

Sprat's *History* of 1667 included a preface in verse by the poet Abraham Cowley. Extracted here are the opening stanza and one addressing the relative worth of words and things.

PHILOSOPHY the great and only Heir  
Of all that Human Knowledge which has bin  
Vnforfeited by Mans rebellious Sin,  
Though full of years He do appear,  
(Philosophy, I say, and call it, He,  
For whatsoe're 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 nurst,  
And of such hopeful parts too at the first.  
But, oh, the Guardians and the Tutors then,  
(Some negligent, and some ambitious men)  
Would ne're consent to set him Free,  
Or his own Natural Powers to let him see,  
Lest that should put an end to their Autoritie.

From Words, which are but Pictures of the Thought,  
(Though we our Thoughts from them perversly drew)  
To Things, the Minds right Object, he\* it brought,  
Like foolish Birds to painted Grapes we flew;  
He sought and gather'd for our use the Tru;  
And when on heaps the chosen Bunches lay,  
He prest them wisely the Mechanic way,  
Till all their juyce did in one Vessel joyn,  
Ferment into a Nourishment Divine,  
The thirsty Souls refreshing Wine.  
Who to the life an exact Piece would make,  
Must not from others Work a Copy take;  
No, not from *Rubens* or *Vandike*;  
Much less content himself to make it like  
Th' Ideaes and the Images which ly  
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 Iudgment of his Eye, and Motion of his Hand.

\* Francis Bacon



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## In Verba:

an anthology of words from the early Royal Society

In 1663 the Royal Society, at the suggestion of John Evelyn, adopted the motto 'Nullius in Verba'. The original meaning is close to 'not bound by any authority', or 'on the word of no authority.' The motto also came to be conveniently misunderstood as meaning simply 'nothing in words', and the early rhetoric of the Society promoted *things* and *works* far above mere *words*. In 1667 the official 'historian' or apologist, Thomas Sprat, described their goal as 'not the Artifice of Words, but a bare knowledge of things' and the institution itself as 'a Society that prefers Works before Words.' (T.Sprat, *The history of the Royal Society of London*, 1667).

It is clear, however, that many of the early Fellows enjoyed words and well-crafted prose. As part of an afternoon of activities related to the written record of the early Royal Society, this anthology presents selections from the writings of four of the Fellows who had close associations with Oxford in the seventeenth century: John Wilkins, Robert Boyle, Chris-

topher Wren and Robert Hooke. Even when affirming the Society's belief in plain speaking, Hooke could not disguise his affection for words: the 'true Philosophical Historian,' he said, will avoid 'all kinds of Rhetorical Flourishes, or Oratorical Garnishes, and all sorts of Periphrases or Circumlocutions.' (R. Waller, ed., *The posthumous works of Robert Hooke*, 1705)



## John Wilkins

John Wilkins (1614-1672), Warden of Wadham College from 1648 to 1659, was the leader of the group of experimental philosophers at the time in Oxford, and probably the most influential among the founders as regards the nature and organisation of the Royal Society.

Wilkins contends that mountains are good, whether on the earth or the moon. This was not the common view in his time, but he cites classical and biblical sources, geography and history for his case that mountains are not the consequence of sin but of providential design.

Though there are some, who think Mountaines to be a deformitie to the earth, as if they were either beate up by the Flood, or else cast up like so many heaps of rubbish left at the Creation; yet if well considered, they will bee found as much to conduce to the beauty and conveniency of the universe, as any of the other parts. Nature (saith *Pliny*) purposely framed them for many excellent uses: partly to tame the violence of greater Rivers; to strengthen certaine joynts within the veines and bowels of the earth, to break the force of the Seas inundation, and for the safety of the earths inhabitants, whether beasts or men. That they make much for the protection of beasts, the Psalmist testifies, *The highest hills are a refuge for the wild goates, and the rocks for conies*. The Kingly Prophet had likewise learned the safety of these by his owne experience, when he also was faine to make a mountaine his refuge from the fury of his Master *Saul*, who persecuted him in the wilderness.

