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# The Bond of Union in Modern Physical Science

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In 1834 Mary Somerville said:

The progress of modern science, especially within the last five years, has been remarkable for a tendency to . . . unite detached branches [of science, so that today] . . . there exists such a bond of union, that proficiency cannot be attained in any one branch without a knowledge of the others.<sup>1</sup>

In 1979 Victor F. Weisskopf stated:

[W]e must not forget that the unity of science remains the main tenet of every scientist and the

basis of his view of nature. We believe in the existence of fundamental laws that govern everything in nature.<sup>2</sup>

Such comments provide a picture of how physical scientists think.

What does a Christian do with these ideas, especially if he is a physical scientist? Recently I wrote *The Unity in Creation* in an attempt to bring a Christian perspective to the “bond of union” or the “unity of science” concept which the writers just quoted so easily refer to.<sup>3</sup> Some people have responded positively; but others have serious questions, and it is these questions, asked not only of me but of

others who have discussed unity, which I wish to address in this article.

I shall first describe the concept of unity in creation as I see it. It seems to me that if an understanding of physical science (later the extension to the rest of creation will come into the discussion) is to be called Christian, one must insist that the various bits of physical information which we possess are not to be isolated from each other. They are linked. Because of this linkage, even non-scientists can predict correctly in many instances that which will later be observed. Physical scientists have demonstrated that all of physical science is unified by means of this linkage.

As I see it, the unification process is straightforward: one observes; he correlates his observations and calls these formulations natural laws; finally, he links the laws together and concludes that there might exist one law which explains all the observations which can be made relevant to the physical scientific aspect of creation. What we then see is that there is order in the physical scientific aspect of creation. What might not be seen well enough even by Christians is that this order exists because God does not contradict himself. He presents himself as one who is faithful, whose acts are coherent. The ultimate reason why there is unity in physical science—in fact, the reason why physical science exists—is that God acts coherently.

The purpose of *The Unity in Creation*, where these ideas were discussed at length, was to bring together various ideas expressed earlier by others. Thus, on the one hand, scientists ordinarily assume that physical scientific activity is a unifying process; on the other hand, many people have correctly believed that God acts coherently with respect to the physical aspect of creation. What I have attempted to con-

front Christians with is the consequence of bringing those two ideas together.

### **The Name of the Physical Scientific Game**

Let us assume the validity of the second of those ideas, the idea that God acts coherently. We ought, however, to look more carefully at the other idea, the idea that physical scientific activity is a unifying process.

We can see in physical scientific activity today that unification is the name of the game as much as it ever was. For example, Sheldon Glashow, Steven Weinberg, and Abdus Salam won the 1979 Nobel prize in physics because they showed that two of the basic forces of nature can be unified. Their work was heralded as a breakthrough in physicists' attempts to unify physics. Another recent development is the discovery of the "gluon," one of the particles which hold matter together. Leon Lederman, a prominent physicist, said that the discovery gives impetus to hopes for a grand unification theory of physics.

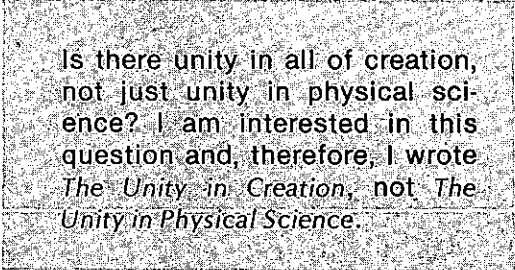
Two recent issues of *Mosaic*, a magazine published by the National Science Foundation, were devoted entirely to the concept of unification in the sciences. (For their purpose they included some of the non-physical sciences; we shall see later that this inclusion is significant.) At the beginning of the first article in the series the authors wrote:

The fundamental forces in nature—gravity, electromagnetism, and the strong and weak subnuclear forces—may be four expressions of a single, universal, unifying phenomenon. To prove that they are, to write a grand unification theory, could represent as revolutionary an in-

sight as did natural selection or the heliocentric solar system.<sup>4</sup>

These *Mosaic* articles describe attempts to unify not only basic physical science, but also geology using plate tectonics developments, the large-scale circulation of ocean water, and world climate.

