knowledge.

To this purpose I must premisse, that it is required in the best, and most delightful Wit; that it be founded on such images which are generally known, and are able to bring a strong, and a sensible impression on the mind. The several subjects from which it has bin ray'd in all Times, are the Rables, and Religions of the Antients, the Civil Histories of all Countries, the Customs of Nations, the Bible, the Sciences, and Manners of Men, the several Arts of their hands, and the works of Nature. In all these, where there may be a resemblance of one thing to another, as there may be in all, there is a sufficient Foundation for Wit. This in all its kinds has its increases, heighs, and decays, as well as all other human things: Let us then examin what Parts of it are already exhausted, and what remain new, and untouch'd, and are still likely to be farther advanc'd.

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The HISTORY of the

The Wit of the Fables and Religions of the Ancient World is well-nigh consum'd: They have already serv'd the Poets long enough; and it is now high time to dismiss them; especially seing they have this pecu-

lar imperfection, that they were only Fictions at first: whereas Truth is never so well express'd or amp-

lify'd, as by those Ornaments which are Tru and Real in themselves.

The Wit which is rais'd from Civil Histories, and the Customs of Countries, is solid and lasting: The Simi-

litudes it affords are substantial, and equal to the minds of men, being drawn from themselves and their own actions. Of this the wittiest Nations have always made the greatest use; their writings being adorn'd with a Wit that was free of their own Cities, consisting of Examples, and Apothegms, and Proverbs, derived from their Ancestors. This I allege, because this kind is scarce yet begun in the English Language; though our own Civil History abounds as much as any other, with great Examples and memorable Events, which may serve for the ornament of Comparison.

The Manners, and Tempers, and Extravagances of men are a standing and eternal foundation of Wit: This if it be gather'd from particular Observations, is call'd Humor: And the more particular they are, they are still the pleasanter. In this kind I may well affirm that our Nation excells all others, as our Dra-

mastic Poetry may witness.

The Wit that may be borrow'd from the Bible is magnificent, and as all the other Treasures of Know-

ledge it contains, inexhaustible. This may be us'd and allow'd without any danger of profaneness. The An-
cient Hethens did the same: They made their Divine Ceremonies
Ceremonies the chief Subjects of their Fancies: By that means their Religions had a more awful impression, became more popular, and lasted longer in force than else they would have done. And why may not Christianity admit the same thing, if it be practis'd with sobriety and reverence? What irreligion can there be in applying some Scripture-expressions to Natural things? Why are not the one rather exalted and purif'd, than the other desil'd by such applications? The very Enthusasts themselves, who are wont to start at such Wit as Atheistical, are more guilty of its excesses than any other sort of men: For whatever they allege out of the Historical, Prophetical; or Evangelical Writings, and apply it to themselves, their Enemies, or their Country, though they call it the mind of God, yet it is nothing else but Scripture-comparison and Similitude.

The Sciences of mens brains are none of the best Materials for this kind of Wit. Very few have happily succeeded in Logical, Metaphysical, Grammatical, nay even scarce in Mathematical Comparisons; and the reason is, because they are most of them conversant about things remov'd from the Senses, and so cannot surprize the fancy with very obvious, or quick, or sensible delights.

The Wit that is founded on the Arts of mens hands is masculine and durable: It consists of Images that are generally observ'd, and such visible things which are familiar to mens minds. This therefore I will reckon as the first sort, which is still improvable by the advancement of Experiments.

And to this I will add the Works of Nature, which are one of the best and most fruitful Soils for the growth of Wit. It is apparent, that the defect of the
the Antients in Natural Knowledge did also streighten their Fancies: Those few things which they knew, they us'd so much, and appli'd so often, that they even almost wore them away by their using. The sweet-ness of Flowers, and Fruits, and Herbs, they had quite devour'd: They had tir'd out the Sun, and Moon, and Stars with their Similitudes, more than they fancy them to be wearied by their daily journeys round the Heavens.

It is now therefore seasonable for Natural Knowledge to come forth, and to give us the understanding of new Virtues and Qualities of things; which may relieve their fellow-creatures, that have long born the burden alone, and have long bin vex'd by the imaginations of Poets. The charitable assistance Experiments will soon follow. The Comparisons which these may afford will be intelligible to all, because they proceed from things that enter into all mens Senses. These will make the most vigorous impressions on mens Fancies, because they do even touch their Eyes, and are nearest to their Nature. Of these the variety will be infinite; for the particulars are so, from whence they may be deduc'd: These may be always new and unsatisfied, seeing there is such a vast number of Natural and Mechanical things, not yet fully known or improv'd, and by consequence not yet sufficiently apply'd.