True indeed, such places as these keepe their neighbours poore, as being most barren, but yet they preserve them safe, as being most strong; witnesse our unconquered *Wales* and *Scotland*, whose greatest protection hath beene the naturall strength of their Countrey, so fortified with Mountaines, that these have alwayes beene unto them sure retraites from the violence and oppression of others. Wherefore a good Author doth rightly call them natures bulwarks, cast up at God Almightyes owne charges, the scornes and curbes of victorious armies ... Certainly then such usefull parts were not the effect of mans sin, or produced by the Worlds curse, the Flood, but rather at the first created by the goodnesse and providence of the Almightye.

John Wilkins, *A discourse concerning a new world & another planet*, 1640

Wilkins is confident that, just as knowledge and skill have progressed by stages to his time, continued progress will one day take us to the moon, there to learn about its inhabitants, the Selenites.

Being content for my owne part to have spoken so much of it, as may conduce to shew the opinion of others concerning the inhabitants of the Moone, I dare not my selfe affirme any thing of these Selenites, because I know not any ground whereon to build any probable opinion. But I thinke that future ages will discover more; and our posterity, perhaps, may invent some meanes for our better acquaintance with these inhabitants. 'Tis the method of providence not presently to shew us all, but to lead us along from the knowledge of one thing to another. 'Twas a great while ere the Planets were distinguished from the fixed Stars, and sometime after that ere the morning and evening starre were found to bee the same, and in greater space I doubt not but this also, and farre greater mysteries will bee discovered. In the first ages of the world the Islanders either thought themselves to be the onely dwellers upon the earth, or else if there were any other, yet they could not possibly conceive how they might have any commerce with them, being severed by the deepe and broad Sea, but the after-times found out the invention of ships, in which notwithstanding none but some bold daring men durst venture, there being few so resolute as to commit themselves unto the vaste Ocean, and yet now how easie a thing is this, even to a timorous & cowardly nature? So, perhaps, there may be some other meanes invented for a conveyance to the Moone, and though it may seeme a terrible and impossible thing ever to passe through the vaste spaces of the aire, yet no question there would bee some men who durst venture this as well as the other. ... We have not now any Drake or Columbus to undertake this voyage, or any Daedalus to invent a conveyance through the aire. However, I doubt not but that time who is still the father of new truths, and hath revealed unto us many things which our Ancestours were ignorant of, will also manifest to our posterity, that which wee now desire, but cannot know.

John Wilkins, *A discourse concerning a new world & another planet*, 1640

To demonstrate the evolution of a language, Wilkins offers an early version of the Lord's Prayer – the first of seven examples he gives extending over nine centuries.

If any *English* man should now write or speak as our forefathers did about six or seven hundred years past, we should as little understand him as if he were a foreiner; of which it were easie to give several proofs by instance, if it were not inconsistent with my present design of brevity. About the year of Christ 700 the Lord's Prayer in English was thus rendred: Uren fader thic arth in heofnas, sic gehalgud thin noma: to cymeth thin ric: sic thin willa sue is in heofnas and in eorþho. Uren hlaf ofer wirtlic sel us to daeg; and forget us scylda urna, sue we forgefen scyldgum urum; and no inlead usith in custnung. Ah gefrig urich from ifle. Amen.

John Wilkins, *An essay towards a real character, and a philosophical language*, 1668

Which was the newest language in the world in 1668? Can a language be invented by agreement among those who intend to use it?

That which seems to be the *newest Language* in the World, is the *Malayan*, which is now as general and common amongst the Natives of the *East-Indies*, as *Latin* or *French* is in these parts of the World. 'Tis said to be but of late invention, occasioned by the course of Fishermen from *Pegu*, *Siam*, *Bengala*, and several other Nations, who meeting together at a place convenient for Fishing, and finding that it was by situation exceeding commodious for Traffick from several parts, did agree to settle there a Plantation; and accordingly built the Town of *Malacca*, which hath since, for many years, been governed by the *Portuguez*, and is now under the power of the Hollander. And, for the more facil converse with one another, they agreed upon a distinct *Language*, which probably was made up by selecting the most soft and easy words belonging to each several Nation. And this is the onely *Language* (for ought I know) that hath ever been at once *invented*, if it may properly be styled a distinct Language, and not rather a *Medley* of many. But this being invented by rude Fishermen, it cannot be expected that it should have all those advantages, with which it might have been furnished by the rules of Philosophy.

