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BY HARRY WHITE

s our understanding of Blake has progressed from A madman to mystic to visionary artist, there is still a widespread tendency to read him as holding "anti-scientific views,"1 expressing "strong anti-scientific sentiments,"2 and being unflagging in his "exploration of anti-scientific doctrines."3 It is said that "Blake did not love science, even feared and despised it,"4 even though he himself objected to "those who pretend to despise the labours of Art & Science, which [he believed] alone are the labours of the Gospel . . . [adding that] to Labour in Knowledge, is to Build up Jerusalem: and to Despise Knowledge, is to Despise Jerusalem & her Builders" (Jerusalem 77, E 232).3 Indeed, Blake claimed for scientific work what he never said about religion or morals: "Arts & Sciences," he wrote, "are the Destruction of Tyrannies or Bad Governments" (annotations to Reynolds, E 636). If Blake hated and feared science, how explain the fact that he believed "The Primeval State of Man, was Wisdom, Art, and Science" (Jerusalem 3, E 146) and that the very last line of The Four Zoas proclaims a future wherein the "dark Religions are departed & sweet Science reigns"? For after all is said and done, "What is the Life of Man but Art & Science?" (Jerusalem 77, E 232).

Blake did not fear that the "power of scientific thought" might "replace imagination,"⁶ nor did he attack the "debilitating influences" of "analytical philosophy ... and empirical science," for it was not scientific thought, but "Abstract Philosophy" which he said was "warring in enmity against Imagination" (*Jerusalem* 5:58, E 148) and doing so in opposition to both art and science. Believing that the power of scientific thought actually derived from the imagination, the "true faculty of knowing" (*All Religions are One*, E 1), Blake felt that "Bacons *Philosophy* has Destroyd all Art & Science" (annotations to Reynolds, E 656; my italics); he showed how the theoretical systems Bacon and other natural philosophers created

 Blake's writings are quoted from The Complete Poetry and Prose of William Blake, ed. David Erdman (New York: Anchor Books, 1988), hereafter "E".

6. Bloom, Blake's Apocalypse 424.

7. Emery 23.

were no different from traditional systems of thought in their general disregard for the evidence of human experience.

In 1936, A. J. Ayer's influential Language, Truth, and Logic was published. Ayer's aim, we are told, was "to liberate science and common sense from philosophy, to free it from 'system builders.' There is no source of truth, Ayer argued, but experience."[#] It is high time we recognized that that can serve as a pretty good description of what Blake attempted almost one hundred and fifty years earlier and, for his time, with greater daring and originality: "Striving with Systems to deliver Individuals from those Systems" by showing how "Knowledge is not by deduction but Immediate by Perception or Sense at once" and can therefore be acquired only through "the faculty which experiences" (Jerusalem 11:5, E 154; annotations to Berkeley, E 664; All Religions are One, E 1).

Blake set "Downright Plain Truth" against "Reasoning [which] is Nothing" and said in opposition to those who contended that "Truth should be Confined to Mathematical Demonstration" that any man could "Know Truth at Sight" (annotations to Watson, E 618; annotations to Reynolds, E 659). Clearly Blake wished above all else to give expression to his visionary imagination, but he also felt compelled to address the radical changes philosophy was undergoing ("Urizen who was Faith & Certainty is changd to Doubt," and the "idiot Reasoner [now] laughs at the Man of Imagination" [Four Zoas 27:15, E 318; Milton 32:6, E 131]), and he was informed and insightful enough to turn the tables on the new philosophers and show how it was they and not men of imagination who were propounding truths that were unreal. A significant and important portion of Blake's writings was devoted to a critical analysis of what he identified as "Truth the result of Reasoning" (annotations to Bacon, E 621). Blake sought to clarify the differences between rational truth and empirical knowledge, which he understood to be any and all knowledge gained immediately through experience and which encompassed everything from a grain of sand to worlds of imagination.

Berkeley had dismissed "philosophers [who] distrust their senses, and doubt the existence ... of everything they see or feel [and who ...] are forced to own we cannot attain to any self-evident ... knowledge of the existence of sensible things."⁹ Similarly Blake ridiculed anyone "who Doubts from what he sees" and called him a knave who inquired "into the truth of a self evident thing" (*Auguries of Innocence* 107, E 492; annotations to Watson, E 613-14). He insisted that there could not be any doubt regarding the self-evident truths of human experience—the worlds of sensation, feeling, and imagination that we all experience but which rational philosophy called into question: "Did Jesus teach Doubt or did he / Give any lessons of Philosophy[?]" No, because "Rational Truth is not the Truth of Christ but of Pilate" (*Everlasting Gospel* p. 48, part of an abandoned section, E 525; annotations to Bacon, E 621).

Rogers 120.
Berkeley, *Treatise* 553.

^{1.} See Toulmin.

^{2.} Weinberg 101.

^{3.} Schorer 49.

^{4.} Dawkins 17.

Only a fool or an idiot would doubt anything men experience, but to doubt the abstractions and generalizations of speculative philosophy was another matter altogether. "That the things I see with my eyes and touch with my hands do ... really exist, I make not the least question," Berkeley wrote. "The only thing whose existence we deny is that which philosophers call matter"10 As we will see, there were many more "things" Blake denied, for he encouraged everyone to doubt the reality of all truths of reason as well as those figures of authority who took advantage of the abstract non-entities philosophers created to enslave the vulgar (see Marriage of Heaven and Hell 11, E 38). There is no inconsistency between Blake's acceptance of every image of truth men can possibly envision and his skeptical attitude with respect to the truths of reason, nor should we be misled by his aphoristic approach into thinking he "gives low priority to detailed investigation of logics other than his own."11 His critiques, where they occur, are never extended, but the details are there, scattered throughout his writings, and just need to be pulled together.

This paper, then, will attempt to situate much of Blake's writing where I believe it properly belongs, not alongside the complaints of opponents of science, but in line with the great British tradition of empirical-analytic philosophy represented by thinkers like Berkeley or Ayer, who questioned the conclusions of speculative philosophy and insisted that experience remains the only basis for all our knowledge, and next to many leading scientists who, like Blake, looked with skepticism at certain influential but unwarranted philosophical assumptions respecting classical physics. I will also attempt show how Blake sketched an alternative view of science based on our actual experience of living forms, which anticipated the great scientific revolution that occurred not long after he ceased writing.

The Material World

Causal determinism was arguably the most important creation of the new philosophy, and Blake knew that it had been shown utterly to lack any basis in experience. His contention that "a Natural Cause only seems" (*Milton* 26:45, E 124) may at first seem wildly dismissive, but as Thomas Reid had noted in 1788, "Natural philosophers ... have never discovered the efficient cause of any one phenomenon"¹² Both statements are perfectly in keeping with Hume's still troublesome critique of causality. The

particular powers, by which all natural operations are performed never appear to the senses In reality, there is no part of matter, that does ever, by its sensible qualities, discover

Berkeley, *Treatise* 534,
Cox 29,
Reid 47,

any power or energy [T]he power of [or] force which actuates the whole machine, is entirely concealed from us¹⁰

It is no sure sign of mystification or anti-scientific prejudice on Blake's part to say, as he did, that we have no experience of any thing being the cause of any other thing. Hume for one had already said it, and Karl Pearson, one of the first major contributors to theoretical statistics, would later note that the "law of causation ... is a useful concept, but in no sense a reality,"¹⁴ while Niels Bohr believed the advent of atomic physics required "a final renunciation of the classical ideal of causality."¹⁵ However, well before statistical analysis undermined the concept of causality, Newton himself wrote to Richard Bentley regarding the greatest of all causes, "You speak of gravity as being essential & inherent in matter, pray do not ascribe that notion to me, for ye cause of gravity is what I do not pretend to know ...," (17 Jan. 1692/93).¹⁶

Blake did not wish to escape from "Humean skepticism" with its doubts regarding "the idea of causation"17; rather, he employed such skepticism to expose the difficulties surrounding causal determinism. When he wrote that "There is no Such Thing as a ... Natural Cause" (annotations to Bacon, E 626), he, like Hume before him and others after them, was merely stating that the term natural cause does not refer to any thing that we know to exist. A natural cause is a non-entity which only seems to exist-just one example of "a Delusion / Of Ulro" in which people commonly mistake what "only seems" for what actually exists (see Milton 26:45-46, E 124). "We deceive ourselves," Reid observed, "if we conceive, that we can point out the real efficient cause" of any "phenomenon that falls within the compass of natural philosophy." The "grandest discovery ever made in natural philosophy, was that of the law of gravitation But the author of this discovery was perfectly aware, that he discovered no real cause, but only the law or rule, according to which the unknown cause operates" (my italics).18

As Bertrand Russell put it, the "reason why physics has ceased to look for causes is that, in fact, there are no such things."¹⁹ Russell was of course referring to twentieth-century physics, but in fact scientists in Blake's time had already methodically avoided looking for causes. Blake thus understood Newton's aims and accomplishments correctly, since Newton himself wrote in his great work, "I here design to give a mathematical notion of these forces, without considering their

 Hume, Enquiry 609, 623, 627. For additional parallels and affinities between Blake and Hume, see Morton D. Paley, Energy and the Imagination (Oxford: Clarendon Press, 1970) 26-27.

16. Newton, Correspondence (hereafter cited solely in the text by addressee and date) 3: 240.

17. Bloom, Blake's Apocalypse 16.

18. Reid 45-46.

^{14.} Pearson 154.

^{15.} Bohr 60.

^{19.} Russell 180.

physical causes and seats."20 His Opticks also makes it clear that science gives us the "general Laws of Nature," even "though their Causes be not yet discover'd"; Newton never scrupled "to propose Principles of Motion" and "leave their Causes to be found out."21 His researches were perfectly in keeping with the revolutionary change Galileo brought to scientific study. As Galileo wrote in his Dialogues Concerning Two New Sciences (1638), the purpose of science is "to investigate and to demonstrate ... the properties of [things like] accelerated motion," but "it is not really worthwhile" to "obtain a proper solution of the problem discussed by philosophers, namely, what causes the acceleration."22 Thus, when Blake contended that scientists have not discovered true or ultimate causes, he was not charging them with having failed in their purpose. Galileo, Newton, and others had already pointed out that scientific investigation does not propose to resolve what are in fact philosophical problems. Philosophers who puzzle over causes should not be thought of as doing the work of science; above all, as Blake repeatedly pointed out, philosophers should not claim what leading scientists had specifically denied, that natural philosophy had in fact solved philosophic issues regarding things like ultimate causes. Blake thus understood the responsibility for the war that was raging between philosophy and science to rest with the philosophers, and he sought to end it by showing that what he and others objected to had nothing to do with actual scientific work (such as the kind, as we shall see, he showed Los engaged in), but with the misguided claims philosophers (like Urizen) made for their own rational systems of thought.