The use of Experiments to this purpose is evident, by the wonderful advantage that my Lord Bacon receiv'd from them. This excellent Writer was abundantly recompenc'd for his Noble Labors in that Philosophy, by a vast Treasure of admirable Imaginations which it afforded him, wherewith to express and adorn his thoughts about other matters. But I will
will not confine this Observation to one single Author, though he was one of the first and most artificial Managers of this way of Wit. I will venture to declare in general of the English Tongue, That as it contains a greater stock of Natural and Mechanical Discoveries, so it is also more inrich'd with beautiful Conceptions, and inimitable Similitudes, gather'd from the Arts of mens hands, and the Works of Nature, than ever any other Language could produce.

And now I hope what I have here said will prevail something with the Wits and Railleurs of this Age, to reconcile their Opinions and Discourses to these Studies: For now they may behold that their Interest is united with that of the Royal Society; and that if they shall decry the promoting of Experiments, they will deprive themselves of the most fertile Subject of Fancy: And indeed it has bin with respect to these terrible men, that I have made this long digression. I acknowledge that we ought to have a great dread of their power: I confess I believe that New Philosophy need not (as Caesar) fear the pale, or the melancholy, as much as the humorous, and the merry: For they perhaps by making it ridiculous, because it is new, and because they themselves are unwilling to take pains about it, may do it more injury than all the Arguments of our severe and frowning and dogmatical Adversaries.

But to gain their good will, I must acquaint them, That the Family of the Railleurs is deriv'd from the same Original with the Philosophers. The Founder of Philosophy is confess'd by all to be Socrates; and he also was the famous Author of all Irony. They ought therefore to be tender in this matter, wherein the honor of their Common Parent is concern'd: it be-

G g g
comes them to remember, that it is the fault, and not the excellence of Wit, to defile its own Nest, and not to spare its own Friends and Relations, for the sake of a jest.

The truth is, The Extremes of Raillery are more offensive than those of Stupidity: It is a work of such a tender and subtil spirit, that it cannot be decently perform'd by all pretenders to it: Nor does it always agree well with the Temper of our Nation; which as it has a greater corage than to suffer derision, so it has a firmer virtu than to be wholly taken up about deriding of others. Such men are therefore to know, That all things are capable of abuse from the same Topicks by which they may be commended; they are to consider, That Laughter is the easiest and the flendrest fruit of Wit; they are to understand, That it proceeds from the observation of the deformity of things; but that there is a nobler and more masculine pleasure, which is rais'd from beholding their Order and Beauty: From thence they may conclude, how great the difference is between them, and the real Philosophers: For while Nature has only form'd them to be pleas'd with its irregularities and monsters, it has given the other the delight of knowing and studying its most beautiful Works.

In plain terms, a universal abuse of every thing, though it may tickle the fancy never so much, is inhuman madness; as one of the Ancients well express'd it, who calls such mirth humanis Bocchari rebus. If all things were made the subjects of such humour, all worthy designs would soon be laugh'd out of the World; and for our present sport, our Posterity would become barbarous. All good Enterprizes ought to find assistance when they are begun, applaud when they
they succeed, and even pity and praise if they fail. The true Rallery should be a defence for Good and Virtuous Works, and should only intend the derision of extravagant, and the disgrace of vile and dishonourable things. This kind of Wit ought to have the nature of Salt, to which it is usually compar'd; which preserves and keeps sweet the good and the found parts of all Bodies, and only frets, dries up, and destroys those humors which putrefy and corrupt.

This pleasant but unprofitable sort of men being thus dismissed with this fair admonition; It now follows in the last place, that I examin the Universal Interest of the English Nation, and consider what effect the Works of the Royal Society are like to have upon it, by what means their Labors may serve to encreas our advantages, and correct our imperfections. In the entrance of this Subject there are so many things presented to my thoughts, which are worthy to be declar'd to my Countrymen, that I rather think it ought to be largely manag'd by itself, than to be huddled up in the end of this Treatise: And certainly there is scarce any matter that more deserves to be handled by the best of our English Wits, than the Interest of their Country. I do therefore take the freedom to recommend it to their hands; and to beseech them to rais their thoughts from lighter businesies, from unmanly flatteries, or vanities of Love, or useless Burlesque, to this grave and this Noble Argument; and to remember, that if Themistocles was in the right, when he prefer'd the making of a small City great, before the playing on a Fiddle, then certainly it is the bravest employment for a worthy mind, to endeavor to make a great Kingdom greater.

