Lucretius (Roman, c. 95 B.C. – 55 B.C.)
On the Nature of Things
Book I, Lines 485 – 558.
Translated by H. A. J. Munro, 1886.
http://www.gutenberg.org/dirs/7/8/785/785.txt

Bodies, again,
Are partly primal germs of things, and partly
Unions deriving from the primal germs.
And those which are the primal germs of things
No power can quench; for in the end they conquer
By their own solidness; though hard it be
To think that aught in things has solid frame;
For lightnings pass, no less than voice and shout,
Through hedging walls of houses, and the iron
White-dazzles in the fire, and rocks will burn
With exhalations fierce and burst asunder.
Totters the rigid gold dissolved in heat;
The ice of bronze melts conquered in the flame;
Warmth and the piercing cold through silver seep,
Since, with the cups held rightly in the hand,
We oft feel both, as from above is poured
The dew of waters between their shining sides:
So true it is no solid form is found.
But yet because true reason and nature of things
Constrain us, come, whilst in few verses now
I disentangle how there still exist
Bodies of solid, everlasting frame--
The seeds of things, the primal germs we teach,
Whence all creation around us came to be.
First since we know a twofold nature exists,
Of things, both twain and utterly unlike--
Body, and place in which an things go on--
Then each must be both for and through itself,
And all unmixed: where'er be empty space,
There body's not; and so where body bides,
There not at all exists the void inane.
Thus primal bodies are solid, without a void.
But since there's void in all begotten things,
All solid matter must be round the same;
Nor, by true reason canst thou prove aught hides
And holds a void within its body, unless
Thou grant what holds it be a solid. Know,
That which can hold a void of things within
Can be naught else than matter in union knit.
Thus matter, consisting of a solid frame,
Hath power to be eternal, though all else,
Though all creation, be dissolved away.
Again, were naught of empty and inane,
The world were then a solid; as, without
Some certain bodies to fill the places held,
The world that is were but a vacant void.
And so, infallibly, alternate-wise
Body and void are still distinguished,
Since nature knows no wholly full nor void.
There are, then, certain bodies, possessed of power
To vary forever the empty and the full;
And these can nor be sundered from without
By beats and blows, nor from within be torn
By penetration, nor be overthrown
By any assault so ever through the world--
For without void, naught can be crushed, it seems,
Nor broken, nor severed by a cut in twain,
Nor can it take the damp, or seeping cold
Or piercing fire, those old destroyers three;
But the more void within a thing, the more
Entirely it totters at their sure assault.
Thus if first bodies be, as I have taught,
Solid, without a void, they must be then
Eternal; and, if matter ne'er had been
Eternal, long ere now had all things gone
Back into nothing utterly, and all
We see around from nothing had been born--
But since I taught above that naught can be
From naught created, nor the once begotten
To naught be summoned back, these primal germs
Must have an immortality of frame.
And into these must each thing be resolved,
When comes its supreme hour, that thus there be
At hand the stuff for plenishing the world

Robert Boyle (English, 1627 – 1691)
The Sceptical Chymist, 1680
reprint, *The Classics of Science Library*, 1997

pp.432 – 433.

I hope you are satisfied that the Arguments, wont to be brought by Chymists to prove That all Bodies consist of either Three Principals, or Five, are far from being so strong as those that I have employ'd to prove, that there is not any certain Determinate number of such Principles or Elements to be met with Universally in all mixt Bodies. And I suppose I need not tell you, that these Anti-Chymical Paradoxes might have been manag'd more to their Advantage; but that having not confin'd my Curiosity to Chymical Experiments, I, who am but a young man, and younger Chymist, can yet be but slenderly furnished with them, in reference to so great and difficult a Task as you impos'd upon me: Besides that, to tell you the Truth, I durst not employ some even of the best Experiments I am acquainted with, because I must not yet disclose them; but, however, I think I may presume that what I have hitherto Discoursed will induce you to think, that Chymists have been much more happy in finding Experiments than the Causes of them; or in assigning the Principles by which they may best be explained.

pp. 435 - 436.
(Boyle is addressing the arguments of an Aristotelian philosopher)

yet methinks that however your Objections seem to evince a great part of what they pretend to, yet they evince it not all; and the numerous tryals of those you call the vulgar Chymists, may be allowed to prove something too.