Laplace would title his great work Celestial Mechanics (1799-1825), but Newton understood himself to be writing about mathematical principles of philosophy and insisted that "we cannot yet prove by Experiments that all the Phaenomena in Nature can be solved by meer Mechanical Causes,"23 Most, however, did understand Newton's work to be providing physical explanations, so Blake had to remind his readers that the reliability of Newton's mathematical principles could not be taken as valid proof of the actual existence of mechanical causes. (Indeed, to this day there is no proof that any such mechanisms as force, inertia, cause or gravity really do exist in nature.) Blake's denial of any proof or knowledge of a physical reality of mechanical causes contradicted those philosophers like Locke who thought it necessary to assume the existence of mechanical causes, but that denial did not contradict the design of Newton's work or Newton's characterization of it as not revealing true causes (verae causae).

Against the view of science that was becoming popular in his day, but not contrary to the view of scientists like Galileo or Newton, Blake repeatedly described scientific formulations as "creations," "fictions," "allegories," "abstractions," or

110 Blake/An Illustrated Quarterly

"non-entities," which oftentimes led to delusions respecting a physical reality of mechanical determinism. He proposed and dramatized the idea that, as Hawking would remark, a scientific "theory ... exists only in our minds and does not have any other reality"24 And he anticipated Einstein's observation that the "tremendous practical success of [Newton's] doctrines ... may well have prevented him and the physicists of the eighteenth and nineteenth centuries from recognizing the fictitious character of the foundations of his system."25 A scientist, Einstein generally noted, is apt to treat "the products of his imagination ... not as the creations of his thoughts but as given realities."26 This, according to Max Planck, was "a fundamental mistake" of classical physics, the belief that it furnished "a direct glimpse into the real happenings of things."27 Niels Bohr went so far as to state that it "is wrong to think that the task of physics is to find out how Nature is."28

In line with those scientists from Newton to Hawking who either refuse to speculate on the ontological status of the terms they successfully employ or deny the validity of their formulas with respect to some reality beyond thought, Blake understood that natural philosophy, or what we might nowadays call theoretical physics, functioned and could function well enough by describing what seems without having to commit the fundamental mistake of proclaiming it had discovered what is. Eden is just such a state of mind, in which one recognizes that what appears to be without is actually within, whereas Ulro is the opposite state, based upon the delusive ontology fostered by classical physics: in Ulro, "What seems to Be: Is: To those to whom / It seems to Be, & is productive of the most dreadful / Consequences to those to whom it seems to Be" (Jerusalem 32:51-53, E 179). As Blake made clear to Crabb Robinson, atheistic materialism was the most dreadful consequence of mistaking what seems to be for what is: "Bacon, Locke & Newton are the three great teachers of Atheism ... Every thing is Atheism which assumes the reality of the natural & unspiritual world."29 By defining atheism as belief in the reality of a natural world, Blake identified himself as neither an opponent of science nor a traditional theist, but specifically as someone opposed to belief in scientific realism.

Blake's anti-realist position with respect to scientific theories is evident in the way he employed a simple word like *thing* to distinguish what exists from what doesn't: "every thing," he wrote, "exists," and so "Every thing possible to be believ'd is an image of truth," and "Mental Things are alone Real," but on the other hand, "What is General Nature is there Such a Thing" and "There is no Such Thing as a ... Natural Cause for any Thing in any Way" (*Jerusalem* 13:66, E 158; *Marriage* 8:38, E 37; *Vision of the Last Judgment*, E 565; annotations to Reyn-

Hawking, Brief History 10.
Einstein, "Method" 273.
Einstein, "Method" 270.
Planck, "Scientist's Picture" 95.
Quoted in Norris 44.
Quoted in Bentley 414.

^{20.} Newton, Mathematical Principles 5.

^{21.} Newton, Opticks 401-02.

^{22.} Galilei 524-25.

^{23.} Newton, "Account" 164.

olds, E 648; annotations to Bacon, E 626). In 1686 the physicist and chemist Robert Boyle had questioned "whether nature be a *thing* or a name," whether "it be a real existent being, or a notional entity somewhat of kin to ... fictitious terms" (my italics).³⁰ Reid later contended that "*Nature* is the name we give to the efficient cause of innumerable effects which fall daily under our observation," and he, like Boyle and Blake, also called it "a fiction."³¹ Among English-speaking writers, the term is still being used to describe scientific theories. In 1973, Hugh Everett (the scientist who originated the manyworlds interpretation of quantum mechanics) wrote that, like "any other theory," the "constructs of classical physics are … fictions of our own minds."³²

At the time Blake wrote, the success of science had been well established even as philosophers debated (as many to this day still do) whether its formulas were human creations or discoveries of real, material entities. If nothing else, the fact that these philosophic issues remained unresolved in the midst of tremendous scientific advance proved that science could maintain itself without having to succumb to the "delusion of Ulro" (see Milton 29:16, E 127) with all its accompanying "unreal forms" (Four Zoas 28:2, E 318). It did not have to presume that its formulations were anything other than what Blake said they were, fictional creations of the rational faculty and not existing entities dwelling in some obscure place. In sum, Blake adopted a then-familiar instrumentalist or functionalist approach to scientific theories, accepting their usefulness, but denying the validity of the philosophic conclusions derived from them. It is the approach Berkeley, for one, insisted on throughout his writings. The "natural philosopher," he wrote, ought not to pretend to "explain things by corporeal causes." Rather, the "knowledge of nature" consists in making "sure and well-grounded predictions"; these "observations and experiments" are made because "they are of use to mankind."33

An instrumentalist approach was regularly adopted not only by scientists like Boyle, but especially by the astronomers (who were the first modern scientists). Thus Bacon could write that Copernicus, Ptolemy, and Tycho Brahe did not mean to say by their theories that "the things they allege, are actually true, but only that they are convenient hypotheses for calculationsⁿ³⁴ As the introduction to Copernicus' *De Revolutionibus* states, the astronomer does not think up causes and hypotheses "in order to persuade anyone of their truth but only in order that they may provide a correct basis for calculation."³⁵ As Galileo knew and testified at his trial, such was the church's position, that "since the opinion of Copernicus, taken absolutely, contradicted Holy Scripture, it could not be held or defended, but ... it might be taken and used

30. Boyle 32.

32. Everett 133.

33. Berkeley, Treatise 545-46, 542, 560.

34. Quoted in Urbach 128.

hypothetically," and he tried to claim that his own Dialogues Concerning the Two Chief World Systems likewise did not hold or defend any opinion regarding the actual motion of the earth or the stability of the sun.36 Thus, by the time Blake wrote, the distinction between factual truths and hypothetical fictions (as they were sometimes called) was firmly in place at the center of the philosophic controversy dividing realists from skeptics regarding scientific proofs. When Blake called scientific theories fictions or scientific laws false appearances to make the case that neither should be taken to be factually true, he was clearly siding with the skeptics, among whom, it should be noted, were a number of leading scientists; he never denied the reality of these theories for the reason the churchmen insisted upon, that they are contradicted by biblical cosmology. Blake denied their validity on purely empirical grounds, because experience does not confirm the existence of the things they allege.

Hume had demonstrated that the nature of mathematical principles and all other rational truths is that they are discoverable "without dependence on what is anywhere existent in the universe,"37 and Blake was utterly relentless in discrediting any and all claims that what he called "Truth the result of Reasoning" could and did exist anywhere in the universe, placing reason's "unreal forms" in Ulro, "the Void Outside of Existence" (Milton 41:37, E 143). Blake's response to the claims of natural philosophy was to draw a clear line of distinction between knowledge of existence and the logical relations of abstract ideas: "Self Evident Truth is one Thing and Truth the result of Reasoning is another Thing" (annotations to Bacon, E 621). He was very much an empiricist to the extent that he believed "the true faculty of knowing must be the faculty which experiences" and that "Knowledge is ... Immediate by Perception or Sense at once" (All Religions are One, E 1; annotations to Berkeley, E 664). While he recognized that there may be general truths of reason, he could not accept that there is "such a Thing" as "General Knowledge" since "All Knowledge [as distinguished from the general truths of reason] is Particular" because all things we experience are particular, and "Unless, You Consult, Particulars, You Cannot, even Know or See ... any Thing ..." (annotations to Reynolds, E 648, 645). Taken together, the annotations to Berkeley and Reynolds give us a good idea of the limitations Blake sought to impose on knowledge. Simply put, knowledge is immediate and particular. Any deductions of the reasoning faculty, whether they are conducted prior to experience (pure speculative reasoning) or even after the immediate sense or perception of things (inductive reasoning), do not qualify as knowledge. They represent truths of reason, but such truths never give us knowledge of experience. (We will continue to examine Blake's distinction between truth and knowledge throughout the upcoming discussion.)

36. Quoted in Sobel 248-49. 37. Hume, Enquiry 598.

^{31.} Reid 34, 45.

^{35.} Copernicus 7.

When Blake insisted that "Mental Things are alone Real," the crucial distinction is not fundamentally or simply between the mental and the physical, but between the reality of the things we know and see and the non-entities of which we have neither experience nor knowledge: "what is Calld Corporeal Nobody Knows of its Dwelling Place ... Where is it but in the Mind of a Fool" (*Vision of the Last Judgment*, E 565)—a fool perhaps like John Locke, who accepted that there was something like material substance even though he admitted "that if anyone will examine himself concerning his notion of pure substance in general, he will find he has no other idea of it at all, but only a supposition of he knows not what [It] is plain, then, that the idea of *corporeal substance* in matter is ... remote from our conceptions and apprehensions"³⁸

Blake was thought by some to be a madman for his fantastic visions, and yet it was the sober John Locke who admitted that corporeal substance was he knew not what and still foolishly supposed it to exist even though he had no idea of it. But, said Blake, "Deduct from a rose its redness. from a lilly its whiteness from a diamond its hardness from a spunge its softness from an oak its heighth from a daisy its lowness ... & then we shall return to Chaos" (annotations to Lavater, E 595). Ernst Mach would make similar deductions so that he too might eliminate all unwarranted metaphysical assumptions from science: "By omitting now this, now that sensory element ..., we can easily jump to the conclusion that, even if we eliminated all the elements, there would always be something left. We imagine ... a carrier of qualities, a substance of the object This idea has no foundation in the [sensory] elements ...; it is purely a product of creative fantasy.""

