

# Thomas Kuhn's Revolution

## A New Way of Looking at Science

Frank M. Hasel

Perhaps no other 20th century book on the nature of science has had and continues to have a more profound impact on our understanding of the subject than Thomas S. Kuhn's *The Structure of Scientific Revolutions*.<sup>1</sup> The effect of Kuhn's concepts has been compared to the impact of Marx, who "shifted our understanding of historical development and possibly Gould [who] will do the same for biological evolution."<sup>2</sup> Kuhn's ideas have been applied to other fields, such as social science, philosophy, humanities,<sup>3</sup> missiology, and theology, to mention but some of the more important areas of reception.

It is important to be familiar with Kuhn's line of thought to understand both the contributions and limitations of his ideas and to use them discriminately in dialoguing with people in different fields of study.

In order to understand Kuhn's radically new interpretation, in which he set out to change the image of science, we will first look at characteristics of the "traditional image of science" comparing it with his alternative concept. We will then point out some implications of Kuhn's position, and evaluate them from a Christian perspective.

### Traditional Science

For the past three centuries one dominant concept of science, which goes back to Francis Bacon (1561-1626), has exercised a pervasive influence on the world's thinking. According to popular belief, which is still very widespread, science is an empirical enterprise based exclusively on "facts," i.e. it is objective in the strictest sense of the term. No hu-

man subjectivity is allowed to influence the objective rules of science. Seemingly the underlying assumption of Bacon's scientific method was that data are hard facts about which there can be no dispute. Hypotheses arise from seeing a pattern in the data and making inductive generalizations. Predictions are derived by simple deduction from the hypothesis itself. Discarding or retaining a hypothesis depends entirely on whether the additional experimental data support it or not. Thus, science is an attempt to discover what is real in the world.

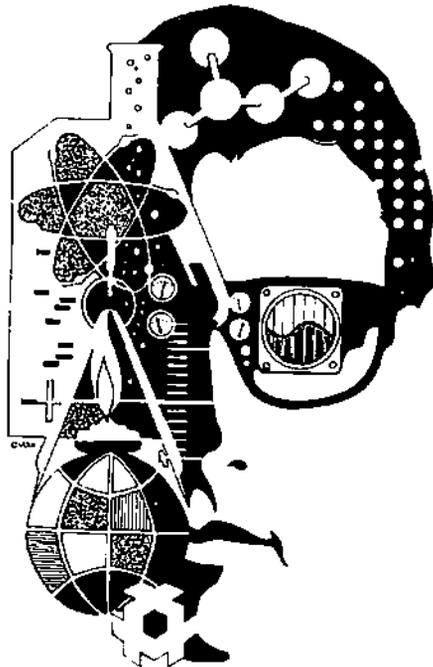
Progress in science consists in piecemeal additions to the list of known laws. Consequently, truths about this world are true regardless of what people think. This means that a sharp distinction may exist between

scientific theories and subjective beliefs. Furthermore, scientific concepts are rather precise, and the terms used in science have a definite and fixed meaning. Connected with this rationalistic view of science is the idea that science cannot truly break with tradition because it preserves the success of its predecessors. Past observations, laws, and theories are seen as permanent additions to the scientific knowledge. Consequently, science becomes the steady accumulation of objective knowledge about nature as it "really is."

### Kuhn's Alternative Concept of Science

Kuhn rejected the classic view of science, which was associated with Bacon's scientific method. Space does not allow us an exhaustive description of Kuhn's ideas, but the following elements play an important role. Kuhn sees a difference between two fundamental kinds of situations: "normal science" and "scientific revolutions."<sup>4</sup> After a group of scientists succeeds in setting standards for all further research in the field, this achievement inaugurates a period of "normal science," which is devoted to "puzzle solving." As long as scientists continue to solve the puzzles they find, they go forward in a way that superficially resembles Bacon's inductive ideal. This state of "normal science" tends to prevent fundamental change in a field of inquiry.

So how does change occur, according to Kuhn? From time to time anomalies in some branch of knowledge get out of hand, and there seems no way to cope with them. This creates a crisis characterized by an atmosphere of ur-



gency to solve those anomalies and eventually leads to the next stage: the scientific revolution.<sup>5</sup>

A revolution occurs when the old paradigm becomes incapable of resolving anomalies, while new paradigms offer different ways of looking at things. The shift from one paradigm to another "cannot be made a step at a time, forced by logic and neutral experiments."<sup>6</sup> According to Kuhn, paradigms are discontinued not by deliberation but by "a relatively sudden and unstructured event like a gestalt switch."<sup>7</sup> This means that a new paradigm prevails only when the older generation has been "converted" to it, or has died off and been replaced by a new generation.