John Wilkins, *An essay towards a real character, and a philosophical language*, 1668

Inventing a language is about as welcome as inventing a disease? – a striking simile from a language inventor.

It cannot be denied, but that the *variety of Letters* is an appendix to the Curse of *Babel*, namely, the multitude and variety of *Languages*. And therefore, for any man to go about to add to their number, will be but like the inventing of a Disease, for which he can expect but little thanks from the world. But this Consideration ought to be no discouragement: For supposing such a thing as is here proposed, could be well established, it would be the surest remedy that could be against the Curse of the Confusion, by rendring all other *Languages* and *Characters* useless.

John Wilkins, *An essay towards a real character, and a philosophical language*, 1668

An analogy between species among the animals and constellations among the stars.

He that looks upon the Starrs, as they are confusedly scattered up and down in the Firmament, will think them to be (as they are sometimes stiled) innumerable, of so vast a multitude, as not to be determined to any set number: but when all these Starrs are distinctly reduced into particular constellations, and described by their several places, magnitudes and names, it appears, that of those that are visible to the naked eye, there are but few more then a thousand in the whole Firmament, and but a little more then half so many to be seen at once in any Hemisphere, taking in the minuter kinds of them, even to six degrees of magnitude. It is so likewise in other things: He that should put the Question, how many sorts of beasts, or birds, &c. there are in the world, would be answered, even by such as are otherwise knowing and learned men, that there are so many hundreds of them, as could not be enumerated; whereas upon a distinct inquiry into all such as are yet known, and have been described by credible Authors, it will appear that they are much fewer then is commonly imagined, not a hundred sorts of Beasts, nor two hundred of Birds.

John Wilkins, *An essay towards a real character, and a philosophical language*, 1668



# Robert Boyle

Robert Boyle (1627-1691) spent the years between 1655 and 1668 in Oxford, though without holding a college or University position. He was perhaps the most prolific and respected experimental philosopher of his generation in England.

In arguing that a variety of qualities or properties of material things can originate in the same underlying source (and so there is no need to imagine a corresponding variety of powers in the body in question), Boyle draws an analogy with a watch, where the power of a coiled spring is the only origin of many different properties.

That the Multiplicity of Qualities, that are sometimes to be met with in the same Natural Bodies, needs not make men reject the Opinion we have been proposing, by perswading them, that so many Differing Attributes, as may be sometimes found in one and the same Natural Body, cannot proceed from the bare Texture, and other Mechanical Affections of its Matter. For we must consider each Body, not barely as it is in it self an entire and distinct portion of Matter, but as it is a Part of the Universe, and consequently plac'd among a great Number and Variety of other Bodies, upon which it may Act, and by which it may be acted on, in many waies, (or upon many Accounts,) each of which Men are wont to Fancy, as a distinct Power or Quality in the Body, by which those Actions, or in which those Passions are produc'd. ... When a Curious Watch is going, though the Spring be that which puts all the Parts into Motion, yet we do not Fancie (as an *Indian* or *Chinois* would perchance do) in this Spring one Faculty to move the Index uniformly round the Dial-plate, another to strike the Hour, and perhaps a Third to give an Alarme, or shew the Age of the Moon, or the Tides; all the action of the Spring, (which is but a