Berkeley had insisted on that very point, that science does not need to suppose a material know-not-what in order to work. It was, he said, generally supposed that "whatever advances have been made ... in the study of nature do all proceed on the supposition that corporeal substance or matter doth really exist," but he answered this by saying that "there is not any one phenomenon explained on that supposition which may not as well be explained without it"40 In fact, Newton himself had already dismissed material explanations as necessary to the design of his work. Since such explanations aren't required-or as Pearson later put it, "matter ... is a metaphysical entity ... meaningless for science"41-it would be wrong to assume that Blake's denial of materialism meant he opposed science itself. Rather, what he proposed was a positivist correction to the new philosophy of science, if we understand positivism in the way the physicist, Pierre Duhem, understood it when he wrote in 1905: "Our interpretation of physical theory is ... essentially positivist in its origins [T]he doctrines which proclaimed that everything

Locke 294-96.
Mach 42.
Berkeley, *Treatise* 539.
Pearson 278-79.

112 Blake/An Illustrated Quarterly

in the material world reduced to matter and motion are metaphysical."42

Although Comte is credited with coining the term *positiv*ism, Hume arguably originated the approach in philosophy so that by 1788, at the onset of Blake's great creative decade, philosophers like Thomas Reid could employ positivist thinking to prevent conclusions he, like Blake, also called "atheistic": "Natural philosophers, when they think accurately, ... and when they pretend to show the cause of any phenomenon of nature, they mean by the cause, a law of nature of which that phenomenon is a necessary consequence." To "discover the laws of nature" is all that Newton "attempted, and all that he thought attainable"⁴³—and, we might add, all that Galileo thought "worthwhile" in scientific investigation.

Much of what Blake wrote needs to be placed in the context of what Heisenberg identified as "the starting point for the empiristic philosophy ... and positivism" which was first formulated in response to the "difficulty of metaphysical realism"-the assumption, which Blake repeatedly attacked, that scientific formulations represent things that really have independent existence. The empiricists and positivists reacted (as did Blake) to "classical physics [which] started from the belief-or should one say the illusion?-that we could describe the world ... without any reference to ourselves."44 As Eugene Wigner noted, the "very study of the external world led to the conclusion that the content of the consciousness is an ultimate reality." Paradoxically, the belief in a material world soon produced the "principal argument against materialism ... [which is] that our knowledge of the external world is the content of our consciousness"145

In Blake's day, Berkeley attributed endless difficulties to the metaphysics of the natural philosophers. "All this scepticism," he noted, "follows from our supposing ... things ... have a subsistence without the mind or unperceived."46 From the beginnings of modern science to our own day, numerous scientists and philosophers have taken the position that certain laws of science, however usefully they function, do not reveal the ultimate truths of existence: Newton would adopt it to protect his theosophical beliefs, as Galileo did to protect himself from the Inquisition, Kant so he could maintain his free rational will. Duhem for his Catholicism, and Einstein so that God would not play dice with the universe. Blake took an anti-realist approach to science precisely because he too wished to protect his own visions of truth from any possible encroachment by natural philosophy; whatever his motivation or whatever his beliefs, Blake's critique of natural philosophy remains quite sound and is consistent with the assessment of many important and knowledgeable thinkers from his time to the present. He, like others, was led to the conclusion that what science

42. Duhem 279.
43. Reid 46.
44. Heisenberg 83, 55.
45. Wigner 172, 176-77.
46. Berkeley, *Treatise* 553.

studied was nothing if not the content of consciousness, because the natural philosophers claimed that they had acquired knowledge of an objective reality as it existed external to the minds of men. "[A]ll you behold," Blake said, "tho it appears Without it is Within" (*Jerusalem* 71:18, E 225). Statements like "Where man is not nature is barren" (*Marriage* 10:68, E 38) attack the very supposition that science had discovered and was describing the natural world as it actually existed before men ever came to know it.

By the turn of the century, a number of leading scientists were coming round to expressing very "Blakean" views on science. In 1920 Arthur Eddington wrote, where "science has progressed the farthest, the mind has but regained from nature that which the mind has put into nature."47 In 1892 Pearson would explain how "the laws of science are inherent in ourselves" They are "products of the human mind rather than factors of the external world The law of gravitation is not so much the discovery of Newton ... as his invention"48 A century before, Blake regularly placed the creation of the material world after the fall to demonstrate that the natural world with its "globes of attraction" was a hypothetical fiction that had no reality-it did not exist and was not thought to exist-before (fallen) men created it. To assume that gravity existed prior to Newton's formulation of the laws of gravity was a foolish and unnecessary supposition; by showing that all of creation is just that, a creation of the minds of men, Blake attacked the metaphysics of materialism to reveal that what philosophers identify as corporeal does not appear in sense experience, but it is often a "false appearance which appears to the reasoner" Its supposed appearance is based on a "Fallacy & its Existence an Imposture Where is the Existence Out of Mind or Thought" (Milton 29:15, E 127; Vision of the Last Judgment, E 565).

It was clear to Blake that material substance and natural cause, the two elements supposed to be the foundation of the sciences of his day, did not appear to the mind of any man-not even Newton's or Locke's. Ault, however, says that Blake "accepts necessity as an undeniable aspect of the 'physical' world, even though this necessity is in a real sense fictitious."19 Maybe we should turn the wording around and say that the physical world is a product of the belief in necessity; otherwise, we might miss Blake's very important point that what was thought to be the physical world was mostly a fiction (a "creative fantasy," as Mach called it) created by the power of scientific reasoning. Blake did not accept necessity as an aspect of the physical or any other world. He agreed with Berkeley and Hume that no such thing as causal necessity could be known to exist (and, as we shall see, he showed how ideas about it were not logically sound either). We have "no experience [that] can teach us what necessarily must be,"

47. Eddington, "New Law" 247.
48. Pearson 110, 36, 86,
49. Ault 92.

wrote Reid.⁵⁰ In works like *The First Book of Urizen*, Blake showed that necessity was actually an *a priori* assumption that so impressed would-be scientists that they, like Urizen, needlessly "sought for" a world that would justify their deterministic theories. Urizen literally creates a physical world that will validate his unfounded conviction that principles of rational determinism actually do describe reality. "Single vision & Newtons sleep" (letter to Butts, 22 Nov. 1802, E 722) create formulas, terms, and phrases, such as *corporeal substance*, and then idiot reasoners like Urizen erroneously assume that the creations of natural philosophy denote real entities, despite the fact that there is no empirical evidence for their existence from any realm of experience.

Urizen's mistake represents the rationalist's fallacy of presuming that there has to be a physical world that validates the idealized abstractions natural philosophy creates, even though neither reason, observation nor experiment can discover any such world. That is why Blake depicted Urizen as creating it. The rise of empiricism is the distinguishing feature of modern science, but Urizen is not an empiricist, not even a bad or mistaken one. That is not the problem as Blake understood it. As his name implies, Urizen is a figure devoted to reason rather than to that which can be observed through experience, and Blake depicted him as a philosophic rationalist fraudulently pretending to be doing empirical, scientific research. Urizen holds as a matter of rational faith that the world is a fixed one of solid obstruction, and, lo and behold, that is what he claims to discover, when in fact what he does is literally create the entire fiction of a physical world of causal necessity to justify his theories-a delusory world of solid obstruction not at all grounded in observation, but erected in defiance of all the variety, change and movement he has observed and cannot tolerate. Urizen's so-called explorations have actually been predetermined so that he will "discover" only what conforms to reason. His observations are, as we now say, theory laden. That in itself does not have to be a problem, so long as one is willing "to have the foundations of his knowledge changed by new experience,"51 to acknowledge evidence that might disconfirm, refute or falsify his theories (cf. Karl Popper's theory of falsification). However, what Urizen does is tamper with the evidence. The world he sees is composed of fire, wind, torrents and waves; that is what Urizen observes, but he binds and holds back these elements-suppresses the evidence-in order to create a world of "solid obstruction" that will falsely appear to confirm his notion of what the world ought to be like (Urizen chap. II, E 71-72). That what Urizen observes, or thinks he observes, is a world composed of the four basic elements of ancient Greek thought might show how outdated his theory of reality is, which in turn would suggest that all theories (such as, for example, Newton's gravity acting at a distance in absolute space and time) will eventually be revised

50. Reid 39. 51. Heisenberg 140. or become dated with the advent of new theories (more on this in a moment).

Newton admittedly published his mathematical truths concerning force or inertia without evidence of their existence, and Urizen is like Newton insofar as he will not permit his "self-closed" truths of reason to be modified in any way by knowledge of existence, but he tends to go beyond Newton, or at least to ignore several of Newton's warnings, by claiming that his rational abstractions denote actual physical causes. He does so by creating a delusory existence of non-entities to fit theories that are not only without empirical foundation, but are also, in fact, disconfirmed by what he knows of the world. Newton had repeatedly warned that "hypotheses ought to be applied only in the explanation of the properties of things, and not made use of in determining them ..." (to Oldenburg, 10 June 1672; Correspondence 1: 169), and Blake showed how Urizen's theories do not attempt to explain what he has observed, but are used to determine the properties of a delusion: the physical world of solid obstruction he creates. Urizen does not follow Newton's advice of proceeding "upon the Evidence" and stopping where "Evidence is wanting."52 Blake showed him committing the cardinal sin of any researcher or experimenter when he manufactures evidence rather than collecting it.

