

The Broadview Anthology of British Literature

- The Medieval Period
- The Renaissance and the Early Seventeenth Century
- The Restoration and the Eighteenth Century
- The Age of Romanticism
- The Victorian Era
- The Twentieth Century and Beyond

Volume 3

The Restoration and the Eighteenth Century

Second Edition

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stand in a few days, I make use of common tea-dish which will hold water enough for that time, unless it be in a state of diminution¹ by means of any paper which is going on in it.

If I want to try whether an animal will live in any kind of air, I first put the air into a small vessel just large enough to give it room to stretch itself. And as I generally make use of mice for this purpose, I have found it very convenient to use the hollow part of a tall beer-glass (*d*, fig. 1) which contains between two and three ounce measures of air. In this vessel a mouse will live twenty minutes or half an hour.

For the purpose of these experiments it is most convenient to catch the mice in small wire traps, out of which it is easy to take them and, holding them by the back of the neck, to pass them through the water into the vessel which contains the air. If I expect that the mouse will live a considerable time, I take care to put into the vessel something on which it may conveniently sit, out of the reach of the water. If the air be good, the mouse will soon be perfectly at its ease, having suffered nothing by its passing through the water. If the air be supposed to be noxious, it will be proper (if the operator be desirous of preserving the mice for farther use) to keep hold of their tails, that they may be withdrawn as soon as they begin to show signs of uneasiness. But if the air be thoroughly noxious, and the mouse happens to get a full inspiration, it will be impossible to do this before it be absolutely irrecoverable.

In order to keep the mice, I put them into receivers open at the top and bottom, standing upon plates of tin perforated with many holes, and covered with other plates of the same kind, held down by sufficient weights (as fig. 3). These receivers stand upon a frame of wood, that the fresh air may have an opportunity of getting to the bottoms of them and circulating through them. In the inside I put a quantity of paper or tow,² which must

¹ For the purpose... of diminution More water would be necessary, for instance, if the experiment were left long enough for significant evaporation to occur, or if an aspect of the experiment (such as the application of heat) caused the volume of air in the jar to decrease, drawing more water into the jar.

² tow Flax or hemp fibers.

be changed, and the vessel washed and dried, every two or three days. This is most conveniently done by having another receiver, ready cleaned and prepared, into which the mice may be transferred till the other shall be cleaned.

[T]he most accurate method of procuring air from several substances by means of heat is to put them, if they will bear it, into phials full of quicksilver³ with the mouths immersed in the same, and then throw the focus of a burning mirror upon them. For this purpose the phials should be made with their bottoms round and very thin, that they may not be liable to break with a pretty sudden application of heat.

If I want to expel air from any liquid, I nearly fill a phial with it and, having a cork perforated, I put through it, and secure with cement, a glass tube bended in the manner represented at *e*, fig. 1. I then put the phial into a kettle of water, which I set upon the fire and make to boil. The air expelled by the heat from the liquor contained in the phial issues through the tube, and is received in the basin of quicksilver (fig. 7). Instead of this suspended basin, I sometimes content myself with tying a flaccid bladder to the end of the tube in both these processes, that it may receive the newly generated air.

When I want to try whether any kind of air will admit a candle to burn in it, I make use of a cylindrical glass vessel (fig. 11) and a bit of wax candle (*a*, fig. 12) fastened to the end of a wire (*b*) and turned up in such a manner as to be let down into the vessel with the flame upwards. The vessel should be kept carefully covered till the moment that the candle is admitted. In this manner I have frequently extinguished a candle more than twenty times successively in a vessel of this kind, though it is impossible to dip the candle into it without giving the external air an opportunity of mixing with the air in the inside more or less.

³ quicksilver Mercury.

from John Locke, *An Essay Concerning Human Understanding* (1689)

from BOOK 2, "OF IDEAS," CHAPTER I

Let us then suppose the mind to be, as we say, white paper,¹ void of all characters, without any ideas. How comes it to be furnished? Whence comes it by that vast store, which the busy and boundless fancy of man has painted on it, with an almost endless variety? Whence has it all the materials of reason and knowledge? To this I answer, in one word, from *experience*. In that, all our knowledge is founded, and from that it ultimately derives itself. Our observation employed either about *external, sensible objects*, or about the *internal operations of our minds, perceived and reflected on by ourselves*, is that which supplies our understandings with all the materials of thinking. These two are the fountains of knowledge, from whence all the ideas we have, or can naturally have, do spring.