flexible piece of Steel, forcibly coil'd together,) being but an Endeavour to dilate or unbind its self, and the rest being perform'd by the various Respects it hath to the several Bodies (that compose the Watch) among which it is plac'd, and which they have One to another. We all know, that the Sun hath a power to Harden Clay, and Soften Wax, and Melt Butter, and Thaw Ice, and turn Water into Vapours, and make Air expand it self in Weather-Glasses, and contribute to Blanch Linnen, and make the White skin of the Face Swarthy, and Mowed Grass Yellow, and ripen Fruit, hatch the Eggs of Silk-worms, Caterpillars, and the like Insects, and perform I know not how many other things, divers of which seen contrary Effects, and yet these are not distinct Powers or Faculties in the Sun but onely the Productions of its Heat (which it self is but the brisk, and confus'd Local Motion of the Minute parts of a Body,) diversify'd by the differing Textures of the Body that it chances to work upon, and the Condition of the other Bodies that are concern'd in the Operation.

Robert Boyle, *The origine of formes and qualities*, 1666

Experimental philosophers are best at appreciating the works of the Creator, just as a skilled artisan appreciates a watch better than 'some country fellow'.

And as when some Country Fellow looks upon a curious Watch, though he may be hugely taken with the rich Enamel of the Case, and perhaps with some pretty Landskip that adorns the Dial-plate; yet will not his Ignorance permit him so advantageous a Notion of the exquisite Makers skill, as that little Engine will form in some curious Artist, who besides that obvious Workmanship that first entertains the Eye, considers the exactness, and knows the use of every Wheel, takes notice of their proportion, contrivance, and adaptation altogether, and of the hidden Springs that move them all: So in the World, though every Peruser may read the existence of a Deity,

and be in his degree affected with what he sees, yet is he utterly unable to descry there those subtler Characters and Flourishes of Omniscience, which true Philosophers are sharp-sighted enough to discern. ... How different notions of Gods Wisdom do the Eggs of Hens produce in the ordinary Eaters of them, and in curious Naturalists, who carefully watch and diligently observe from time to time the admirable progress of Nature in the Formation of a Chick.

Robert Boyle, *Some considerations touching the vsefulness of experimental naturall philosophy*, 1661

# Robert Hooke

Robert Hooke (1635-1703) came to Oxford as a student around 1653. He came under the influence of Wilkins and was employed by Boyle. He was appointed Curator of Experiments at the Royal Society in 1662, a post he held for the rest of his life at the centre of the Society's activities. Wren remarked to Hooke in 1665 that 'you all-most wholly preserve [the Society] together by your own constant paines.'

The preface to *Micrographia* opens with Hooke's philosophy of improvement through experiment.

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 humane 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 they do Beasts. By the addition of such *artificial Instruments and methods*, there may be, in some manner, a reparation made for the mischiefs, and imperfection, mankind has drawn upon it self, by negligence, and intemperance, and a wilful and superstitious deserting the Prescripts and Rules of Nature, whereby every man, both from a deriv'd corruption, innate and born with him, and from his breeding and converse with men, is very subject to slip into all sorts of errors.

Improvement will depend, not on new and imaginative theorising, but on a return to careful observing and faithful recording.

In this kind I here present to the World my imperfect Indeaours; which though they shall prove no other way considerable, yet, I hope, they may be in some measure useful to the main Design of a *reformation* in Philosophy, if it be only by shewing, that there is not so much requir'd towards it, any strength of *Imagination*, or exactness of *Method*, or depth of *Contemplation* (though the addition of these, where they can be had, must needs produce a much more perfect composure) as a *sincere Hand*,

and a *faithful Eye*, to examine, and to record, the things themselves as they appear.

The truth is, the Science of Nature has been already too long made only a work of the *Brain* and the *Fancy*: It is now high time that it should return to the plainness and soundness of *Observations on material and obvious* things.

Concluding his preface, Hooke introduces his observations with a brilliant reference to the biblical story of the widow's mite. Her 'mite' was a tiny coin, Hooke's one of his tiny insects, but all the contemporary readers of *Micrographia* will have known that, according to Jesus, 'this poor widow hath cast in more than they all.'