Yet Blake realized that despite his warnings to stick to phenomena, Newton himself was mistaken if he thought his theories actually did proceed upon the evidence. In his famous statement, hypotheses non fingo, Newton had contended that he framed no hypotheses. The trouble with hypotheses, he said, is that they "are not deduced from the phenomena" and therefore they "have no place in experimental philosophy. In this philosophy, particular propositions are inferred from the phenomena, and afterwards rendered general by induction."53 By the time Blake began writing, Hume had shown (and, as we shall see, Blake well understood) how inductive generalizations and therefore the formulations that had become basic to physics could not be reasonably derived from any number of experiences or observations. As Einstein put it, physical concepts "cannot be distilled ... from experience by an inductive method, but can only be obtained by free invention."⁵⁴ They "are free creations of the human mind and are not, however it may seem, uniquely determined by the external world."55 Newton's Mathematical Principles of Natural Philosophy in fact presented a logical system that synthesized the theories of men like Kepler and Galileo and was conceived for the most part while Newton pondered by himself. His reputation for having a mind "Voyaging through strange seas of Thought, alone" (as Wordsworth characterized him in The Prelude 3:63) was well known in Blake's day. The approach Blake had Urizen take in The First Book of Urizen is therefore as much parody as satire,

52. Newton, "Account" 163.

54. Einstein, "Physics and Reality" 322.

revealing how Urizen—and by implication, Newton—working alone, withdrawn, self-closed, all repelling, hidden, and set apart, frames hypotheses without conducting any experiments or consulting particular phenomena. What Urizen, like Newton, has "written in solitude" are pure creations of the reasoning faculty which were neither derived from nor tested against any observation or experience. Urizen's creative endeavors are meant to reveal that Newton's formulas were, in fact, freely created hypotheses framed by his reasoning power and not generalizations that proceeded or could proceed from anything he or anyone else could or did observe. Blake believed and portrayed through Urizen's methods what John Maynard Keynes later sensed about Newton: "His experiments," Keynes wrote, "were always, I suspect, a means, not of discovery, but always of verifying what he knew already."⁵⁶

What Blake confronted with respect to Newton's Mathematical Principles was the great philosophic mystery of modern science. Centuries after Newton's mathematical principles were put forth, even a Nobel Prize-winning physicist like Richard Feynman had to admit, "Why nature is mathematical ... is a mystery."57 Blake's answer was that nature is mathematical because it is the creation of the process whereby "mathematic power / [gives] a body to Falshood" (Jerusalem 12:12-13, E 155). He knew that science worked, and to some extent he knew how it worked, but he, like everyone else, did not know why it worked. As Shelley, following Hume, explained the problem in his "Mont Blanc," the power animating all that we know to exist dwells apart from human experience. This much, however, was certain for Blake: the mathematical proof of any scientific hypothesis should not be mistaken for evidence of what really exists. As Einstein noted, "Propositions arrived at purely by logical means [what Blake called the truths of reason] are completely empty as regards reality"58-as Blake himself realized, consigning scientific propositions to a dark void empty of any real forms and calling it Ulro. In addition, Blake maintained, as did Boyle and Reid, that all scientific theories remained fictions, including those that had been confirmed by experiment to be established as scientific law-they remained no different from scientific hypotheses in terms of explaining the true nature of reality. As the mathematician and physicist Leonhard Euler (1707-83) wrote: "to learn the true causes of phenomena is not allowed to us, nevertheless ... a certain fictive hypothesis may suffice for explaining many phenomena."59 The theories describing-usually in mathematical terms-certain regularities pertaining to existing things are constantly changing and are even falsified: "Reason ... is not the Same it shall be when we know More" (annotations to Reynolds, E 659); "Establishment of Truth depends on destruction of Falshood

56. Keynes 541.

57. Feynman 24. 58. Quoted in Hawking, Shoulders of Giants 397.

59. Quoted in Kline 2: 739.

^{53.} Newton, Principles 547.

^{55,} Einstein and Infeld 31.

continually" (Jerusalem 55:65, E 205). However, our experience of these things remains the same: "Imagination is a Representation of what Eternally Exists. Really & Unchangeably" (Vision of the Last Judgment, E 554). That is the case because "The Imagination is not a State: it is the Human Existence itself / ... / ... [while] the Reason is a State / Created to be Annihilated ... / Whatever can be Created can be Annihilated" (Milton 32:32-36, E 132); scientific theories as well as scientific laws are forever being created and annihilated. In antiquity, Empedocles reasoned that the world was composed of four basic elements; in Blake's day the universe was thought to be like a clock, operating according to Newton's conception of absolute time and space; soon after it became like a steam engine, with the advent of thermodynamics; nowadays, the same universe which we experience in the same way because it really hasn't changed is said to be a computer transmitting information as part of Einstein's space-time continuum. Many philosophers of Blake's time, but not that many scientists, confidently asserted the novel claim that science had finally provided the answer respecting the ultimate nature of reality. Blake's response to that claim was to point out what many scientists believed, that there was no scientific evidence for it. The stunning progress of modern science and the rapidity with which theories change have resulted in continual and, for many, disturbing reevaluations of the nature of reality. Blake believed that any philosophic reevaluation was unnecessary, because scientific progress didn't require it, and unwarranted, because even though scientific theories and philosophical explanations do change, our experience of reality does not.

Now we are beginning to see that Blake not only attacked the errors of the new philosophy, but also confronted problems respecting the scientific method itself. Before examining his critique of the method, we might summarize Blake's objections to the new philosophy. They have to do with his understanding of the nature of knowledge, truth and falsehood, and they involve key concepts he employed throughout his writings.

For Blake there were basically two kinds of truth: truths of existence and truths of reason.

The truths of existence are of two kinds: there are first of all *self-evident truths*. They are what Blake also called *downright plain truths*. They are undeniable, and no one can doubt them. Every man knows them on plain sight (like the hardness of diamonds or the redness of a rose).

Secondly, there are the contraries, those various irreconcilable differences among individuals. A contrary is an existing quality or characteristic opposed to some other existing quality or characteristic, but not logically negating or falsifying it because no contrary can possibly contradict any other. While it is true with respect to the contraries that ancient and modern "accounts of polar metaphysics ... were readily available" to Blake,⁶⁰ it is also true that philosophers like Hume were show-

60. Nurmi 73.

ing how the "contrary of every matter of fact is still possible; because it can never imply a contradiction, and is conceived by the mind with the same facility and distinctness"61 As Newton observed, "Those things wch men understand by ... contradictious phrases may be sometimes really in nature without any contradiction at all" (to Bentley, 25 Feb. 1692/93; Correspondence 3: 254). When Blake similarly noted that "Contraries mutually Exist" or that "Contrarieties are equally True" (Jerusalem 17:33, E 162; Milton 30:1, E 129), he aimed to point out that nothing which actually does exist necessarily contradicts by its existence or its qualities anything else that exists. That is why, when Blake listed a number of what were for him erroneous conceptions-that energy is alone from the body, for example-he insisted that "the following Contraries to these are True"-that man has no body distinct from his soul, for example (Marriage 4, E 34). That both sets of beliefs concern matters of fact, even if the first set is composed of what Blake thought were erroneous beliefs, means that the contrary conception is possible-many do conceive the body as distinct from the soul-and there is no logical contradiction between them.

One of the fundamental rules of logic is the law of noncontradiction, which says that if you conjoin a proposition and its negation the result is a contradiction and the statement is necessarily false. However, Blake understood that this and other rules of logic cannot and should not be applied to matters of fact and existence which can never be logically "contradictious." To hold "all Wisdom / To consist. in the agreements & disagree [me]nts of Ideas" (Jerusalem 70:7-8, E 224) does little more than foolishly reduce "the variety of nature to the abstract idea" (see Reynolds in annotations to Reynolds, E 649). No abstract rational system can ever fully and accurately describe the reality we observe, consisting of downright plain truths and, taken together, the contraries of these various minute particulars. What this means for science (as we shall see) is that however many observations we make, we can never arrive at demonstrable certainty with respect to any laws we formulate regarding matters of fact and existence.

To speak as Fisher does of Blake's objection to "systems of knowledge"⁶² is not quite right because Blake denied there ever could be systematic knowledge of human experience. Nor is it likely, as Bloom claims, that Blake allowed for a need, under conditions where reason has been corrupted, for a "systematic vision of all existence."⁶³ Blake was relentless in attacking what he understood to be a fundamental error of corrupt reason: the presumption that anyone's system was valid for *all* existence—or for all persons. He insisted that all systems are created precisely because they have to be, since they have little or no basis in what we know to exist.

61. Hume, Enquiry 598.
62. Fisher 6.
63. Bloom, Commentary 931.

What concerned Blake might be better identified as systems of truth, and what he objected to was the mistaken belief that these rational systems were actually providing systematic knowledge of all existence. The various systems of philosophic, religious or scientific truth which the reasoning power creates are true or false by virtue of the fact that they are logical or illogical, coherent or incoherent-whether, as Blake wrote, the ideas in them are in agreement or disagreement; logical agreement within a system does not mean that it is therefore true in the sense that it corresponds to the things we experience. The problem Blake had with Urizen was not that he is rational, but that he believes existence must conform to the laws the reasoning power formulates-the "one Law" he would impose on everyone and everything (see Urizen 4:40, E 72). Those things which we do experience, the minute particulars that any scientist seeking knowledge of the world must consult, exist either individually as plain truths or in relation to each other as contraries, and insofar as contraries can mutually exist and be equally true, they can't possibly contradict each other. There is no logical relation among the minute particulars we experience-individually, of course, it is impossible, and collectively we know them to exist together in no rational or logical way. Thus, despite what scientists or priests or kings claim, not only can there be no knowledge beyond what men experience for the simple reason that nothing can be known to exist if it does not exist within human experience, but also the things we do experience, from the guinea sun to the heavenly host of angels (Vision of the Last Judgment, E 565-66), simply do not add up in any systematic way. By the same token, because there is no logical agreement or disagreement among the various and contrary facts we do observe, any rational system that does achieve demonstrable certainty does so by virtue of the fact that it fails fully to take into account the variety of different particulars we experience.

The truths of reason are also of two kinds. They correspond to what are commonly understood in philosophy as deductive *a priori* and inductive *a posteriori* truths.