First, our senses, conversant about particular sensible objects, do convey into the mind several distinct perceptions of things, according to those various ways, wherein those objects do affect them; and thus we come by those ideas we have of yellow, white, heat, cold, soft, hard, bitter, sweet, and all those which we call sensible qualities, which when I say the senses convey into the mind, I mean, they from external objects convey into the mind what produces there those perceptions. This great source of most of the ideas we have, depending wholly upon our senses and derived by them to the understanding, I call *sensation*.

Secondly, the other fountain from which experience furnisheth the understanding with ideas is the *perception of the operations of our own minds* within us, as it is employed about the ideas it has got; which operations, when the soul comes to reflect on and consider, do furnish the understanding with another set of ideas,

¹ white paper The Latin phrase *tabula rasa*, meaning "blank (or erased) slate," is generally used to reference the concept Locke discusses here using the phrase "white paper." The term was first used in the sixteenth century in connection with the ideas of Aristotle, who, like Locke, believed our minds were born void and ready to receive impressions. It is now most often associated with Locke, who provided the most comprehensive articulation of the "blank slate" theory.

which could not be had from things without; and such are *perception, thinking, doubting, believing, reasoning, knowing, willing*, and all the different actings of our own minds; which we being conscious of, and observing in ourselves, do from these receive into our understandings, as distinct ideas, as we do from bodies affecting our senses. This source of ideas every man has wholly in himself. And though it be not sense, as having nothing to do with external objects, yet it is very like it, and might properly enough be called internal sense. But as I call the other *sensation*, so I call this *reflection*, the ideas it affords being such only as the mind gets by reflecting on its own operations within itself. By *reflection* then, in the following part of this discourse, I would be understood to mean that notice which the mind takes of its own operations, and the manner of them, by reason whereof there come to be ideas of these operations in the understanding. These two, I say, viz. external, material things, as the objects of sensation, and the operations of our own minds within, as the objects of reflection, are, to me, the only originals, from whence all our ideas take their beginnings. The term *operations* here I use in a large sense, as comprehending not barely the actions of the mind about its ideas, but some sort of passions arising sometimes from them, such as is the satisfaction or uneasiness arising from any thought.

The understanding seems to me not to have the least glimmering of any ideas which it doth not receive from one of these two. *External objects furnish the mind with the ideas of sensible qualities*, which are all those different perceptions they produce in us; and the *mind furnishes the understanding with ideas of its own operations*.

These, when we have taken a full survey of them, and their several modes, combinations, and relations, we shall find to contain all our whole stock of ideas; and that we have nothing in our minds which did not come in one of these two ways. Let anyone examine his own thoughts, and thoroughly search into his understanding, and then let him tell me, whether all the original ideas he has there are any other than of the objects of his senses, or of the operations of his mind, considered as objects of his reflection; and how great a mass of knowledge soever he imagines to be lodged there, he will, upon taking a strict view, see that he has *not any idea in his mind, but what one of these two have imprinted;*

though, perhaps, with infinite variety compounded and enlarged by the understanding, as we shall see hereafter.

He that attentively considers the state of a child at his first coming into the world, will have little reason to think him stored with plenty of ideas that are to be the matter of his future knowledge. 'Tis by degrees he comes to be furnished with them. And though the ideas of obvious and familiar qualities imprint themselves before the memory begins to keep a register of time and order, yet 'tis often so late before some unusual qualities come in the way that there are few men that cannot recollect the beginning of their acquaintance with them; and if it were worthwhile, no doubt a child might be so ordered as to have but a very few, even of the ordinary ideas, 'till he were grown up to a man. But all that are born into the world being surrounded with bodies that perpetually and diversely affect them, variety of ideas, whether care be taken about it or no, are imprinted on the minds of children: light and colors are busy at hand everywhere, when the eye is but open; sounds and some tangible qualities fail not to solicit their proper senses and force an entrance to the mind. But yet, I think, it will be granted easily that if a child were kept in a place where he never saw any other but black and white till he were a man, he would have no more ideas of scarlet or green than he that from his childhood never tasted an oyster, or a pineapple, has of those particular relishes. . . .

from BOOK 2, CHAPTER 23

But to return to the matter in hand, the ideas we have of substances, and the ways we come by them; I say our specific ideas of substances are nothing else but a collection of a certain number of simple ideas, considered as united in one thing. These ideas of substances, though they are commonly called simple apprehensions, and the names of them simple terms, yet in effect, are complex and compounded. Thus the idea which an Englishman signifies by the name *swan* is white color, long neck, red beak, black legs, and whole feet, and all these of a certain size, with a power of swimming in the

water, and making a certain kind of noise, and, perhaps, to a man who has long observed those kind of birds, some other properties, which all terminate in sensible simple ideas, all united in one common subject.