§XXXVIII
Experiments advantageous to the Interest of our Nation.
There are very many things in the Natural Genius of the English, which qualify them above any other for a Governing Nation. The situation of our Country is most advantageous for Command: Its native productions are most serviceable for Strength and Empire: The disposition of the people is bold in dangers, severe in Discipline, valiant in Arms, virtuous in Life; relenting to the afflicted, and merciful in Conquest. The unfortunate Divisions by which our Force has been of late distracted, are but of one or two Ages growth; the Vices to which we are subject are not natural to our Soil; but imported hither from foreign Countries: The English Generosity, Fidelity, Magnanimity, Modesty, Integrity, they owe to themselves; their luxury, their Debauchery, their Divisions, their Spiritual Schisms, they have receiv'd from abroad.

And now what can be a greater work than the management of all these matters? Here the Writer might have occasion of doing right to the honor of his Country, and yet reproving its faults with a just censure: He might explain the weaknesses and advantages of our Kingdom: He might remove the one, and confirm the other: He might compare the Actions of our Ancestors with the Manners of this Time, and shew by what degrees this dissolution of goodness crept in: He might with a generous and tender hand, apply himself to the cure of our Religious Distempers: He might with irresistible Arguments attempt to amend what is amiss, restore the good, and by the power of Domestic Examples reduce us back to the ancient sincerity of dealing, and innocence of Life, and union of Interests.

The desire of seeing this work perform'd, fits so much on my mind, that I cannot but once more represent it to...
to the consideration of the many eloquent and judicious Authors, with whom our Nation is now more abundantly furnish'd than ever. But if neither the necessity nor usefulness of the Subject, nor the benefit of their Native Land, will prevail with them to set upon it; it is my purpose to excite them by another way, which will indeed be hazardous to my own reputation, yet perhaps may take effect. I will try the same stratagem which I have often seen unskillful Singers use, to make those who have excellent voices shew their Art: For as they by ill singing some excellent Tune are wont to provoke the others to sing, when no persuasions could move them; so do I intend at my first leisure, by ill handling of this Noble Subject, to stir up men of greater abilities to employ their skill and their judgment about it.

Having thus taken this task on myself, it will not be needful here to insist long upon it before hand: I will only in few words declare, That it is the True concernment of England to secure itself from the Dominion of Strangers, both Ecclesiastical and Temporal; to advance its Industry in peaceful Arts; to increase its people; to improve its own Manufactures; to introduce the foreign of which our soil is capable; to make use of the two Kingdoms that are joyn'd with it under the same Monarch, for those productions which grow not at home; to obtain a union of mind, both in Civil and Spiritual Matters; and to preserve the ancient form of Government.

Of all these I will only touch upon those parts of our Interest which have reference to the design of the Royal Society.

The first thing that ought to be improv'd in the English Nation, is their Industry. This, it is true, has
of late years bin marvellously advancéd: as may be shewn, by the enlarging of Trees, the spreading of many Fruits, the plantations of Trees, and the great improvement of Manual Arts. But it is evident, that it may still admit of farther warmth, and activity: as we may conclude, by the want of employment for younger Brothers, and many other conditions of men; and by the number of our poor, whom Idleness, and not infirmities do impoverish. The way to compass this, is not alone by Acts of Parliament, and good Laws: whose force will soon be evaded by present Craft, and interpretation, or else will be antiquated by time. This perhaps our Country has found above all others: If our Laborers had bin as diligent, as our Law-givers, we had prov’d the most laborious Nation under Heaven. But the tru Method of increasing Industry, is by that course which the Royal Society has begun in Philosophy, by Works, and endeavors, and not by the prescriptions of words; or Paper Commands.

There is nothing whose promoting is so easy as diligence, when it is once set on foot. This does not only propagat works but workers: Though at first it may begin on necessity, yet it will afterwards proceed upon pleasure: So that the farther it goes, the swifter it advances because willing works are sooner perform’d than those to which we are compell’d. This I will demonstrate by an instance which I have already alledg’d, and it is of the Hollanders: For we may fetch examples of virtu from our own Countrymen, but of Industry from them. At first they were as lazy as the worst of ours: their hands were unus’d to labor: their manner of life was much like that of the Ancient Britains: their Coasts lay desolat to the Sea, with out
out Bancks, or Towns, or Ships, or harbors: and when the Roman Emperor gather'd Cockles there, perhaps there was little else worth gathering. But when by the number of their people they were fore'd to look abroad, to Trade, to Fish, to labor in Mechanics; they soon found the sweetness as well as the toyl of their diligence; their success and riches still added new heat to their minds; and thus they have continued improving, till they have not only disgrac'd but terrify'd their Neighbors, by their Industry. Nor will it suffice to tell us, that they ow this activity to the form of their Government. That supposition may presently be confuted by the Example of France, the most absolute Monarchy of Christendome. There it is apparent by the prodigious toyls of their people, both upon the Earth, and in their Shops, that diligence may thrive in a Kingdom, as well as a Common-wealth.