I have at length cast in my Mite, into the vast Treasury of *A Philosophical History*. And it is my *hope*, as well as *belief*, that these my *Labours* will be no more comparable to the *Productions* of many other *Natural Philosophers*, who are now every where busie about *greater* things; then my *little Objects* are to be compar'd to the greater and more beautiful *Works of Nature*, A Flea, a Mite, a Gnat, to an Horse, an Elephant, or a Lyon.

Robert Hooke, *Micrographia*, 1665

The strength and beauty of a flea.

For its strength, the *Microscope* is able to make no greater discoveries of it then the naked eye, but onely the curious contrivance of its leggs and joints, for the exerting that strength, is very plainly manifested, such as no other creature, I have yet observ'd, has any thing like it; for the joints of it are so adapted, that he can, as 'twere, fold them short one

within another, and suddenly stretch, or spring them out to their whole length ... six leggs he clitches up altogether, and when he leaps, springs them all out, and thereby exerts his whole strength at once. But, as for the beauty of it, the *Microscope* manifests it to be all over adorn'd with a curiously polish'd suit of *sable* Armour, neatly jointed, and beset with multitudes of sharp pinns, shap'd almost like Porcupine's Quills, or bright conical Steel-bodkins; the head is on either side beautify'd with a quick and round black eye, behind each of which also appears a small cavity in which he seems to move to and fro a certain thin film beset with many small transparent hairs, which probably may be his ears.

Robert Hooke, *Micrographia*, 1665

Feeding a louse.

Having kept several of them in a box for two or three dayes, so that for all that time they had nothing to feed on, I found, upon letting one creep on my hand, that it immediately fell to sucking, and did neither seem to thrust its nose very deep into the skin, nor to open any kind of mouth, but I could plainly perceive a small current of blood, which came directly from its snout, and past into its belly; and ... there seem'd a contrivance, somewhat resembling a Pump, pair of Bellows, or Heart, for by a very swift *systole* and *diastole* the blood seem'd drawn from the nose, and forced into the body. It did not seem at all, though I viewed it a good while as it was sucking, to thrust more of its nose into the skin then the very snout, nor did it cause the least discernable pain.

Robert Hooke, *Micrographia*, 1665

Experiment and narrative: intravenous injection.

It happen'd to have some Discourse about matters of the like Nature, with those excellent Mathematicians, Dr. I. Wilkins, and Mr. Christopher Wren; at which the latter of those *Virtuosi* told us, That he thought he could easily contrive a way to convey any liquid Poison immediately into the Mass of Blood. Whereupon, our knowledge of his extraordinary Sagacity, making us very desirous to try what he propos'd, I provided a large Dog, on which he made his Experiment in the presence, and with the assistance of some eminent Physitians, and other learned Men: His way (which is much better learn'd by sight, then relation) was briefly this: First, to make a small and opportune Incision over that part of the hind-leg, where the larger Vessels that carry the Blood, are most easie to be taken hold of: Then to make a Ligature upon those Vessels, and to apply a certain small Plate of Brass (of above half an Inch long, and about a quarter of an Inch broad, whose sides were bending inward) almost of the shape and bigness of the Nail of a Mans Thumb, but somewhat longer. This Plate had four little holes in the sides, near the corners, that by threads pass'd thorow them, it might be well fasten'd to the Vessel: And in the same little Plate there was also left an Aperture, or somewhat large Slit, parallel to the sides of it, and almost as long as the Plate, that the Vein might be there expos'd to the Lancet, and kept from starting aside. This Plate being well fasten'd on, he made a Slit along the Vein, from the Ligature towards the Heart, great enough to put in at it the slender Pipe of a Syringe: By which I had propos'd to have injected a warm solution