The first result in what Blake identified as creations, fictions, allegories, abstractions and non-entities; so long as these truths of pure deductive reasoning are recognized as fictional nonentities, Blake had no problem with them. The error Blake repeatedly challenged involved what linguistic philosophers now call a "category mistake"-mistaking one kind of category (abstract non-entities) for another (existing entities); for Blake the mistake usually occurred whenever the reasoning power misrepresented its creations, such as corporeal substance or Nobodaddy, as existing entities. Those truths of reason that are mistaken to be part of existence, Blake called negations. A negation is a "false appearance which appears to the reasoner" (Milton 29:15, E 127) and is created whenever the reasoning faculty mistakes or misrepresents the creation of rational abstractions for the discovery of real entities. "Negations Exist Not" (Jerusalem 17:34, E 162). They are abstract non-entities which are oftentimes erroneously presumed to provide us with objectively true knowledge of existence. That misunderstanding is what turns a truth of reason into an untrue, false, erroneous, delusive negation. Negations negate self-evident truths by ignoring, dismissing, denying or suppressing them, replacing life's minute particulars with mathematical formulas and fictitious mechanical laws. That is what the new philosophy did whenever it failed to understand that its "mathematical symbols [do not] represent ... entities of the external world"64 Yet ever since its inception, philosophy has been in the business of reifying its abstractions, of giving what Blake called "a body to Falshood" and inventing some often remote, transcendent place where these falsehoods supposedly exist, but as Moritz Schlick remarked, "There is ... no domain of 'philosophical' truths."65 The embodied falsehoods of natural and other philosophies Blake called negations; the delusive domain outside of existence where they reside he named Ulro.

The *a posteriori* truths of reason Blake distinguished with the term the *ratio*. The ratio is a product of inductive reasoning which results not in the creation of *fictions*, but in *generalizations* drawn from experience. Reason, so defined, is "the ratio of all we have already known," a "Ratio / Of the Things of Memory," which functions to "compare & judge of what [one] has already perciev'd" (*There is No Natural Religion*, E 2; *Jerusalem* 74:11-12, E 229; *There is No Natural Religion*, E 2). At one point Los identifies the difference between the two methods when he rejects inductive reasoning in favor of pure, *a priori* rationalism: "I will not Reason & Compare," he says, "my business is to Create" (*Jerusalem* 10:21, E 153); as we shall see, *creation* in Blake usually refers to a purely rational and not necessarily an imaginative process.

Because the ratio derives from experience, Blake did not question its validity-its correspondence to the things we know and see-in the way he did the creations of a priori reasoning. Rather, his doubts concerned its reliability as a predictor of future experience. This was Blake's fundamental challenge to the scientific method, to Bacon's contention that one could derive "the most general axioms" from "the senses and particulars."46 When Blake said that the ratio "is not the same that it shall be when we know more" (There is No Natural Religion, E 2), he denied that knowledge derived from past experience can be retained as axioms for future knowledge. By claiming that knowledge of the unknown could reasonably be arrived at on the basis of already acquired knowledge, the new philosophy put itself in the wholly illogical position of supposing it could deduce knowledge of all existence before it had experienced all of existence. Blake contended to the contrary that from "already acquired knowledge Man could not acquire more" (All Religions are One, E 1). If science is to progress, the ratio of what we know must not be established so as to fix, circumscribe and limit all further knowledge. Scientific progress cannot be based, as Bacon claimed,

64. Eddington, *Philosophy* 50.65. Schlick 56.66. Bacon 31.

on past experience. The acquisition of new knowledge comes through new experience (which is the only means by which knowledge can be acquired); coming to know more must inevitably change what we understand by the ratio.

Blake understood that the progress of science, which he argued for in opposition to those "Sciences [which] were fixd" (Four Zoas 73:21, E 350), requires that we not keep traversing old lands like a mill horse going round in circles, and that by remaining open to new experiences what we are looking for should not be the confirmation of fixed systems of thought, which is what all systems of thought tend to look for. Rather, we must be prepared to reject cherished theories as false in the light of any new evidence we find. In science, "the rise, acceptance and fall of theories is an everyday occurrence"67 and "in a day ... [a] hardly-won position is assailed and made untenable Therefore, the experimenter cannot afford to close his eyes to a new discovery."68 As Blake put it, "Science cannot exist ... / ... in generalizing Demonstrations of the Rational Power, / ... / Establishment of Truth depends on destruction of Falshood continually" (Jerusalem 55:62-65, E 205).

The most glaring problem respecting the ratio is therefore not that it is a limited reflection of experience, but that when the rational and mathematic powers operate without regard for imaginative experience, they come to a standstill, preventing the discovery of new information by fixing the ratio of all past experience as a permanent and closed system of thought: "The Spectre is the Reasoning Power in Man; & when separated / From Imagination, and closing itself as in steel, in a Ratio / Of the Things of Memory. It thence frames Laws & Moralities / To destroy Imagination!" (Jerusalem 74:10-13, E 229). Therefore, if "it were not for the Poetic or Prophetic character. [which Blake identified as the faculty that experiences] the Philosophic & Experimental would soon be at the ratio of all things & stand still, unable to do other than repeat the same dull round over again" (There is No Natural Religion, E 3). Blake was willing to accept what he called the ratio to the extent that it did not prohibit the acquisition of new knowledge based on new experience: "the Reason is a State / Created to be Annihilated & a new Ratio Created" (Milton 32:34-35, E 132). In response to those who gave primacy in natural philosophy to the rational power and the supposedly permanent systems it created, Blake offered a description of how reason could function within a genuinely empirical and progressive science. He described it this way (for the first time in response to Reynolds' contention that "reason is something invariable"): "Reason or A Ratio of All We have Known is not the Same it shall be when we know More" (annotations to Reynolds, E 659).

Furthermore, in accordance with his belief that knowledge is of the things we sense and that philosophy was destroying science, Blake evaluated the "Philosophic & Experimental" components of science quite differently: when Blake wrote that "the true method of knowledge is experiment" involving our "experiences" (*All Religions are One*, E 1), he was of course being ironic, but the point of his irony has to do with his use of the definite article. What Blake could not tolerate was the implication that "Science such as is Weighed or Measured" was of superior value to all other methods of knowledge (annotations to Reynolds, E 659)—that it was *the* only true method. While he opposed the delusions of abstract reason themselves, when considering experimentalism he targeted those individuals who dismissed as incredible or doubtful all images of truth that could not be proved by experimentation; his opposition was to those "Who teach Doubt & Experiment" on the assumption that men cannot "believe without Experiment" (*Jerusalem* 54:18, 22, E 203, 204).

Thanks to the work of critics like Northrop Frye, much has been written about the different visionary states in Blake, but to say that Blake understood that "the abstract reasoner attempts to give independent reality to the qualities of the things he sees" or that he finds that "the tree is more real to the wise man than it is to the fool"69 overlooks perhaps the most important categorical distinction Blake made, which was not between levels of perception and vision, but between the fictions we create and what is eternally true in human experience. All visionary states, however limited, are real, and so are all the things they include: "A fool sees not the same tree that a wise man sees," and he sees it maybe as "only a Green thing that stands in the way" (Marriage 7:8, E 35; letter to Trusler, 23 Aug. 1799, E 702), but it is still a thing he sees. Though "he sees all things thro' narrow chinks of his cavern" (Marriage 14, E 39), everything the fool sees and knows in his world of experience, while it may be less rich, cannot be any less real. It is not the fool (or the experimenter) but the abstract reasoner who deals in unrealities. The fool's tree is a real thing. Nobodaddy and material substance are not. They are delusions created by priests and philosophers, but no one has created the fool's tree for him and then demanded that he believe what he does not see.

Blake described the material world as a *creation* to emphasize that he understood it to be largely a creation of, that is to say a product of, the reasoning power. Before the advent of natural philosophy "Earth was not: nor globes of attraction" (*Urizen* 3:36, E 71)—they were not thought to exist before Urizen, following Newton's principles of universal gravity, created that "delusion of Ulro" of "a Globe rolling thro Voidness" (*Milton* 29:16, E 127). To say that for "Blake, to create [truth] *is* to find it"⁷⁰ turns completely upside down Blake's central contention that "Error is Created Truth is Eternal" and ignores the fact that what he exposed throughout his writings was "Error or Creation" (*Vision of the Last Judgment*, E 565). Systems are created by an Aquinas or a Newton, but not eternal truth.

69. Frye 20, 21. 70. Birenbaum 43.

Blake responded to the "idiot Reasoner" who laughed "at the Man of Imagination" (Milton 32:6, E 131) by insisting over and again that the reasoning faculty creates fictitious nonentities whereas the imagination deals with existing realities: "All Things Exist in the Human Imagination"; "Imagination [is] the real & eternal World"; "Eternal Realities ... Exist in the Human Imagination" (Jerusalem 69:25, E 223; 77, E 231; Vision of the Last Judgment, E 562). Because the things in the imagination have existed eternally, prior to any imaginative act, Blake tended to describe the imaginative process not in terms of creation, but as an act of sensing, seeing, representing and copying: "This World Is a World of Imagination & Vision I see Every thing I paint In This World Imagination ... is Spiritual Sensation"; "Imagination is a Representation of what Eternally Exists. Really & Unchangeably"; "Copiers of Imagination are Correct" (letter to Trusler, 23 Aug. 1799, E 702-03; Vision of the Last Judgment, E 554; Public Address 59, E 575). In Blake's writings, the term creation tends to be associated with what does not really exist, with abstractions, allegories, systems, and non-entities, and with what is not true, with delusions and falsehoods, and with the greatest delusion of all, the Nobodaddy who created this entire world out of nothing.

In Blake's scheme of things, the man who reasons a posteriori from the qualities of the things he sees is operating from the real world of experience, whereas the abstract reasoner is operating a priori, in "a Void, outside of Existence" with "the unreal forms of Ulros night" (Jerusalem 1:1, E 144; Four Zoas 28:2, E 318). By describing Ulro as a dark delusive void and those who enter it as being in a state of sleep (see, for example, Four Zoas 85:21, E 360; Milton 29:16, E 127; 37:16, E 137; Jerusalem 4:1, E 146), Blake was indicating that those who fall into Ulro have dropped out of human existence into a state where they are not conscious and/or have no experience or vision of anything. Shelley thought "the deep truth is imageless" (Prometheus Unbound 2.4.116), but Blake thought that nothing could be said to be true which men could not imagine in some definite form: "it is impossible to think without images" (annotations to Lavater, E 600). The state of Ulro, being imageless, contains nothing for anyone to imagine and believe in, and anyone who does believe he has seen or discovered anything there is deluding himself with false appearances. Ulro is therefore categorically different from the states of consciousness or vision, identified as Eden, Beulah, and Experience. The products of it are unlike the tree of either the wise man or the fool. The latter are images true to human perception and vision, whereas in Ulro there is only darkness and void. Filling this void are the pure creations and delusions of the reasoning power, such as the fictitious creations of Newton's sleep (gravity, force, or inertia) which exist neither in eternity nor experience, and the "false appearance which appears to the reasoner," like those images we think we see while asleep, as "when a man dreams, he reflects not that his body sleeps" (Milton 15:1, E 109).