And if ever the English will attain to the Mastery of Commerce, not only in discours, but reality; they must begin it by their labors, as well as by their swords; they must do it by awakening their minds, by rousing themselves from this Lethargy, by action, by trials, by working; Unless this be done, they will in vain be Victorious: At the end of their Wars they will cool again, and lose all the fruits of their Valour. The Arts of peace, and their Improvements, must proceed in equal steps with the success of their Arms: The works of our Citizens, our Plough-men, our Gardeners, our Wood-men, our Fishers, our diggers in Mines, must be equally advance'd with the Triumphs of our Fleets: or else their blood will be shed in vain: they will soon return to the same poverty, and want of Trade, which they strive to avoid. For as Tully professeth, nominem vide eloquentem, saeum esse victoria: 
rid: So I will affirm, that we shall never be made industrious by Victory alone.

The Second thing to be corrected in the English humor, is an inclination to every Novelty, and vanity of foreign Countries, and a contempt of the good things of our own. This fondness is the usual fault of young Travellers, but it has also ill effects on men of full Age. For this they are wont to allege the excuse of good Breeding. But if we could not study, or understand our own Country without the imputation of ill manners, good Breeding were the most pernicious thing in the World. For there was never yet any Nation great, which only adorn'd the Customs of other people, and wholly made them the Pattern of their imitation. This wandring, and affected humor Experiments will lessen, above all other Studies. They will employ our thoughts, about our Native conveniences: they will make us intend our minds, on what is contain'd within our own Seas: and by considering, and handling them more, will also make them more worthy of our consideration.

The Third imperfection is on the other extremity, and that is a narrowness of mind, and a pusillanimous confining our thoughts to our selves, without regarding any thing that is foreign, or believing that any of their Arts, or Customs may be preferr'd before our own. This indeed is a perverseness, of which the English are not wholly to be acquitted: it being proper to Islands, and to such Countries that are divided from the rest of the World. This will be cur'd by the effectual Demonstrations that the Society will give, of the benefit of a universal Correspondence, and Communication. And this according to their Method, will be done without falling into the other vice of affe-
R O T A L  S O C I E T Y.

...ing forein habits, and manners, and gestures. In thefe the English need not be beholding to others: but in their Fruits, in their Manufactures, in their Engines, in their works in Gold, and Silver, and Brass, and Iron, we may follow their practice, and emulate their Curiosities, without affection.

There is one instance which will shew how our respect to outlandifh things is to be regulated. To depend on the French for every little fashion of Cloaths, and to equal their Nobility in their way of life, is neither for our honor, nor profit. For the difference between their Gentry and ours, and their Commonalty and ours is so great; that the same manners will not be decent in us, which become them well enough. But to learn from them their skill in Horsemanship, and Arms, their Building, their Cultivation of Fruits, the Parsimony, and Industry of their Tradesmen, is commendable: for in these things we are defective, and they excell. It is therefore the admiration of foreign extravagances, and not the imitation of their excellencies that is to be condemn'd. If we will rather obstinately be content with our own store, than borrow what is good from abroad: we flatter our selves with the same foolish imaginations, that all Countries had while they were barbarous. To them their Acorns, and their Cottages were at first the utmost ends of their ambition. They knew no more, nor aspir'd to any farther addition: But as soon as a new light sprung forth amongst them, they despis'd themselves and their former condition; and then they first began to understand their wants, when they perceiv'd how they might be supply'd. As long as we find, that all parts of our Country, are not Ingenious, Inventive, and Industrious alike: we cannot presume, that we...
have already got beyond all possibility of amendment by others patterns. As long as we behold any City, or Province, or Family, or Street of our Neighbors, exceed the worst of ours, I will not say the best in easiness of life, or pleasantness, and smoothness of manners: we have no reason to arrogat too much to ourselves; but we rather should conceive it to be a less disgrace to tread in their footsteps, than to want their perfections. As long as there remains any room for our most civil People to grow more Civil, the Introduction of Forein Inventions is not only pardonable, but necessary: For such is the nature of Civility, that as it increases, it still requires more Arts, though it contents itself with less Forms of living.

The Fourth mischief by which the greatness of the English is suppress'd, is a want of union of Interests, and Affections. This is originally caus'd by a Natural reservedness, to which our Temper is inclin'd: but it has bin heighten'd by our Civil differences, and Religious dissensions. For the sweetning of such dissensions, it is not best at first to meet, and convers about affairs of state, or spiritual controversies. For those did first occasion our animosities, and the more they are rubb'd, the rawer they will prove. But the most effectual remedy to be us'd is, first to assemble about some calm, and indifferent things, especially Experiments. In them there can be no caufe of mutual Exasperations: In them they may agree, or dissent without faction, or fierceness: and so from induring each others company, they may rise to a bearing of each others opinions; from thence to an exchange of good offices; from thence to real Friendship: Till at last by such a Gentle, and easy Method, our several Interests,
ROYAL SOCIETY.

tereftes and sects may come to suffer one another, with
the same peaceableness as men of different trades live
one by another in the same street.