Wherefore, if it be granted you that you have made it probable,

First, that the differing substances into which mixt Bodies are wont to be resolved by the Fire are not of a pure and Elementary nature, especially for this Reason, that they yet retain so much of the nature of the Concrete that afforded them, as to appear yet somewhat compounded, and oftentimes to differ in one Concrete from Principles of the same denomination in another:

Next, that as to the number of these differing substances, neither is it precisely three, because in most Vegetable and Animal bodies Earth and Phlegme are also to be found among their Ingredients; nor is there any one determinate number into which the Fire (as it is wont to be employ'd) does precisely and universally resolve all compound Bodies whatsoever, as well Minerals as others that are reputed perfectly mixt:

Lastly, that there are divers Qualities which cannot well be refer'd to any of these Substances, as if they primarily resided in it and belong'd to it; and for some other qualities, which though they seem to have their chief and most ordinary residence in some one of these Principle or Elements of mixt Bodies, are not yet so deducible from it, but that also some more general Principles must be taken in to explicate them:

Joseph Priestly (English, 1733 – 1804)
Experiments and Observations on Different Kinds of Air, 1775
http://www.archive.org/details/experimentsobser01prie

Preface, pp. vi – vii.

As to myself, I find it absolutely impossible to produce a work on this subject that shall be any thing like complete. My first publication acknowledged to be very imperfect, and the present, I am as ready to acknowledge, is still more so. But, paradoxical as it may seem, this will ever be the case in the progress of natural science, so long as the works of God are, like himself, infinite and inexhaustible. In completing one discovery we never fail to get an imperfect knowledge of others, of which we could have no idea before, so that we cannot solve one doubt without creating several new ones.

Preface, pp. ix – x.

I would observe farther, that a person who means to serve the cause of science effectually, must hazard his own reputation so far as to risk even mistakes in things of less moment. Among a multiplicity of new objects, and new relations, some will necessarily pass without sufficient attention ; but if a man be not mistaken in the principal objects of his pursuits, he has no occasion to distress himself about lesser things.

In the progress of his inquiries he will generally be able to rectify his own mistakes or if little and envious fouls should take a malignant pleasure in detecting them for him, and endeavouring to expose him, he is not worthy of the name of a philosopher, if he has not strength of mind sufficient to enable him not to be disturbed at it. He who does not foolishly affect to be above the failings of humanity, will not be mortified when it is proved that he is but a man.

In this work, as well as in all my other philosophical writings, I have made it a rule not to conceal the real views with which I have made experiments ; because though, by following a contrary maxim, I might have acquired a character of greater sagacity, I think that two very good ends are answered by the method that I have adopted. For it both tends to make a narrative of a course of experiments more interesting, and likewise encourages other adventurers in experimental philosophy ; showing them that, by pursuing even false lights, real and important truths may be discovered, and that in seeking one thing we often find another.

Antoine Lavoisier (French, 1743 - 1794)
Essays Physical and Chemical
Translated by Thomas Henry, 1776
http://books.google.com/books?id=HxMAAAAAQAAJ&pg=PR7&vq=%22after+an+imaginary+production+that+was+to+reduce+all+things+to+gold,+had,+inftead+of+that+fruitlefs+purfuit,+beftowed+their%22&source=gbs_quotes_r&cad=6#v=onepage&q&f=false

p. 3

It must be acknowledged that this last part of my work is not so complete as I could wish, and that is not without some degree of regret that I publish it; But as it is easy to lose one's way in a road but little traveled, I reflected how important it might be for me to benefit myself by the remarks of the learned, though it might expose me at the same time to their criticisms. It is principally with this view that the latter part of this work is published in this state of imperfection; and I am already aware that I have occasion for all the indulgence of my reader.

pp. 222 – 223.
Experiment 1
The Solution of Chalk in the Nitrous Acid.

I poured into a small matrass, with a long narrow neck, six ounces of the nitrous acid, the weight of which was to that of water as 129,895 to 100,000. I added, by degrees, some chalk in powder dried in a degree of fire, long continued, nearly equal to that in which mercury boils.

The solution was effected by a quick effervescence, but with scarcely any heat. I took care to keep the matrass as much stopped as possible; only opened it from time to time, to give vent to the vapours which were discharged impetuously; these precautions were taken that the evaporation might be as small as possible. Two ounces, three drachms, and thirty-six grains of chalk were employed to saturate the acid; the whole weight, therefore, of both substances, amounted to eight ounces, three drachms, and thirty-six grains; but having weighed them again, after their combination, the weight was no more than seven ounces, three drachms, and thirty-six grains; which made the loss in weight exactly one ounce. This could only be attributed to the elastic fluid which was separated, and the watery or other vapours which it had carried off with it: a method was, therefore, to be discovered to retain and examine them. This I proposed to do in by the following experiment.