Consider the work of Albert Einstein. Why was Einstein world-famous for decades? No doubt his work interested many people because he asked some of the more profound questions that scientists ask. But what we might not realize about Einstein is that his work on profound questions was successful just because he believed that the physical aspect of the world is united. Commemorating the one hun-



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dredth anniversary of Einstein's birth, *Time* said, "Einstein was convinced such a basic harmony and simplicity existed in nature."<sup>5</sup> Thomas F. Torrance, in agreeing with Einstein said that there is intrinsic order in the universe and that, as a consequence, we can perceive that "we are in touch with a depth of intelligibility which reaches definitely beyond what our finite minds can comprehend."<sup>6</sup> Torrance quoted Einstein, who referred to:

[T]hat humble attitude of mind towards the grandeur of reason incarnate in existence, and which, in its profoundest depths is inaccessible to man.<sup>7</sup>

Einstein also said that he had:

[R]apturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all systematic thinking and acting of human beings is an utterly insignificant reflection.<sup>8</sup>

### Outside of Physical Science

Even if we take it as proven that physical scientific activity is a unifying process, an important question remains. Is there unity in all of creation, not just unity in physical science? I am interested in this question and, therefore, I wrote *The Unity in Creation*, not *The Unity in Physical Science*.

The question of unity in creation has been debated for centuries. Therefore, it is a question which will not be answered quickly or simply. But is it possible that God acts coherently with respect to the physical aspect and incoherently with respect to the other aspects? I assume that this is only a rhetorical question. He obviously is coherent in all His acts. Everything we study, physical or not, we must approach with this most basic idea: God created, God upholds, and God does not contradict Himself. If, however, this confession is to be more than a mere platitude, our work in the various aspects of creation will show that we believe God created the universe and upholds it coherently. The ultimate working principle of the Christian in understanding the nature of things will then be that God spoke and all things came into being. Contrast this ultimate principle with the ultimate principle of the non-Christian, who (if he attempts to be consistent) says that there never was a creation, a beginning point in time. There is the battle line: you are either for God (you believe He created) or you

are against God (you deny that there ever was a creation).

But even without denying that there is coherence in the universe, some persons have for one reason or another had real fears about attempts to unify. For example, many eighteenth-century Germans claimed that French scientific work was mechanistic and that the French had thereby put a deterministic universe in place of a world made and upheld by God. Thus, Goethe, an eighteenth-century poet, was concerned about unification efforts, even though he had an obvious respect for creation. He said:

A system of nature was announced, and therefore we hoped to learn really something of nature, —our idol . . . . But how hollow and empty did we feel in this melancholy half-night, in which the earth vanished with all its images, the heaven with all its stars. There was to be matter in motion from all eternity, and by this motion, right, left, and in every direction, without anything further, it was to produce the infinite phenomena of existence . . . .<sup>9</sup>

Goethe began his study of nature with the study of plants. But he detested Linnaeus' system of classification because it depended on the use of numbers. For example, to classify a flower its pistils were counted. Goethe preferred to use imagination. He would not count the parts of the plant; he would rather consider the whole life of the plant. According to him all plants were by a mysterious law derived from an archetypal plant. In his thinking he extended this archetypal idea to zoology and physical science. Therefore, for Goethe Newtonian science was incomplete. Commentators have

said that Goethe approached nature poetically and that for him nature was permeated with non-material forces.

Similar ideas are held today. Blackstone, in writing of Virginia Woolf, said:

Surrounding the human synthesis we have this great mystery of nature. Perhaps it is chaos, perhaps it will reveal a pattern. We don't know. And the danger is this: that pattern-making, "one-making," as [Virginia Woolf] called it in her last novel, *Between the Acts*, is so inveterate a habit of the human mind that it makes clear vision very difficult. We want to see a pattern, and a pattern obediently appears.<sup>10</sup>

These objections are perhaps typical of the fears of some non-scientists concerning unification efforts. For them unification seems to mean that all the aspects of creation will be explained in terms of the physical aspect. They see physical scientists unifying by making observations, formulating laws, and finally joining these laws so that one fundamental idea or a set of complementary fundamental ideas can be expressed. These non-scientists fear attempts to use the same process in the non-physical aspects. The non-physical aspects would then be reduced to the physical. In order that the unity-in-creation concept be understood correctly, we should see that reductionism (in this case, attempts to explain all the aspects of creation in terms of the physical aspect) is improper. In fact, a complete statement of the unity concept should include a denial of reductionism.