Nor is it the least commendation the Royal Society
deserves, that designing a union of mens hands and
reasons, it has proceeded so far in uniting their affections: For there we behold an unusual sight to the
English nation, that men of disagreeing parties, and
ways of life, have forgotten to hate, and have met
in the unanimous advancement of the same works.
There the soldier, the tradesman, the merchant, the
scholar, the gentleman, the courtier, the divine, the
presbyterian, the papist, the independent, and those of
orthodox judgment, have laid aside their names of
distinction, and calmly conspir'd in a mutual agree-
ment of labors and desires: A blessing which seems
even to have exceeded that evangelical promise,
that the lion and the lamb shall ly down together:
For here they do not only endure each others pre-
sence without violence or fear; but they work and
think in company, and confer their help to each o-
thers inventions.

The last part of the General Interest of our nation,
in which I will survey the influence of experiments,
is obedience to the civil government: And we ought
to be very watchful that they prove not offensive to
the supreme power: For being the king has honor'd
them with his royal patronage, it is but just that the
prerogatives of his crown should be no losers by their
increase. It is indeed a common accusation, which is
wont to be made against all manner of knowledge, by
those who have it not. That it renders men mutinous,
arrogant, and incapable of superiors: But if this be
admitted
admitted, we shall aspers human Nature and Government with the greatest calumny. This were to affirm, That men cannot exercise their Reason without being factious and unruly; and that Civil Government will be insupportable to all but ignorant men and fools: which is so far from being true, that it were easy to prove that those Nations which are void of all Arts and Knowledge, cannot be properly said to pay a right Obedience to their Sovereigns; but that the subjection under which they live, rather deserves to be stily'd the stupidity and slavery of Beasts, than a just and a manly submission.

But to limit this Question to the particular kind of Knowledge which is now under debate, it is certain that the skill of Nature ought so little to be suspected for making men pervers and ungovernable, that it is the best preservative against disobedience. One of the principal Causes of this is a misguided Conscience, and opposing the pretended Dictates of God against the Commands of the Sovereign. This I have already shewn, that these labors will moderate and reform, by abolishing or restraining the fury of Enthusiasm. Another is idle poverty, which drives men into sullenness, melancholy, discontent, and at last into resistance of lawful Authority. To this Experiments will afford a certain cure; they will take away all pretence of idleness, by aconstant course of pleasant endeavors; they will employ men about profitable Works, as well as delightful; by the pleasure of their Discoveries they will wear off the roughness, and sweeten the humorous peevishness of mind, whereby many are sown into Rebellion.

But the most fruitful Parent of Sedition is Pride, and a lofty conceit of mens own wisdom; whereby they
they presently imagine themselves sufficient to direct and censure all the actions of their Governors. And here that is true in Civil affairs, which I have already quoted out of my Lord Bacon concerning Divine: A little Knowledge is subject to make men headstrong, insolent, and untractable; but a great deal has a quite contrary effect, inclining them to be submissive to their Betters, and obedient to the Sovereign Power.

The Science that is acquire'd by Disputation, teaches men to cavil well, and to find fault with accurate subtlety; it gives them a fearless confidence of their own judgments; it leads them from contending in sport, to oppositions in earnest; it makes them believe that every thing is to be handled for, and against, in the State, as well as in the Schools. But the unseign'd and laborious Philosophy gives no countenance to the vain dotages of privat Politicians: that bends its Disciples to regard the benefit of mankind, and not the disquiet: that by the moderation it prescribes, to our thoughts about Natural Things, will also take away all sharpness and violence about Civil: The Work of that is so vast, that it cannot be perform'd without the assistance of the Prince: It will not therefore undermine his Authority whose aid it implores: that prescribes a better way to bestow our time, than in contending about little differences, in which both the Conquerors and the Conquer'd have always reason to repent of their success: That shews us the difficulty of ord'ring the very motions of senseless and irrational things; and therefore how much harder it is to rule the restless minds of men: That teaches men humility, and acquaints them with their own errors; and so removes all overweening haughtiness of mind, and swelling imaginations, that they are better able to,
to manage Kingdoms than those who possess them. This without question is the chief root of all the uneasiness of Subjects to their Princes. The World would be better govern'd, if so many did not presume that they are fit to sustain the cares of Government. Transgression of the Law is Idolatry; the reason of mens contemning all Jurisdiction and Power, proceeds from their Idolizing their own Wit: They make their own Prudence omnipotent; they suppose themselves infallible; they set up their own Opinions, and worship them. But this vain Idolatry will inevitably fall before Experimental Knowledge; which as it is an enemy to all manner of false Superstitions, so especially to that of mens adoring themselves, and their own Fancies.

