

## “Query 31” of *Opticks*

Isaac Newton, 1704

1 All these things being consider'd, it seems probable to me,  
2 that God in the Beginning form'd Matter in solid, massy, hard,  
3 impenetrable Particles, of such Sizes and Figures, and with such  
4 other Properties, and in such Proportion to Space, as most  
5 conduced to the End for which he form'd them; and that these  
6 primitive Particles being Solids, are incomparably harder than any  
7 porous Bodies compounded of them; even so very hard, as never  
8 to wear or break in pieces; no ordinary Power being able to divide  
9 what God himself made one in the first Creation. While the  
10 Particles continue entire, they may compose Bodies of one and the  
11 same Nature and Texture in all Ages: But should they wear away,  
12 or break in pieces, the Nature of Things depending on them, would  
13 be changed. Water and Earth, composed of old worn Particles and  
14 Fragments of Particles, would not be of the same Nature and  
15 Texture now, with Water and Earth composed of entire Particles in  
16 the Beginning. And therefore, that Nature may be lasting, the  
17 Changes of corporeal Things are to be placed only in the various  
18 Separations and new Associations and Motions of these permanent  
19 Particles; compound Bodies being apt to break, not in the midst of  
20 solid Particles, but where those Particles are laid together, and only  
21 touch in a few Points.

22 It seems to me farther, that these Particles have not only a *Vis*  
23 *inertiae*, accompanied with such passive Laws of Motion as  
24 naturally result from the Force, but also that they are moved by  
25 certain active Principles, such as is that of Gravity, and that which  
26 causes Fermentation, and the Cohesion of Bodies. These Principles  
27 I consider, not as occult Qualities, supposed to result from the  
28 specifick Forms of Things, but as general Laws of Nature, by  
29 which the Things themselves are form'd; their Truth appearing to  
30 us by Phaenomena, though their Causes be not yet discover'd. For  
31 these are manifest Qualities, and their Causes only are occult. And  
32 the *Aristotelians* gave the Name of occult Qualities only as they  
33 supposed to lie hid in Bodies, and to be the unknown Causes of  
34 manifest Effects: Such as would be the Causes of Gravity, and of  
35 magnetick and electrick Attractions, and of Fermentations, if we  
36 should suppose that these Forces or Actions arose from Qualities

37 unknown to us, and uncapable of being discovered and made  
38 manifest. Such occult Qualities put a stop to the Improvement of  
39 natural Philosophy, and therefore of late Years have been rejected.  
40 To tell us that every Species of Things is endow'd with an occult  
41 specifick Quality by which it acts and produces manifest Effects, is  
42 to tell us nothing: But to derive two or three general Principles of  
43 Motion from Phaenomena, and afterwards to tell us how the  
44 Properties and Actions of all corporeal Things follow from those  
45 manifest Principles, would be a very great step in Philosophy,  
46 though the Causes of those Principles were not yet discover'd: And  
47 therefore I scruple not to propose the Principles of Motion  
48 above-mention'd, they being of very general Extent, and leave  
49 their Causes to be found out.

50 Now by the help of these Principles, all material Things seem  
51 to have been composed of the hard and solid Particles  
52 above-mention'd, variously associated in the first Creation by the  
53 Counsel of an intelligent Agent. For it became him who created  
54 them to set them in order. And if he did so, it's unphilosophical to  
55 seek for any other Origin of the World, or to pretend that it might  
56 arise out of a Chaos by the mere Laws of Nature; though being  
57 once form'd, it may continue by those Laws for many Ages. For  
58 while Comets move in very excentrick Orbs in all manner of  
59 Positions, blind Fate could never make all the Planets move one  
60 and the same way in Orbs concentrick, some inconsiderable  
61 Irregularities excepted, which may have risen from the mutual  
62 Actions of Comets and Planets upon one another, and which will  
63 be apt to increase, till this System wants a Reformation. Such a  
64 wonderful Uniformity in the Planetary System must be allowed the  
65 Effect of Choice. And so must the Uniformity in the Bodies of  
66 Animals, they having generally a right and a left side shaped alike,  
67 and on either side of their Bodies two Legs behind, and either two  
68 Arms, or two Legs, or two Wings before upon their Shoulders, and  
69 between their Shoulders a Neck running down into a Back-bone,  
70 and a Head upon it; and in the Head two Ears, two Eyes, a Nose, a  
71 Mouth, and a Tongue, alike situated. Also the first Contrivance of  
72 those very artificial Parts of Animals, the Eyes, Ears, Brain,  
73 Muscles, Heart, Lungs, Midriff, Glands, Larynx, Hands, Wings,  
74 swimming Bladders, natural Spectacles, and other Organs of Sense  
75 and Motion; and the Instinct of Brutes and Insects, can be the  
76 effect of nothing else than the Wisdom and Skill of a powerful