The problem with Frye's description of what he identified as the abstract reasoner is that while it does describe a pos*teriori* reasoning, it fails to take into account that, first of all, Blake typically described the abstract reasoner as operating *a priori* and without concern for the real qualities or characteristics of anything he or anyone else actually sees, and that, secondly, he recognized that inductive generalizations drawn from experience involved a different type of reasoning with different problems.

Blake's most insightful analysis of the fallacy of inductivism comes in *There is No Natural Religion* and *All Religions are One.* In defense of empiricism, Blake insisted that knowledge can be acquired only through experience and not at all by the deductions of the reasoning power. The powers of reason, being analytic and circular, are limited to analyzing already acquired knowledge and cannot possibly synthesize new knowledge: "Man by his reasoning power. can only compare & judge of what he has already perciev'd. From a perception of only 3 senses or 3 elements none could deduce a fourth or fifth" (*There is No Natural Religion*, E 2; Shelley similarly contrasted reason and imagination at the beginning of his *Defence of Poetry*).

Blake hit upon the fundamental problem with the inductive method, which is that however large the sample, no finite number of known sensations or elements we consult can ever guarantee with certainty the general conclusion that all sensations or elements of that kind which we encounter in the future will without exception appear or act in exactly the same way. Seeing a hundred or a thousand white lambs is no demonstration of the generalization that all lambs are white. Tomorrow we could encounter a black lamb-or maybe be surprised by a white tiger. "The induction cannot be perfect till every simple idea that can enter into the human mind be examined No man can pretend to have made this examination of all our simple ideas without exception; and, therefore, no man can ... assure us, that [his] conclusion holds without any exception."71 Or, as Blake put it, our perception of two or three elements cannot guarantee what our perception of a fourth or fifth will be like. Without seeing or consulting the latter we cannot rationally "deduce" it from the former in the way that we can deduce that Socrates is mortal if all men are. Newton himself pointed out that arguing by "Induction [can] be no Demonstration of general Conclusions,"72 and, more generally, Hume noted how all inquiries regarding matters of "fact and existence ... are evidently incapable of demonstration"73; however, many ignored these warnings and readily assumed the certainty of general conclusions regarding matters of fact and existence. Blake had to remind his readers that it would be "ignorance to view a small portion & think that All, / And call it Demonstration: blind to all the simple rules of life" (Jerusalem 65:27-28, E 216). In his annotations to Reynolds, he noted that demonstration is certainly an object of reason (an-

71. Reid 26. 72. Newton, Opticks 404.

73. Hume, Enquiry 688.

notations to Reynolds, E 659), but inductive generalizations from experience, unlike the conclusions of deductive reasoning, cannot reasonably rise to the level of demonstrations. A scientific method that "takes portions of existence and fancies that the whole" (*Marriage* 16, E 40) remains wholly illogical and cannot reasonably prove or demonstrate anything with any certainty.

The problem of induction has been called the problem of the uncertain future, which Hume put this way: all "our experimental conclusions proceed upon the supposition that the future will be conformable to the past If there be any suspicion that the course of nature may change ... all experience becomes useless, and can give rise to no inference or conclusion."74 The problem one faces is that if nature changes, then from "already acquired knowledge Man could not acquire more"; Blake showed how Urizen's unscientific method gets around the difficulty of induction through the creation of a "world of solid obstruction" in which the course of nature does not change: "all futurity [is] bound in his vast chain / And the Sciences were fixd" (Four Zoas 73:20-21, E 350), and so are the inhabitants of Urizen's world: "Beasts & Birds & Fishes, & Plants & Minerals / Here fixd into a frozen bulk" (Milton 34:53-54, E 135). The only way induction can be logically guaranteed is if the future will in all particulars conform to the past. Then and only then can the ratio of all we have already known demonstrate with absolute certainty all that we will ever come to know. Urizen is shown creating a world that is bound, frozen and fixed because he realizes that it is only on condition that there will be no change in the world or its inhabitants that he can insure for all time the general validity of inductive reasoning and causal determinism. Urizen's world is reason's and not science's world-a world in which human experience is frozen and scientific progress cannot possibly occur.

To represent certain axioms of science "as things given independently of our senses" did "not necessarily damage science," but it "easily led into the error of believing that these notions, whose origin is forgotten, are necessary and unalterable accompaniments of our thinking"73 Much of Blake's effort was directed against the erroneous philosophic conclusion that the axioms of science originate independently of our thinking, but he also recognized that true science cannot work the way he described Urizen practicing it, not because scientists mistake the source of their inventions (that is a philosophical, not a scientific, error), but because they presume that "reason is something invariable" and go about "Fixing their Systems, permanent: by mathematic power" (Jerusalem 12:12, E 155). If we truly desire to know more, we cannot accept a Urizenic pseudo-science of stubbornly invariable rationalism established without regard for observed and observable features of human experience.

The Living World

In Blake's day important thinkers began seeking, through what Comte called social physics (physique sociale), universal laws of social behavior, and they tried to eliminate personal characteristics in the quest for the ideal of a mean average man (Quetelet's l'homme moyen). Since "the French Revolution," Blake observed, "Englishmen are all Intermeasurable One by Another Certainly a happy state of Agreement to which I for One do not Agree" (letter to Cumberland, 12 April 1827, E 783). Much of his writing needs to be seen as reacting to a type of radicalism that would model society on the physical sciences, in the hope that each "Individual" within society would appropriate to himself "Universal Characteristics" and "Universal Attributes" (Jerusalem 90:28-33, E 250) so that every member of society, like every object in the material world, would be intermeasurable with every other. Indeed, The First Book of Urizen presents one of the first satires on social engineering, showing how Urizen, as both natural philosopher and primeval priest, bases his laws of society on the same principles of fixity and uniformity that he has imposed on the physical world.

The idea that human behavior could be measured in the way physicists measured the material world was not limited to radical Enlightenment thinkers. Following the success of Newtonian physics, many, believing that "natural and moral evidence ... are of the same nature, and [are] derived from the same principles,"70 wished to establish a science of human nature modeled after the physical sciences. Although the Newtonian revolution looked for "universal laws ... [and] the ultimate truth of everything as embodied in these laws ...," it overlooked the problem that though there are regularities in the living world, "most of these regularities are not universal and without exception777 It ignored the fact that "Man varies from Man" and triumphed because it erroneously "supposes all Men alike" and believed there could be "One Law for the Lion & Ox" (annotations to Reynolds, E 656; annotations to Bacon, E 621; Marriage 24, E 44).

Denying the existence of the world without exceptions that natural philosophy had created, Blake showed how its laws remained "blind to all the simple rules of life" (*Jerusalem* 65:28, E 216) because they ignored those "minutely organized Particulars" and individual variations that were self-evident to any honestly observant individual and foolishly "reduced the variety of nature to ... abstract idea[s]" (see Reynolds in annotations to Reynolds, E 649). Blake's numerous comparisons between the living worlds of men and animals do not represent merely a poet's simile or metaphor, but an answer to the Newtonian revolution of his day. When men were looking to the regularities of celestial mechanics to comprehend human behavior, Blake did something quite unusual for his

74. Hume, *Enquiry* 606. 75. Einstein, "Physics and Reality" 299. 76. Hume, Enquiry 640. 77. Mayr 27, 62. time. He turned from the large-scale material world of physical objects to the minutely organized particulars of animal life to illustrate the kind of rules that might truly describe human behavior.

Specifically, Blake showed that the living world cannot be comprehended by the same laws natural philosophers employed to explain the material world they created, because every living thing acts in accordance with a variety of intentions, propensities, and purposes of its own that are not the effect of and therefore cannot be explained in terms of efficient, mechanistic causality. To say that from the time of Bacon on, "nobody before Darwin managed to anticipate," that "final causes could and would ... be employed very usefully in biology ...""⁸ is a pretty large claim. However, it is one that cannot be maintained after anyone considers the works of William Blake, for they repeatedly insist that all biological life needs to be understood in terms of final rather than efficient causes.

Moreover, since every living thing behaves in accordance with different purposes and not any one law, since the "apple tree never asks the beech how he shall grow, nor the lion. the horse; how he shall take his prey" (Marriage 9:50, E 37), the simple rules of life, as distinguished from the complex rules of abstract philosophy, tell us that there can be no valid inductive generalizations regarding biological existence, such as, for example, the growth of plants or the eating habits of animals (unlike apple trees, beech trees grow only in southern England, and horses aren't predators). The "Emmets Inch & Eagles Mile / Make Lame Philosophy to smile" (Auguries of Innocence 105-06, E 492), since one cannot conclude from observing a portion of existence, like the emmet's inch, what the rest of the world, like the eagle's mile, will be like. With statistics and the rules of chance and probability, the social sciences in the late eighteenth century and the biological sciences in the nineteenth and twentieth would successfully challenge the mechanistic determinism of classical physics, and with the advent of atomic physics even the physicists started playing dice with the universe. However, by the 1790s Blake was already illustrating how biological existence provided living proof that the determinism of Bacon, Newton and Locke was fundamentally flawed.

Blake's response to Newtonianism was thus a lot simpler, more direct and obvious than Donald Ault's elaborate and complex work, Visionary Physics, would lead us to believe. However intimate Blake was with Newtonian physics, he did not need to offer an intricately detailed refutation of it. All he felt he had to do to stop the new philosophy dead in its tracks was to remind his readers of what everyone well knew and what the philosophers chose to overlook: consider the living world of man and animals that we are all familiar with. Does it conform to Newtonian principles of natural philosophy? Not at all. So how can any system of scientific laws that does not explain life itself claim to be a fundamental and universal explanation comprehending all existence? Blake insisted over and again that the "Sciences of Urizen" triumphed "at the cost of every thing that breathes" (*Four Zoas* 102:22, E 375), and he did not have to create his own system to counter Newton's. The alternative universe he kept illustrating was no fictional creation, but something that had always existed: a living, breathing world that operated by its own internal causes, but that the natural philosophers refused to consult because it could not be explained in Newtonian terms.