But why is reductionism improper? To answer that question it is sufficient to note what reductionism means to one who believes in it:

[S]cience describes nature. And man and his technology are embedded in nature. The hope is that once science can be satisfied with its descriptions of nature's thermodynamic sociology in a technological world, the stage could be set for some ethical choices based on real knowledge of what decisions could be contributing either to the wrecking or to the salvation of the planet. It is a huge order, but the processes have begun.<sup>11</sup>

Here is an expression of a belief that the methods of thermodynamics, a branch of physics, can scientifically explain sociology, and that such a scientific explanation can determine ethical principles, thereby making it possible to save the planet. Reducing ethics and sociology to physics denies the richness of creation and, of course, denies much of what God has revealed.

The Christian position does seem to demand that there be some way to demonstrate for each aspect of creation, not just the physical aspect, that it is a coherent manifestation of God's creating and upholding power. In that sense, each aspect is internally unified.

The Christian position does seem to demand that there be some way to demonstrate for each aspect of creation, not just the physical aspect, that it is a coherent manifestation of God's creating and upholding power. In that sense, each aspect is internally unified. Consequently, certain conceivable goals of the investigator cannot be achieved. For example, no in-

vestigator will be able to explain man's psyche using only physical laws. But—and this is the important point—as we learn more and more about man's psyche, we should be able to say better and better, "What we know of man's psyche teaches us that God does not contradict Himself and that He has created so that we can see harmony in his creation."

### More Questions

Other questions concerning unity have often been asked. Perhaps behind these questions lies a fear of reductionism. In any case, further explanation is needed.

First, when scientists who are Christians use the observations-laws-fundamental idea sequence to show that God acts coherently, are they not improperly attempting to prove the existence of God? "Natural theology," which has existed in one form or another for centuries, has been rejected by many Christians because it seems to attempt that which is impossible. Is the concept of unity in creation just another form of natural theology and, if so, should it then also be rejected for the same reason?

One can err and make natural theology a theology which starts with man, not God. But the concept of unity in creation could be equivalent to a redefined natural theology if it is understood that all theology properly starts with and is dependent upon God. Such "natural theology" need not be rejected. Men who are given evidence of what God does and still fail to recognize His power and control do not give Him the honor due Him. After all, Christians have always known that God does not contradict Himself, that He is all-powerful, and that He upholds what He has created. When the scientist finds that his discoveries taken all together

give just this picture of God, it is not a bad thing. Rather, the Christian should rejoice.

Second, does the observations-laws-fundamental idea method of showing unity properly take into account ideas we had before we did the observing and the formulating? Are presuppositions, which everyone has, skipped over in this process? Should not presuppositions be closely examined?

The procedure used does ultimately depend upon the one presupposition all men have, although some suppress it: there is a God and He has eternal power (Romans 1:20). But there are subsidiary presuppositions which might not be suppressed, and these are not the same for all men. Should not one take into account all of a person's presuppositions before coming to a conclusion concerning his scientific activity? Such an objection seems to miss the point. There is nothing particularly bad about claiming that one makes observations, formulates laws, and arrives at a fundamental idea even as one maintains that such a procedure helps us understand some of God's revelation about Himself. One need neither affirm nor deny the existence of presuppositions (except the one that all men have) for the purpose of the argument. The striking observation we can make is that unity is seen by men *in spite of* their varying presuppositions and *because of* the one presupposition they all possess.

Third, isn't the idea that God does not contradict Himself the same as holding to the logical law of non-contradiction, the basis of human logic? Doesn't that amount to basing our position on man-made logic?

One is tempted to say—since the unity argument is based on the idea that God does not contradict Himself—that

the argument is indeed based on the law of non-contradiction which men have deduced to be true. But in our scientific work we find out what God does, not what man does. If God reveals that He is One who does not contradict Himself, we must use that revelation. We then use the law of non-contradiction in our thinking only because God made a world in which that law is true. We do not have the freedom to ignore the law of non-contradiction simply because it is also part of a system of logic formulated by man.

Fourth, doesn't the diversity of phenomena, the diversity of observations and laws in physical science, point to God just as well as unity points to Him? What is claimed in this objection is that much of the grandeur of what God has made lies in its indescribable diversity. Creation seems to have an endless number of facets, and only a God as great as ours could have made a world like this.