77 ever-living Agent, who being in all Places, is more able by his Will  
78 to move the Bodies within his boundless uniform Sensorium, and  
79 thereby to form and reform the Parts of our own Bodies. And yet  
80 we are not to consider the World as the Body of God, or the  
81 several Parts thereof, as the Parts of God. He is an uniform Being,  
82 void of Organs, Members or Parts, and they are his Creatures  
83 subordinate to him, and subservient to his Will; and he is no more  
84 of the Species of Things carried through the Organs of Sense into  
85 the place of its Sensation, where it perceives them by means of its  
86 immediate Presence, without the Intervention of any third thing.  
87 The Organs of Sense are not for enabling the Soul to perceive the  
88 Species of Things in its Sensorium, but only for conveying them  
89 thither; and God has no need of such Organs, he being every  
90 where present to the Things themselves. And since Space is  
91 divisible in infinitum, and Matter is not necessarily in all places, it  
92 may be also allow'd that God is able to create Particles of Matter of  
93 several Sizes and Figures, and in several Proportions to Space, and  
94 perhaps of different Densities and Forces, and thereby to vary the  
95 Laws of Nature, and make Worlds of several sort in several Parts  
96 of the Universe. At least, I see nothing of Contradiction in all this.

97 As in Mathematicks, so in Natural Philosophy, the  
98 Investigation of difficult Things by the Method of Analysis, ought  
99 ever to precede the Method of Composition. This Analysis consists  
100 in making Experiments and Observations, and in drawing general  
101 Conclusions from them by Induction, and admitting of no  
102 Objections against the Conclusions, but such as are taken from  
103 Experiments, or other certain Truths. For Hypotheses are not to be  
104 regarded in experimental Philosophy. And although the arguing  
105 from Experiments and Observations by Induction be no  
106 Demonstration of general Conclusions; yet it is the best way of  
107 arguing which the Nature of Things admits of, and may be looked  
108 upon as so much the stronger, by how much the Induction is more  
109 general. And if no Exception occur from Phaenomena, the  
110 Conclusion may be pronounced generally. But if at any time  
111 afterwards any Exception shall occur from Experiments, it may  
112 then begin to be pronounced with such Exceptions as occur. By  
113 this way of Analysis we may proceed from Compounds to  
114 Ingredients, and from Motions to the Forces producing them; and  
115 in general, from Effects to their Causes, and from particular  
116 Causes to more general ones, till the Argument end in the most  
117 general. This is the Method of Analysis: And the Synthesis  
118 consists in assuming the Causes discover'd, and establish'd as

119 Principles, and by them explaining the Phaenomena proceeding  
120 from them, and proving the Explanations.

121 In the two first Books of these Opticks, I proceeded by this  
122 Analysis to discover and prove the original Differences of the Rays  
123 of Light in respect of Refrangibility, Reflexibility, and Colour, and  
124 their alternate Fits of easy Reflexion and easy Transmission, and  
125 the Properties of Bodies , both opake and pellucid, on which their  
126 Reflexions and Colours depend. And these Discoveries being  
127 proved, may be assumed in the Method of Composition for  
128 explaining the Phaenomena arising from them: An Instance of  
129 which Method I gave in the End of the first Book. In this third  
130 Book I have only begun the Analysis of what remains to be  
131 discover'd about Light and its Effects upon the Frame of Nature,  
132 hinting several things about it, and leaving the Hints to be  
133 examin'd and improv'd by the farther Experiments and  
134 Observations of such as are inquisitive. And if natural Philosophy  
135 in all its Parts, by pursuing this Method, shall at length be  
136 perfected, the Bounds of Moral Philosophy will be also enlarged.  
137 For so far as we can know by natural Philosophy what is the first  
138 Cause, what Power he has over us, and what Benefits we receive  
139 from him, so far our Duty towards him, as well as that towards one  
140 another, will appear to us by the Light of Nature. And no doubt, if  
141 the Worship of false Gods had not blinded the Heathen, their  
142 moral Philosophy would have gone farther than to the four  
143 Cardinal Virtues; and instead of teaching the Transmigration of  
144 Souls, and to worship the Sun and Moon, and dead Heroes, they  
145 would have taught us to worship our true Author and Benefactor,  
146 as their Ancestors did under the Government of Noah and his Sons  
147 before they corrupted themselves.