It is important to note that in this process for Kuhn, "neither proof nor error is at issue."<sup>8</sup> Consequently, many have concluded that a paradigm shift is a highly subjective process. In order to better understand what is involved in Kuhn's argument, we need to look briefly at his concept of paradigm and some related aspects.

---

## Paradigms

---

Unfortunately, a clear and uniform understanding of Kuhn's basic concept of paradigm becomes difficult because of the variety of usages he makes of this term. A friendly critic has counted no less than 21 different uses of the term *paradigm* in the first edition of Kuhn's work.<sup>9</sup> Kuhn later attempted to clarify his intent and to distinguish between two different uses of *paradigm*. One is the sociological use, which "stands for the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community"; the other is the paradigm as achievement, where it denotes "concrete puzzle-solutions" that provide models for further research.<sup>10</sup> This distinction, however, leaves Kuhn with a problem. Which comes first, the paradigm or the community? Kuhn admits that "a paradigm is what the members of a scientific community share, and, conversely, a scientific community consists of men who share a paradigm." He continues by admitting that "not all circularities

are vicious...but this one is a source of real difficulties."<sup>11</sup>

Another point to be noted is that for Kuhn observations are paradigm dependent. There is no neutral observation language. Not only observations but also criteria are paradigm dependent. There are no external standards on which to base a choice between paradigms, for standards are themselves products of paradigms. This means that one would need a "super-paradigm" to decide between different paradigms, but this is lacking in Kuhn's concept. There are no external standards for settling a dispute because, in a revolution, the standards themselves change. Consequently, Kuhn believes that paradigms cannot be compared to one another because nothing outside the paradigm can serve as common ground for such an assessment. Paradigms are, in Kuhn's terminology, incommensurable; thus, science is non-cumulative. New theories are not additions to, but rather replacements of older theories. His understanding of progress is derived explicitly from an etiological evolution logic that is formulated in neo-Darwinian terms.<sup>12</sup> This is an often overlooked element of Kuhn's argument. Having said this, we need to look at some of the implications of Kuhn's ideas and to try to evaluate them from a Christian perspective.

---

## Evaluation

---

As we look at Kuhn's proposals, we have to give him credit for having broken new ground in the philosophy of science. He has conclusively shown that even natural science is a decidedly human pursuit that is no more rigidly objective and logical than the humans who engage in it.<sup>13</sup> Because values are an important component of the paradigm, human subjectivity is firmly planted in the center of science.<sup>14</sup> According to Stephen Toulmin, Kuhn has historicized natural science and thereby "completed the historicization of human thought that had begun in the eighteenth century."<sup>15</sup>

In so doing, Kuhn has achieved a major breakthrough in demytholog-

izing much of the absolute nature of science that has dominated the scholarly world for so long and still casts its spell over much pseudo-scientific thinking. Science, even natural science, is being increasingly perceived as a human activity. The contrast between so-called objective truth and metaphysics and the dichotomy between science and ideology have been called into serious question. Also, Kuhn's insight that scientific theories cannot be overthrown solely by experiments and observation merits serious attention. These insights can help Christians as they dialogue with people who challenge the allegedly "unscientific" nature of Christian faith. It can help to show that Christianity is at least as serious an alternative as a scientific or naturalistic world view.

Noting these contributions, however, one should also be aware of serious limitations of Kuhn's thought, especially when seen from a Christian perspective. Let us start with his crucial concept of paradigm. Leaving aside other difficulties, we will note only the following: in Kuhn's own initial definition, paradigms are "universally recognized scientific achievements that *for a time* provide model problems and solutions to a community of practitioners."<sup>16</sup> In other words, a paradigm by definition has only provisional character, and lasts for a limited period of time. There is no permanent, trans-historical or trans-cultural paradigm as Kuhn describes it.