Besides the complex ideas we have of material sensible substances, of which I have last spoken, by the simple ideas we have taken from those operations of our own minds, which we experiment daily in ourselves, as thinking, understanding, willing, knowing, and power of beginning motion, etc. co-existing in some substance, we are able to frame the complex idea of an immaterial spirit. And thus by putting together the ideas of thinking, perceiving, liberty, and power of moving themselves and other things, we have as clear a perception and notion of immaterial substances as we have of material. For putting together the ideas of thinking and willing, or the power of moving or quieting corporeal motion, joined to substance, of which we have no distinct idea, we have the idea of an immaterial spirit; and by putting together the ideas of coherent solid parts, and a power of being moved, joined with substance, of which likewise we have no positive idea, we have the idea of matter. The one is as clear and distinct an idea as the other: the idea of thinking, and moving a body, being as clear and distinct ideas as the ideas of extension, solidity, and being moved. . . .

If we examine the idea we have of the incomprehensible Supreme Being, we shall find that we come by it the same way; and that the complex ideas we have both of God and separate spirits are made up of the simple ideas we receive from reflection; v.g.,¹ having, from what we experiment in ourselves, got the ideas of existence and duration; of knowledge and power; of pleasure and happiness; and of several other qualities and powers, which it is better to have than to be without. When we would frame an idea the most suitable we can to the Supreme Being, we enlarge every one of these with our idea of infinity; and so putting them together, make our complex idea of God. For that the mind has such a power of enlarging some of its ideas, received from sensation and reflection, has been already showed. . . .

¹ v.g. For *verbi gratia* (Latin), meaning "for example."

from Robert Hooke, *Micrographia: Or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses, with Observations and Inquiries Thereupon* (1665)

THE EPISTLE DEDICATORY. TO THE KING.¹

I do here most humbly lay this small present at your Majesty's royal feet. And though it comes accompanied with two disadvantages, the meanness of the author, and of the subject; yet in both I am encouraged by the greatness of your mercy and your knowledge. By the one I am taught that you can forgive the most presumptuous offenders; and by the other, that you will not esteem the least work of nature or art unworthy your observation. Amidst the many felicities that have accompanied your Majesty's happy restoration² and government, it is none of the least considerable that philosophy and experimental learning have prospered under your royal patronage. And as the calm prosperity of your reign has given us the leisure to follow these studies of quiet and retirement, so it is just that the fruits of them should, by way of acknowledgement, be returned to your Majesty. There are, Sir, several other of your subjects, of your Royal Society, now busy about nobler matters: the improvement of manufactures and agriculture, the increase of commerce, the advantage of navigation, in all which they are assisted by your Majesty's encouragement and example. Amidst all those greater designs, I here presume to bring in that which is more proportionable to the smallness of my abilities, and to offer some of the least of all visible things to that mighty king, that has established an empire over the best of all invisible things of this world: the minds of men.

Your Majesty's most humble and most obedient subject and servant,

ROBERT HOOKE.

¹ the King Charles II, a generous patron of the sciences who granted the Society its charter and remained supportive of its activities.

² your Majesty's happy restoration Charles II's restoration to the throne six years earlier.

TO THE ROYAL SOCIETY.

After my address to our great founder and patron, I could not but think myself obliged, in consideration of those many engagements you have laid upon me, to offer these my poor labours to this most illustrious assembly. You have been pleased formerly to accept of these rude drafts.³ I have since added to them some descriptions and some conjectures of my own. And therefore, together with your acceptance, I must also beg your pardon. The rules you have prescribed yourselves in your philosophical progress do seem the best that have ever yet been practised. And particularly that of avoiding dogmatizing and the espousal of any hypothesis not sufficiently grounded and confirmed by experiments. This way seems the most excellent, and may preserve both philosophy and natural history from its former corruptions. In saying which, I may seem to condemn my own course in this treatise, in which there may perhaps be some expressions which may seem more positive than your prescriptions will permit: and though I desire to have them understood only as conjectures and queries (which your method does not altogether disallow) yet if even in those I have exceeded, 'tis fit that I should declare that it was not done by your directions. For it is most unreasonable that you should undergo the imputation of the faults of my conjectures, seeing you can receive so small advantage of reputation by the slight observations of your most humble and most faithful servant,

ROBERT HOOKE.

from THE PREFACE.

It is the great prerogative of mankind above other creatures that we are not only able to behold the works of nature, or barely to sustain our lives by them, but we have also the power of considering, comparing, altering, assisting, and improving them to various uses. And as this is the peculiar privilege of human nature in general, so is it capable of being so far advanced by the helps of art and experience as to make some men excel others in their observations and deductions almost as much as

³ You have . . . rude drafts Some of the material in *Micrographia* was originally used in demonstrations given for the Royal Society.