I have now at last brought my Reader, by a tedious compass, to the end of our Journey: And here I desire him to look back, and to make a reflection on the matters of which I have treated. In the first part of my Discourse I have alleg'd the Causes by which these Studies were suppress'd in all former Ages; which have bin Interest of Seats, the violence of Disputations, the plausible Artists of Speech, the Religious Controversies, the Dogmatical Opinions, the poverty of the Undertakers, and the want of a continual race of Experimenters. In the Second I have shew'd by what steps the Royal Society arose, what it has propos'd to attempt, what course it has taken to make its Observations universal and perpetual; what assistance has bin afforded it to that purpose, and about what particulars it has bin conversant. In the Third I have try'd to free it from the false Scandals of Ignorance, and the prejudices of several ways of life; and
to prove that its effects will more immediately refer to our own Country.

My Reader now beholds an Assembly settled of many eminent men of all Qualities: who have ingag'd to bestow their labors, on a design so public, and so free from all suspicion of mean, or private Interest. What foundation they have within themselves, for defraying the expence of their Trials, and Intelligence, may be ghes'd by their Number, which at this present, amounts very neer to Two Hundred; as appears by this following Catalogue, which I have rang'd Alphabetically.

The King's Majesty Founder, and Patron.
His Royal Highness the Duke of York.
His Highness Prince Rupert.
His Highness Ferdinand Albert, Duke of Brunswick, and Lunenbourgh.

The Duke of Albermarle, the Earl of Alesbury, the Earl of Argill, the Lord Asby, the Lord Annesley, Mr. Ashmole, Sr. Robert Atkins, Mr. Austin, Mons. Auxout, Mr. Aubrey.

The Duke of Buckingham, the Lord George Berkeley, the Lord Brereton, Mr. Bagnal, Mr. Bains, Mr. William Balle, Mr. Isaac Barrow, Dr. George Bate, Dr. Bathurst, Dr. Beal, Mons. Beaufort de Fresars, Sr. John Birkinhead, Mr. Blunt, Mr. Boyl, Mr. Brook, Dr. Bruce, Mons. Bullialdus, Mr. Burnet, Sr. Edward Byfshe.

The Lord Arch-Bishop of Canterbury, the Earl of Clarendon Lord Chancellor of England, the Earl of Carlile, the Earl of Crawford, and Lindsay, the Lord Cavendish, the Lord Clifford, Mr. Carkeff, Mr. Carteret.
Dr. Charleton, Sr. Winstone Churchill, Sr. John Clayton, Sr. Clifford Clifton, Mr. George Cock, Sr. Richard Corbet, Dr. Cotton, Dr. Cox, Mr. Thomas Cox, Mr. Daniel Cox, Mr. Creed, Mr. Crispe, Sr. John Cutler.

The Marquess of Dorchester, the Earl of Devonshire, the Earl of Dorset, Mons. Vital de Damas, Sr. George Ent, Mr. Ellise, Mr. John Evelyn, Sr. Francis Fane, Mons. le Febvre, Sr. John Finch, Mr. Henry Ford, Sr. Bernhard Gascoigne, Mr. Joseph Glanvile, Dr. Glisson, Mr. William Godolphin, Mr. Graunt.

The Lord Hatton, Mr. Haak, Mr. William Hammond, Mr. William Harrington, Sr. Edward Harley, Sr. Robert Harley, Mr. Harley, Dr. Henshaw, Mons. Hevelius, Mr. Abraham Hill, Mr. Hoar, Dr. Holder, Mr. Hook, Mr. Charles Howard, Mons. Huygens.

Mr. Richard Jones, the Earl of Kincardin, Sr. Andrew King, Mr. Edmund King, the Earl of Lindsey, the Lord Bishop of London, Mr. Lake, Sr. Ellis Leighton, Mr. James Long, Sr. John Lowther, Mr. Lowther, Mons. Hugues de Lyonne.

The Earl of Manchester, Mons. Nicolas Mercator, Dr. More, Dr. Jasper Needham, Dr. Needham, Mr. Thomas Neile, Mr. William Neile, Mr. Nellborp, Mr. Newburgh, Sr. Thomas Nott, the Earl of Peterburgh, Mr. Packer, Mr. Samuel Parker, Sr. Robert Paston, Dr. John Pearson, Dr. Pell, Sr. William Persall, Sr. Peter Pett, Mr. Peter Pett, Mons. Petit, Sr. William Portman, Mr. Francis Potter, Mr. Povey, Dr. Power, Sr. Richard Powle, Mr. Pepys.