The stranglehold that Newtonian formulations have had on modern thought may be measured by the fact that as late as 1944 a physicist like Erwin Schroedinger still had to remind his audience that the workings of living organisms "cannot be reduced to the laws of physics."79 Over a century and a half before that, Blake kept insisting that this kind of reductionism was more than just foolish. It was unscientific. In the living world, causality originates from within each thing and does not operate as some scientists presumed it to operate in the physical world, where every thing was being viewed as the cause of every other thing but never as its own cause: "Every thing in Eternity shines by its own Internal light" (Milton 10:16, E 104; my italics), and that light remains within us while we are in the world of experience. What the "Philosophy of Causes & Consequences" refused to recognize was that in the living world "Each thing is its own cause" and instead by "Demonstration" made "Accident" the "Substance & Principle" of human behavior (annotations to Lavater, E 601; Milton 29:35-36, E 128). In other words, Blake understood that a perfectly realistic explanation for the behavior of living things could be given in terms of teleology or purposive causality (as in Eden, where "Wheel within Wheel in freedom revolve," motivating from within and without hindrance from external forces) instead of efficient or mechanical causality (as in Experience, where natural philosophers find only "wheel without wheel, with cogs tyrannic / Moving by compulsion each other" [Jerusalem 15:18-20, E 159]-the cogwheels here might refer to those of a clock and to the then popular clockwork view of the universe). In "a teleological system, its behavior involves ... the expenditure of energy derived from a local source rather than from the environment. The teleological system is ... not goaded by the environment,"" or, as Blake put it, a teleological system "is its own cause."

It is by the same mechanisms of sense perception carried on with the identical sense organs that the chicken and the hawk receive impressions from the physical world, but they do not respond in identical ways to the identical impressions as sensationist psychology would have us believe, because each is impelled not by natural causes external to it, but is guided by its own "internal light."

79. Schroedinger 81. 80. Beckner 134.

78. Urbach 101.

With what sense is it that the chicken shuns the ravenous hawk? With what sense does the tame pigeon measure out the expanse? With what sense does the bee form cells? have not the mouse & frog

Eyes and ears and sense of touch? yet are their habitations. And their pursuits, as different as their forms and as their joys: Ask the wild ass why he refuses burdens: and the meek camel Why he loves man: is it because of eye ear mouth or skin Or breathing nostrils? No. for these the wolf and tyger have. (Visions of the Daughters of Albion 3:2-9, E 47)

One cannot apply a cause and effect determinism to study the actions of wolves or camels or men because the law of the living world is that for every action there is an opposite and *unequal* reaction. Strike a rock with another rock, and it will react pretty much like any other rock. Strike a chicken and a tiger with the same rock, and you will immediately notice the difference, but you will have to strike the chicken first. Lockean psychology had overlooked what everyone obviously knew, that even the mind of a chicken is not originally a blank slate that will be shaped entirely by sense impressions.

Similarly, Blake argued that one could not arrive at "General Knowledge" of men based on the fact that they have identical sense organs: "Every Man has Eyes Nose & Mouth this Every Idiot knows but he who enters into & discriminates most minutely the Manners & Intentions the ... Characters in all their branches is the alone Wise or Sensible Man ..." (Vision of the Last Judgment, E 560). "Man varies from Man more than Animal from Animal of Different Species" (annotations to Reynolds, E 656) because the manner of each person's behavior, even more than that of each animal, is the outcome of his various intentions (purposive causality) and not the effect of what every man similarly senses in the world he experiences (efficient causality). Because man is not "Naturally ... only a natural organ subject to Sense" (There is No Natural Religion, E 2), it is therefore not possible to predict according to environmental circumstances how various persons will behave under similar or identical conditions: "Want of Money & the Distress of A Thief can never be alledged as the Cause of his Thievery, for many honest people endure greater hard ships with Fortitude We must therefore seek the Cause elsewhere than in want of Money ... " (letter to Trusler, 23 Aug. 1799, E 702). The identity of sense organs, combined with the irregularity of behavior in men and animals, reveals that sense experience does not determine and therefore cannot possibly explain the actions of men or animals. The obvious differences in their behavior means that any science of living beings has to look to what is different about them to understand why they act the way they do: it has to understand their different "propensities," "intentions" and "pursuits."

Ever since antiquity, scientists had searched for the laws of the universe because of their faith in a God who was both creator and lawgiver. Newtonianism seemed to be the ultimate vindication of that search and the faith that inspired it, and the natural religion of the Enlightenment put the capstone on this almighty edifice. "Look round the world: ... you will find it to be nothing but one great machine, subdivided into an infinite number of lesser machines" each accurately adjusted to one another, all of which proves "at once the existence of a Deity, and his similarity to human mind and intelligence."⁸¹ With the Age of Reason, the endeavor of natural philosophers to create a solid universe of fixed laws culminated with such a pervasive intensity, affecting all aspects of thought—Urizenic thinking took over everything, suppressed all thought, vision, imagination, passion—that Blake felt the falsity of it all would soon become clear: Los sees "the finger of God ... / ... / Fixing their Systems, permanent: by mathematic power / Giving a body to Falshood that it may be cast off for ever" (*Jerusalem* 12:10-13, E 155).

Indeed in 1831, twenty-seven years after Blake printed those words and just four years after he died, the *Beagle* set sail. It is impossible to tell exactly how Blake would have responded to Darwin's great work, much of which he no doubt would have found repugnant. However, we do know that he had no trouble defending Paine against Bishop Watson's attack on his *Age of Reason*, a work with which Blake certainly had much disagreement, and he readily interpreted the Bible in his infernal way so as to overlook what was disagreeable and highlight what he favored, so there is good reason to suppose that he also would have extracted from Darwin whatever suited his purposes. There is much that would have delighted Blake, who thought "the Creator of this World is a very Cruel Being" (*Vision of the Last Judgment*, E 565).

When Blake inquired "Did he who made the Lamb make thee?" he knew that it is not credible to say that God made the lamb and not the tyger, the implication being that there is no moral plan according to which God made only what the religious call good qualities (lamb-like meekness) and did not also create and even smile upon what they call evil (tyger-like wrath). We are not "put on earth" to fulfill any providential design or plan, such as, for example, learning as slaves "to bear the beams of [God's] love" ("Little Black Boy," E 9). Priests who proclaim that the "Gods had orderd such things" merely take advantage of the vulgar (see *Marriage* 11, E 38), for in truth no God preordained, planned or created anything.

Perhaps, then, the best answer to the question regarding the making of tygers and lambs is not that God made both, but that no distant hand or eye created either. Blake thoroughly rejected the Genesis account of creation, along with its Creator God. He was an anti-creationist who held that "Eternity Exists and All things in Eternity" and found the supposition that all was once "Solitude & Chaos" to be "the most pernicious Idea" (*Vision of the Last Judgment*, E 563). He therefore might very well have loved much that Darwin achieved after he returned from his momentous voyage. Darwin destroyed not only the Creator God, but also "conceptions that had reigned in the philosophy of nature and knowledge for two thousand years [which] ... rested on the assumption of the fixed and final ...

81. Hume, Dialogues 701.

[The] 'Origin of Species' introduced a mode of thinking that in the end was bound to transform the logic of knowledge, and hence the treatment of morals, and religion."⁸²

Blake's realization that "All Knowledge is Particular," that "Unless, You Consult, Particulars, You Cannot, even Know or See ... any Thing ..." and that "Science cannot exist but in minutely organized Particulars / And not in generalizing Demonstrations of the Rational Power" (Jerusalem 55:62-63, E 205) derived in large part from his understanding of the behavior of men and animals. These insights could very well have served as guidelines for the research methods Darwin employed. Certainly no scientist before Darwin consulted minutely organized particulars, every inch and mile of creation, more than he did. Darwin's painstaking research into the living world of plants and animals did not lead him to reduce the variety of nature to fixities and uniformities, as all those Urizenic scientists before him did. His writings are filled with terms Blake used or would certainly have appreciated-words like individual differences and variations-and he showed how and why minute particulars are organized the way they are. Darwin's work was the hammer of Los that destroyed the Urizenic error that had been misleading scientists for millennia.

Blake was one of the very few prior to Darwin who understood the error of fixity and finality. He hammered away at perhaps the fundamental mistake of all pre-Darwinian thinking as it affected science, as well as society's moral and religious beliefs. He recognized just why there was so much secrecy surrounding God's "words and laws"—because there were no universal, preestablished laws that religion could discover. They were merely priestly inventions. Once natural philosophers similarly claimed to have discovered fixed and final abstract laws, Blake noted that these laws were equally fictitious creations and not the stuff of real science. For Blake, true science must give us knowledge of those minutely organized images of truth that we all experience, and if it does not, then the so-called new philosophy is just the same old philosophy all over again.

"The labours of Art & Science"

Nowadays we tend to divide art and science into different cultures—their studies are located in different parts of most universities. However, Blake's contemporaries considered science to be a branch of philosophy. Blake responded by seeking to differentiate both art and science, which he viewed as related endeavors, from all philosophy, including natural philosophy. The phrase "art and science" appears over seventeen times in his writings (too many times to list—five appear in the first two paragraphs of this essay—so the reader interested in all of them should consult David Erdman's *Blake Concordance*). As Blake understood it, science, along with art, was

82. Dewey 1-2.

one of the intellectual gifts of humanity; its aims were to be distinguished not only from natural philosophy, but also from all moral and religious concerns, since those who "trouble Religion with Questions concerning Good & Evil" and all such "Knowledges or Reasonings" despise and hinder "Imaginative Art & Science & all Intellectual Gifts all the Gifts of the Holy Ghost" (*Vision of the Last Judgment*, E 554). For Blake, what has marked the two warring cultures of Western civilization have been the attempts of moralists and theologians to hinder the work of artists and scientists, with the dark religions and abstract philosophy (the frequent handmaiden of religion) opposing art and science. "Laws & Moralities / ... destroy Imagination" (*Jerusalem* 74:12-13, E 229). Throughout his writings, Blake called for the liberation of both art and science from their traditional hindrances.