Joseph Louis Proust (French, 1754 – 1826)
"Sur les Mines de Cobalt, Nickel et Autres" *Journal de Physique* 63, 566-8 (1806),
Translated by Maurice Crosland in *The Science of Matter: A Historical Survey* , 1971
http://web.lemoyne.edu/~giunta/proust2.html

Everything in mineralogy is not a compound ... there is a large number of substances to which this name should not be applied indiscriminately, as some authors do for want of having thought sufficiently about what is understood by this word in chemistry. Because they have not noticed that the science has made a rule of reserving its use, they have applied it indifferently to substances which it deliberately avoids describing thus. They therefore confuse compounds with certain concrete solutions, certain combinations, certain systems of compound bodies to which it attaches a quite contrary idea. Nature, for example, presents us with compounds of elements, but also with combinations formed by a multiple aggregation of these same compounds.

Let us stop for a moment to satisfy an objection which D'Aubuisson certainly addresses to me, when he says in a memoir in which he so justly sees the futility of certain definitions, "The analyses of the copper ore … are a new example of compounds formed in variable proportions." I would reply that the copper ore does not belong at all to the order of compounds which chemists are examining at the moment in order to unravel the principles of their formation. A compound according to our principles … is something like sulphide of silver, of antimony, of mercury, of copper; it is an acidified combustible substance, etc.; it is a privileged product to which nature assigns fixed proportions; it is in a word a being which she never creates, even in the hands of man, except with the aid of a balance, *pondere et mensura*. (proportioned and measured)

John Dalton (English, 1766 - 1844)
"On the Constitution of Bodies" *A New System of Chemical Philosophy* (1808) pp. 141-143 reprinted in *Foundations of the Atomic Theory*, William F. Clay, Edinburgh, 1893.
http://books.google.com/books?printsec=frontcover&dq=john%20Dalton&id=V5sEAAAAYAAJ&output=text&pg=PA26

THERE are three distinctions in the kinds of bodies, or three states, which have more especially claimed the attention of philosophical chemists; namely, those which are marked by the terms *elastic fluids, liquids, and solids.* A very familiar instance is exhibited to us in water, of a body, which, in certain circumstances, is capable of assuming all the three states. In steam we recognize a perfectly elastic fluid, in water a perfect liquid, and in ice a complete solid. These observations have tacitly led to the conclusion which seems universally adopted, that all bodies of sensible magnitude, whether liquid or solid, are constituted of a vast number of extremely small particles, or atoms of matter bound together by a force of attraction, which is more or less powerful according to circumstances, and which as it endeavours to prevent their separation, is very properly called in that view, *attraction of cohesion;* but as it collects them from a dispersed state (as from steam into water) it is called, *attraction of aggregation,* or more simply, *affinity.* Whatever names it may go by, they still signify one and the same power. It is not my design to call in question this conclusion, which appears completely satisfactory; but to show that we have hitherto made no use of it, and that the consequence of the neglect, has been a very obscure view of chemical agency, which is daily growing more so in proportion to the new lights attempted to be thrown upon it.

The opinions I more particularly allude to, are those of Berthollet on the Laws of chemical affinity; such as that chemical agency is proportional to the mass, and that in all chemical unions, there exist insensible gradations in the proportions of the constituent principles. The inconsistence of these opinions, both with reason and observation, cannot, I think, fail to strike every one who takes a proper view of the phenomena.

Whether the ultimate particles of a body, such as water, are all alike, that is, of the same figure, weight, &c. is a question of some importance. From what is known, we have no reason to apprehend a diversity in these particulars: if it does exist in water, it must equally exist in the elements constituting water, namely, hydrogen and oxygen. Now it is scarcely possible to conceive how the aggregates of dissimilar particles should be so uniformly the same. If some of the particles of water were heavier than others, if a parcel of the liquid on any occasion were constituted principally of these heavier particles, it must be supposed to affect the specific gravity of the mass, a circumstance not known. Similar observations may be made on other substances. Therefore we may conclude that *the ultimate particles of all homogeneous bodies are perfectly alike in weight, figure, etc.*. In other words, every particle of water is like every other particle of water; every particle of hydrogen is like every other particle of hydrogen, &c.