The Lord Robert's Lord Privy Seal, the Lord Bishop of Rochester, Mr. Roll, Mr. Rycaut, the Earl of Sandwich, the Lord Viscount Stafford, the Lord Stermont, Mr. Schroter, Sr. James Scaun, Mr. Skippon, Sr. Nicholas Slaney, Mr. Henry Slingsby, Mr. Smethwick. Mr. Edward
ROYAL SOCIETY.

Edward Smith, Dr. George Smith, Mons. Sorbiere, Sr. Robert Southwell, Mr. Alexander Stanhope, Mr. Thomas Stanley.

The Earl of Tweedale, Sr. Gilbert Talbot, Sr. John Talbot, Dr. Terne, Mr. Thomas Thyn, Dr. Thrusston, Sr. Samuel Tuke, Sr. Theodore de Vaux, Mr. Vermuyden, Mons. Isaac Vossius.

The Lord Bishop of Winchester, Mr. Waller, Dr. Wallis, Mr. Waterhouse, Dr. Whistler, Mr. Joseph Williamson, Dr. Willis, Mr. Francis Willughby, Mr. Wind, Mr. Winkworth, Mr. Woodford, Mr. Matthew Wren, Dr. Thomas Wren, Sr. Cyril Wyche, Sr. Peter Wyche, Mr. Wylde, the Lord Arch-Bishop of York, the Lord Treasurer.

The present Council are these that follow,

William Lord Viscount Burlington President: which Office has bin annually renew'd to him by Election, out of the true judgment, which the Society has made of his great Abilities in all Natural, and especially Mathematical Knowledge.

Mr. William Aerskin, Dr. Peter Ball, Dr. Timothy Clerk, Mr. Daniel Colwall, Dr. Croon, the Lord Bishop of Exeter, Dr. Jonathan Goddard, Mr. Henry Howard of Norfolk, Mr. Henshaw, Mr. Hoskins, Sr. Robert Moray, Sr. Anthony Morgan, Dr. Merret, the Earl of Northampton, Sr. Paul Neile, Mr. Oldenburgh, Sr. William Petty, Doctor Pope, Dr. Wilkins, Dr. Christopher Wren.

In this number perhaps there may some be found, whose employments will not give them leave to promote these Studies, with their own Hands. But it being their part to Contribute joyntly towards the Charge, and to pass judgment on what others shall try: they will appear to be well-nigh as useful, as I i i
those that Labor, to the main end of this Enterprise:

Whatever Reasons they shall raise, by this or any other means, they intend thereby to make an Establishment for their Curators. To this Office they have already admitted some of their Fellows, whom they will employ according to their Studies and Sufficiency: Some shall be sent to travail abroad to search for Discoveries: Some shall constantly remain in London, and represent their Observations to the weekly Assemblies.

The places of their Residence they have appointed to be two: One a College, which they design to build in London, to serve for their Meetings, their Laboratories, their Repository, their Library, and the Lodgings for their Curators: The other the College at Chelsea, which the King has bestowed on them; where they have a large Inclosure, to serve for all Experiments of Gardening and Agriculture: and by the neighbourhood of the River they have excellent opportunity of making all Trials that belong to the Water.

And now as I have spoken of a Society that prefers Works before Words, so it becomes their History to endeavor after real Fruits and Effects. I will therefore conclude by recommending again this Undertaking to the English Nation; to the bravest People, the most generous Design; to the most zealous lovers of Liberty, the surest way to ransome the minds of all mankind from Slavery.

The Privileges that our Kings Dominions enjoy for this end, appear to be equal’d by no other Country. The men that we have now living to employ, are excellently furnish’d with all manner of abilities: Their Method is already setled, and plac’d out of the reach of calumny or contradiction.
The work itself indeed is vast, and almost incomprehensible, when it is considered in gross: But they have made it feasible and easy, by distributing the burden. They have shewn to the World this great secret, That *Philosophy* ought not only to be attended by a select company of *refined Spirits*. As they desire that its productions should be *vulgar*, so they also declare, that they may be promoted by *vulgar hands*. They exact no extraordinary preparations of *Learning*: to have found *Senses* and *Truth*, is with them a sufficient *Qualification*. Here is enough business for *Minds* of all sizes: And so boundless is the variety of these *Studies*, that here is also enough delight to recompense the Labors of them all, from the most ordinary capacities, to the highest and most searching *Wits*.