One cannot overemphasize the grandness of the diversity of what we see. The point made in the unity argument is not so much that there is simplicity and therefore unity, but rather that, in spite of the obvious diversity in creation, men have been given the ability to discern in this diversity the unity that exists. Were there no diversity for all to see, then the idea of unifying various observations would not be nearly as significant as it is.

### **Where Does the Matter Stand?**

What is to be feared more than anything else concerning the idea of unification is that objections might be made because of wrong ideas one might have about "natural" and "supernatural." The idea that some things are natural and in some way separate from God, and therefore neutral, while other

things are supernatural and not neutral, is an idea that has gained great currency in our day. Those who have this wrong idea are tempted to characterize fundamental physical science—and, for that matter, the fundamentals of most aspects of creation—as neutral, things which have no particular relation to the will of God. If such a position were correct, then applied physical science, but not fundamental physical science, would have a significant relation to our faith. Technology, certain aspects of ecology, and related subjects would then be the only parts of physical science of interest when the proper Christian attitude toward science is discussed. Unfortunately, this attitude is precisely the attitude most Christians have toward physical science; and no doubt a good case could be made to show that a similar wrong attitude is held with respect to the fundamentals of the other aspects of creation.

The Christian may not ignore trends in the sciences in this last part of the twentieth century. T.S. Kuhn, a physicist who is a historian of science, explained what scientists are doing now:

[A]t a still higher level, there is another set of distinctions without which no man is a scientist. The scientist must, for example, be concerned to understand the world and to extend the precision and scope with which it has been ordered.<sup>12</sup>

The scientist's duty is to find more order. Edoardo Amaldi put it another way:

[T]he problem of coordinating the scattered and immense body of specialized findings into a systematic whole [in the physical sciences] is a real one and cannot be neglected.<sup>13</sup>

Besides mentioning cosmology, geology, and physics, Amaldi listed biology, behavioral science, history, and the social sciences. The very least that Christians can do is be present when scientists are deciding whether, for example, behavioral science can be explained wholly in terms of physical principles. Just because wrong decisions about how to unify can hurt entire cultures, Christians must show what is the proper way to observe the unity in creation. Decisions for the scholarly community concerning unification and reductionism must not be made by those who are insensitive to the Christian position.

## Notes

<sup>1</sup>Mary Somerville, *On the Connexion of the Physical Sciences* (London, 1834), Preface, n. pag., in Thomas S. Kuhn, *The Essential Tension* (Chicago: Univ. of Chicago Press, 1977), p. 75.

<sup>2</sup>Victor F. Weisskopf, "Contemporary Frontiers in Physics," *Science*, 203 (1979), 240.

<sup>3</sup>Russell W. Maatman, *The Unity in Creation* (Sioux Center, Iowa: Dordt College Press, 1978).

<sup>4</sup>"Grand Unification: An Elusive Grail," *Mosaic*, 10, No. 5 (1979), 2-12.

<sup>5</sup>"The Year of Dr. Einstein," *Time*, 19 Feb. 1979, pp. 70-79.

<sup>6</sup>Thomas F. Torrance, "Acceptance Address for Templeton Prize 1978," *Journal of the American Scientific Affiliation*, 31 (1979), 102.

<sup>7</sup>Torrance, p. 102.

<sup>8</sup>Torrance, p. 102.

<sup>9</sup>Quoted in L. Pearce Williams and Henry John Steffens, *Modern Science 1700-1900*, Vol. III of *The History of Science in Western Civilization* (Washington, D.C.: University Press of America, 1978), p. 11.

<sup>10</sup>B. Blackstone, *Virginia Woolf* (London: Hogarth, 1949), p. 21; quoted in J.T. Davies, *The Scientific Approach* (New York: Academic Press, 1973), pp. 3-4.

<sup>11</sup>Wil Lepowski, "The Social Thermodynamics of Ilya Prigogine," *Chemical and Engineering News*, 16 April 1979, pp. 30-33.

<sup>12</sup>Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: Univ. of Chicago Press, 1962), p. 42.

<sup>13</sup>Edoardo Amaldi, "The Unity of Physics," *Physics Today*, 26 (September 1973), 23.