What kind of science could he possibly have been thinking of? And who was practicing it? As Blake saw it, science is one of the eternal arts of humanity, and from science every earthly occupation derives: "in Eternity the Four Arts: Poetry, Painting, Music, / And Architecture which is Science: are the Four Faces of Man. / Not so in Time & Space: there ... only / Science remains ... & by means of Science, the Three / Become apparent in Time & Space, in the Three Professions / Poetry in Religion: Music, Law: Painting, in Physic & Surgery: / That Man may live upon Earth ..., / And from these Three, Science derives every Occupation of Men. / ... Science is divided" and "Some Sons of Los" build "porches of iron & silver" while "Others; Cabinets richly fabricate" and "the Artist [takes] his clay / ... to mould artful a model for golden ornaments" (*Milton* 27:55-28:15, E 125-26).

These are the words of a professional artisan who represented the poetic genius not as someone sitting on an old grey stone for the length of half a day or invoking inspiration from the wind (cf. Wordsworth's "Expostulation and Reply" and Shelley's "Ode to the West Wind"), but as Los, the smithy continuously working at and giving concrete form to his art and not off generalizing about abstractions as Urizen does. As science has become increasingly specialized and theoretical, Blake's description might first strike us as out of date, but when attempting to understand what he meant by the art of science, we should recall that Leonardo practiced science and Goethe worked at it in Blake's day. Later still, Borodin was a chemist, Chekhov a physician, and Kafka an excellent lawyer. In a lecture at the Royal Institution (given on 16 June 1836), Constable contended, "Painting is a science ... a branch of natural philosophy, of which pictures are but experiments." Not an opinion Blake would entirely have agreed with, because he sought to distinguish art and science from philosophy, but it shows that other artists in Blake's day also considered art and science to be allied disciplines.

Moreover, as science developed it continued to go in the direction Blake wished to move it, divorcing itself from speculative philosophy and its concerns and claims, but not necessarily from the occupations of the artist. At the end of the twentieth century, the paleontologist Stephen Jay Gould offered his opinion as to the nature of science and how it differs from philosophy: "Maybe philosophers do sit in their armchairs and think about the nature of reality," he said. "But I don't think most practicing scientists do, I think they just get on with their work."¹⁰³ The physicist Freeman Dyson agrees that "science has more in common with art than it has with philosophy."³⁴ At the end of the eighteenth century, Blake struggled to establish a view of science as a practical discipline completely separate from the concerns and claims of philosophy. By the end of the twentieth century, his assessment has become the one accepted by a number of scientists and philosophers.

In the West, the only science worth speaking of prior to the scientific revolution of the Renaissance occurred in ancient Greece, and it pretty much died there, in part because it was largely something studied by an aristocratic class of philosophers who had little or no interest in its practical applications and who would not have understood what Berkeley meant when he wrote that the "study of nature" serves to frame "artificial things for the use and ornament of life."⁸⁵ Significantly Blake's poetic genius, Los, is a member of the working class for whom science and art is an occupation he labors at and not simply something that he sits thinking about at his leisure. He is the perfect embodiment of Berkeley's description of the nature and purpose of real science, as distinguished from the musings of natural philosophers:

the end of speculation [should] be practice, or the improvement or regulation of our lives and actions; yet those, who are most addicted to speculative studies, seem as generally of another mind [Men] of leisure ... lay themselves out in fruitless disquisitions, without descending to the practical parts of life, or informing themselves in the more necessary and important parts of knowledge."^m

Modern science is distinguished by its insistence on empirical observation and proof, and that advancement in learning is due, to an extent not fully appreciated, to the interests and work of a class of ordinary artisans, among whom were the painters, silversmiths and blacksmiths, ironworkers and cabinetmakers Blake listed as doing the work of science. To take a few examples from many: in 1698 an English merchant, Thomas Savery, patented a steam device for clearing water from coal mines; an instrument maker, James Watt, perfected the engine; and in 1824, a French military engineer, Sadi Carnot, published a treatise on the steam engine, *Reflexions on the Motive Power of Fire*, all of which eventually made the science of thermodynamics possible, as the science of aerodynamics was advanced by two brothers who ran a bicycle shop in Dayton, Ohio. It is of no small significance that Galileo, often considered the father of modern science, placed his last and most important scientific dialogue (*Concerning Two New Sci*ences) in a shipyard.

Examining the rise of empiricism in his Mathematical Thought from Ancient to Modern Times, Morris Kline noted: "While reformers of science urged the return to nature practically oriented artisans, engineers, and painters[!] were actually obtaining the hard facts of experience." They "dealt with particulars, rather than generalities ["To Generalize is to be an Idiot"; "Science cannot exist but in minutely organized Particulars / And not in generalizing Demonstrations of the Rational Power" (annotations to Reynolds, E 641; Jerusalem 55:62-63, E 205)], and they added to science instead of defining it" The "pure empiricism of the artisans," working with "mechanical ideas and properties of materials" provided "new physical insights [that] were impressive."67 Indeed, one of those artisans not only wrote about science but also demonstrated how art and science actually work together-how every occupation of man derives from and involves real scientific work. Experimenting with copper, gum arabic, and acid, he made his own impressive discovery. In 1972 I met with a printer and happened to ask him if he knew the work of William Blake. He could hardly sit still. "Oh, William Blake!" he exclaimed. "That is printing of the 21st century!"

In the end, I hope this essay has shown that, for all that's been written to explain and celebrate Blake as a mystic or visionary, he was a child of the Enlightenment who sought, as did the finest thinkers of the age, to free men from their numerous "mind-forg'd manacles" ("London," E 27) which served only to hinder art and science, whose work he believed formed the basis of any good society. He, like other Enlightenment figures, sought to reevaluate those eternal verities that custom, tradition and law required men to believe in, and to redefine what individuals can sense to be true and what they know is not; in the process he defined for himself and others a quite modern version of truth which, in the best spirit of the Enlightenment, was at once accepting, tolerant and critically very astute. Blake examined ancient and modern conceptions of the truths of reason to show that rational truths were neither true nor false with respect to all those images of truth we experience, and anyone who claimed that they were true in that sense was speaking falsely, since there was no foundation in experience for any such belief or claim. On the other hand, everything that humans do experience is true, has to be true, and cannot possibly be untrue; no one, no philosopher, nor king or priest, has any right to reject or condemn anything humans experience as being false or wrong, for "every thing that lives is holy!" (Visions of the Daughters of Albion 8:10, E 51).

83. Gould 80.
84. Dyson 139.
85. Berkeley, *Treatise* 544.
86. Berkeley, *Dialogues* 103.

87. Kline 1: 227-28.

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124 Blake/An Illustrated Quarterly

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Blake and the Sheffield Iris

By DAVID GROVES

The Sheffield Iris was a weekly eight-page newspaper, founded in 1794 by the poet and reformer James Montgomery (1771-1854). Its enlightened political views gave the Iris an influence far beyond the English manufacturing city of Sheffield. Although Montgomery's role as editor ended in 1825, he continued to take an interest in the paper, and to contribute occasional pieces to it.¹

When the second volume of Allan Cunningham's Lives of the Most Eminent British Painters, Sculptors, and Architects appeared in 1830, it was reviewed in the Iris, with special attention to Cunningham's chapter on Blake. The anonymous review has never been reprinted or mentioned in print, until now:

See John Holland and James Everett, Memoirs of the Life and Writings of James Montgomery, Including Selections from His Correspondence, 7 vols. (London: Longman, 1856) 1: 175 and 7: 95. Montgomery had some interest in Blake, and in the 1808 edition of Blair's Grave, with designs by Blake (see Holland and Everett 1: 38 and G. E. Bentley, Jr., Blake Records [Oxford: Clarendon P, 1969] 194). In the review that follows, however, there seems to be no evidence of Montgomery's pen. See also the valuable discussion of the Cromek-Montgomery-Blake nexus in Robert N. Essick and Morton D. Paley, Robert Blair's The Grave Illustrated by William Blake: A Study with Facsimile (London: Scolar P, 1982) 23-25.

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NUMBER X. of this interesting work, which we have on a previous occasion introduced to our readers, is just published, and comprises the lives of seven painters-West, Barry, Blake, Opie, Morland, Bird, and Fuseli, with likenesses, more or less highly finished, of each. To say, that the memoirs contained in this neat volume-the second of "British Painters, Sculptures [sic], and Architects," are from the fascinating pen of Allan Cunningham, and the far-famed depot of Albemarle-street, leaves nothing else to be added in the way of praise. What a singular being was William Blake! A painter, an engraver, a poet, and a visionary,-in the last character perhaps little less singular than Swedenberg [sic] himself. "To describe" says the biographer "the conversations which Blake held in prose with demons, and in verse with angels, would fill volumes, and an ordinary gallery could not contain all the heads which he drew of his visionary visitants. That all this was real, he himself most sincerely believed; nay, so infectious was his enthusiasm, that some acute and sensible persons who heard him expatiate, shook their heads, and hinted that he was an extraordinary man, and that there might be something in the matter." The spirits, however, who thus obeyed the artist's bidding, came not to reveal any secrets, save the secrets of their own countenances-in short they came as might be expected at the call of a painter-to have their portraits taken! and many of the likenesses of these spiritual sitters did poor Blake delineate, from the heroic Wallace to the "ghost of a fleal" Instead of transcribing the narrative of these unearthly vagaries, we shall copy the brief account of the enthusiast's procedure and luck in a transaction incident to the greater part of mankind: but in which few engage so inconsiderately, and fewer still, when that is the case, with such exemplary good fortune:---

(The two paragraphs that follow are the ninth and tenth paragraphs of Cunningham's chapter on Blake, from the first edition of the *Lives*.³ The only substantive change is the spelling of the names of Blake's wife as [alternatively] "Katharine Boucher" and "Catharine Boucher." Blake was in fact 24, not 26, when he married.)

 Anon., Sheffield Iris 9 February 1830: 4. The opening words, "NUMBER X. of this interesting work," refer to the "Family Library" series, of which number ten was the second of Cunningham's sixvolume Lives. "Albemarle-street" was the location of Cunningham's London publisher, John Murray. "Swedenberg" was of course the mystic Emanuel Swedenborg.

 The second edition of Cunningham's life of Blake is reprinted in Bentley 476-507.