Here first they may take a plain view of all particular things, their kinds, their order, their figure, their place, their motion: And even this naked prospect cannot but fill their thoughts with much satisfaction, seeing it was the first pleasure which the *Scripture* relates *God* himself to have taken at the *Creation*; and that not only once, but at the end of every day's work, when he saw all that he had made, and approved it to be good. From this they may proceed to survey the difference of their Composition, their *Effects*, the *Instruments* of their Beings and Lives, the *Subtilty* and *Structure*, the decay and supply of their parts; wherein how large is the *Space* of their delight, seeing the very shape of a *Mite* and the sting of a *Bee* appears so prodigious. From hence they may go to apply things together, to make them work one upon another, to imitate their productions, to help their defects, and with the Noblest duty to assist *Nature*,
true, our common mother, in her Operations: From hence to all the works of men's hands, the divers Ar- tifices of several Ages, the various Materials, the Im- provement of Trades, the advancement of Manufactures: in which last alone there is to be found so great content, that many Mighty Princes of the for- mer and present Times, amidst the pleasures of Go- vernment, which are no doubt the highest in the World, have striven to excel in some Manual Art.

In this spacious field their Observations may wan- der, and in this whatever they shall meet with, they may call their own. Here they will not only enjoy the cold contentment of Learning, but that which is far greater, of Discovering. Many things that have bin hitherto hidden, will arise and expose themselves to their view: Many Methods of advancing what we have already, will come in their way: Nay, even many of the lost Rarities of Antiquity will be hereby restor'd. Of these a great quantity has bin over- whelm'd in the ruins of Time: And they will sooner be retreiv'd by our laboring anew, in the material Subjects whence they first arose, than by our plod- ding everlastingly on the ancient Writings. Their Inventions may be soonest regain'd the same way by which their Medals and Coins have bin found; of which the greatest part has bin recover'd, not by those who sought for them on purpose in old rubbish, but by digging up Foundations to rais new Buildings, and by plowing the Ground to sow new Seed.

This is the Work we propose to be incourag'd, which at once regards the discovering of new Secrets, and the purifying and repairing all the profitable things of Antiquity. The Supply that is needful to finish it, will neither impoverish Families, nor ex-
hand a mighty income. So near is Mankind to its happiness, that so great an attempt may be plentifully indow'd by a small part of what is spent on any one single Lust, or extravagant Vanity of the Time. So moderat is the Society in their desires of assistance, that as much Charity as is bestow'd in England in one year, for the relief of particular Poverty and Diseases, were enough for ever to sustain a Design, which indeavors to give aid against all the infirmities and wants of human Nature.

If now this Enterprise shall chance to fail for want of Patronage and Revenue, the World will not only be frustrated of their present expectations, but will have just ground to despair of any future Labours, towards the increas of the Practical Philosophy. If our Posterity shall find, that an Institution so vigorously begun, and so strengthen'd by many signal advantages, could not support itself: They will have reason in all times to conclude, That the long barrenness of Knowledge was not caus'd by the corrupt method, which was taken, but by the nature of the Thing itself. This will be the last great indeavor that will be made in this way, if this shall prove ineffectual: and so we shall not only be guilty of our own Ignorance, but of the Errors of all those that come after us.

But if (as I rather believe and praefage) our Nation shall lay hold of this opportunity, to deserve the applause of Mankind, the force of this Example will be irresistibly prevalent in all Countries round about us; the State of Christendom will soon obtain a new face; while this Halyon Knowledge is breeding, all Tempests will cease: the oppositions and contentious wranglings of Science, falsely so call'd, will soon vanish.
vanish away: the peaceable calmness of men's judgments, will have admirable influence on their manners; the sincerity of their understandings will appear in their actions; their opinions will be less violent and dogmatical, but more certain; they will only be God's one to another, and not wolves; the value of their arts will be esteem'd by the great things they perform, and not by those they speak: While the old philosophy could only at the best pretend to the portion of Nepthali, to give goodly words, the New will have the blessings of Joseph the younger and the belov'd Son: it shall be like a fruitful bough, even a fruitful bough by a well, whose branches run over the wall: It shall have the blessings of Heaven above, the blessings of the deep that lies under, the blessings of the breasts and of the womb: While the old could only bestow on us some barren terms and notions, the New shall impart to us the uses of all the creatures, and shall inrich us with all the benefits of fruitfulnes and plenty.

FINIS.
ERRATA.

Page 2. line 17. for Building read Buildings. p. 4. l. 32. for Now, New.
   p. 12. l. 26. for strongest, stronger. p. 27. l. 29. for which, while. p.
   42. l. 32. for Academy, Academy. p. 75. l. 13. for Invention, Intention. p.
   83. l. 8. after there put in may. p. 125. l. 27. for Ducat, Ducal. p. 154.
   l. 13. for that, I he. p. 159. for exact, exact. p. 242. l. 19. for values,
   values. p. 313. l. 32. for more, more. p. 314. l. 20. for Diameter, Diameters.
   p. 327. l. 23. for and, an. p. 388. l. 16. for the East, these.