of *Opium* in Sack, that the effect of our Experiment might be the more quick and manifest. And accordingly our dexterous Experimenter having surmounted the difficulties which the tortur'd Dogs violent struglings interpos'd, convey'd a small Dose of the Solution or Tincture into the open'd Vessel, whereby, getting into the mass of Blood (some quantity of which, 'tis hard to avoid shedding in the operation) it was quickly, by the circular motion of That, carry'd to the Brain, and other parts of the Body. So that we had scarce unty'd the Dog (whose four feet it had been requisite to fasten very strongly to the four Corners of the Table) before the *Opium* began to disclose its Narcotick Quality, and almost as soon as he was upon his feet, he began to nod with his head, and faulter and reel in his pace, and presently after appear'd so stupif'd, that there were Wagers offer'd his Life could not be sav'd. But I, that was willing to reserve him for further observation, caus'd him to be whipp'd up and down the Neighboring Garden, whereby being kept awake, and in motion, after some time he began to come to himself again; and being led home, and carefully tended, he not onely recover'd, but began to grow fat so manifestly that 'twas admir'd: But I could not long observe how it far'd with him. For this Experiment, and some other tryals I made upon him, having made him famous, he was soon after stoln away from me.

Robert Boyle, *Some considerations touching the usefulness of experimental naturall philosophy*, 1661

# Christopher Wren

Christopher Wren (1632-1723) came to Oxford as a student at Wadham College under Wilkins in 1650 and was Savilian Professor of Astronomy from 1661 to 1673, though by the latter date his architectural work had obliged him to appoint a deputy to give his lectures. He was President of the Royal Society for two years from 1681.

The science of billiards and tennis.

Experiments for the establishment of natural philosophy are seldom pompous. It is upon billiards and tennis-balls, upon the purling of sticks and tops, upon a vial of water, or a wedge of glass, that the great Des Cartes hath built the most refined accurate theories, that human wit ever reached to; and certainly nature, in the best of her works, is apparent enough by obvious things, were they but curiously observed.

Letter from Wren to William Brouncker, 1663, in C. Wren, ed, *Parentalia*, 1750.

Beware of fashion.

An Architect ought to be jealous of Novelties, in which Fancy blinds the Judgment; and to think his Judges, as well those that are to live five Centuries after him, as those of his own Time. That which is commendable now for Novelty, will not be a new Invention to Posterity, when his Works are often imitated, and when it is unknown which was the Original; but the Glory of that which is good of itself is eternal.

Wren's first tract on architecture, in C. Wren, ed, *Parentalia*, 1750.

The wonderful discoveries of 17th-century astronomy, as Wren imagines them striking astronomers from the ancient world, had they known ...

... that a Time would come, when Men should be able to stretch out their Eyes as Snails do, and extend them to fifty Feet in length; by which means, they should be able to discover Two thousand Times as many Stars as we can; and find the Galaxy to be Myriads of them; and every nebulous Star appearing as if it were the Firmament of some other World, at an incomprehensible Distance, bury'd in the vast Abys of intermundious Vacuum: That they should see the Planets like our Earth, unequally spotted with Hills and Vales: that they should see Saturn, a very Proteus, changing more admirably than our Moon, by the various Turnings, and Inumbrations of his several Bodies, and accompany'd besides with a Moon of his own ; that they should find Jupiter to be an oval Earth, whose Night is enlighten'd by four several Moons, moving in various Swiftnesses, and making Multitudes of Eclipses: That they should see Mars, Venus, and Mercury to wax and wain: And of the Moon herself, that they should have a Prospect, as if they were hard by, discovering the Heighths and Shape of the Mountains, and Depths of round and uniform Vallies, the Shadows of the Mountains, the Figure of the Shores, describing Pictures of her, with more Accurateness, than we can our own Globe, and therein requiting the Moon for her own Labours, who to discover our Longitudes, by eclipsing the Sun, hath painted out the Countries upon our Globe, with the point of her conical Shadow, as with a Pencil. After all this, if we should have told them, how the very fountain of Light is variegated with its Faculae and Maculae, proceeding round in regular Motions, would not any of the Astronomers of his Time have chang'd their whole Life for a few windy Days, (in which principally the Solar spots appear) or a few clear Nights of our Saeculum.

English draft of Wren's inaugural address as Professor of Astronomy at Gresham College, 1657, in C. Wren, ed, *Parentalia*, 1750.