The problem with Kuhn's model, from a Christian perspective that takes the self-testimony of Scripture as God's Word seriously, is that it remains essentially intra-historical, lacking the supra-historical framework of divine revelation. Scripture is not historically conditioned by purely immanent cause-and-effect relationships, but is divinely conditioned and *historically constituted*, and thereby universally binding and valid for all times.<sup>17</sup> Thus, for Christians who take the Bible as their norm for faith and practice, *revelation* provides the criteria for evaluating beliefs and not community values, as for Kuhn. It is Scripture and not experi-

ence that serves as the norm for truth.<sup>18</sup>

Another serious limitation of Kuhn's thought results from his underlying evolutionary premise, which does not permit a normative use of history, let alone a canonical one. Since "truth" is to be determined by the internal consistency of a paradigm, epistemological relativism seems almost unavoidable. The question of truth is the real problem in Kuhn's approach. For him there are no external, paradigm-independent standards that determine whether the paradigm in question is true or false. He, therefore, denies that we can get closer to the truth by means of new and changing paradigms.<sup>19</sup>

Kuhn rejects what he calls "objective" or "absolute" truth in favor of a pragmatic or instrumental view of truth. For him "there is no standard higher than the assent of the relevant community."<sup>20</sup> Consequently, truth no longer corresponds to God's revelation in Scripture, but to what humans accept; in other words, it is sociologically defined. Christians, for whom the Bible is foundational, would argue that "historically the community is called and led by God... rather than the community choosing and developing a paradigm.... Christians acknowledge the existence of a transcendent God who is able to act in supernatural ways (miracles, for example). This is in distinct contrast with the naturalistic metaphysics normally assumed by current paradigms of science."<sup>21</sup>

## Conclusion

We have sought to describe some of Kuhn's major arguments relating to his understanding of science. Intellectual responsibility demands that we seek to understand his theories on their own terms. Otherwise, the one who refers to "paradigms, models, and things like that" to justify his or her beliefs is no better off than undergraduates who refer to "Freud, existentialism, Zen and stuff like that" to justify theirs.<sup>22</sup>

We have seen that some of Kuhn's ideas have been instrumental in demythologizing much of the "objec-

tive" nature of natural science by showing the indebtedness of science to human subjectivity. Yet Kuhn's proposal is accompanied by an epistemological relativism that excludes any kind of supernatural framework by which one could evaluate and judge choices between competing paradigms. As a matter of fact, paradigms in the Kuhnian sense have only a provisional character and do not bring us closer to truth. Truth, in a Kuhnian paradigm, is defined not by its correspondence to nature or the revealed will of God but by what the scientific community accepts and whether a concept works in practice.

These and other points lead us to conclude that, despite some important contributions in the field of the philosophy of science, there are also severe limitations inevitably bound up with Kuhn's ideas. This is especially the case when one tries to transfer his ideas uncritically into the field of theology and religion. This presents a real danger that elements of Kuhn's thesis will deny the possibility of basing theology on the authoritative Word of God, just as did earlier scientific theories. True science should not exclude a priori any areas of reality but must be open to and guided by the supernatural element as attested in Scripture.<sup>23</sup>

## NOTES

1. Second edition (Chicago: University of Chicago Press, 1970). Hereafter referred to as SSR. In this paper I follow the detailed and documented analysis of Kuhn's thought as presented in my article, "Scientific Revolution: An Analysis and Evaluation of Thomas Kuhn's Concept of Paradigm and Paradigm Change for Theology," *The Journal of the Adventist Theological Society* 2:2 (1991), pp. 160-177. A copy may be obtained by writing to: Adventist Theological Society Publications; P.O. Box 86; Berrien Springs, Michigan 49103; U.S.A.

2. Langdon Gilkey, "The Paradigm Shift in Theology," in *Paradigm Change in Theology*, eds. Hans Kung and David Tracy, transl. by Margarete Kohl (New York: Crossroad, 1988), p. 367.

3. See Gary Gutting, ed. *Paradigms and Revolutions: Appraisals and Applications of Thomas Kuhn's Philosophy of Science* (Notre Dame, Indiana: Univer-

sity of Notre Dame Press, 1980).

4. Actually Kuhn mentions three types of situations in the development of a particular scientific field. We have left out the first stage, which he calls "immature science" because the result is not considered science. See also the more in-depth discussion in my article mentioned in note 1, pp. 163-166.

5. SSR, pp. 71-91.

6. SSR, p. 150.

7. SSR, pp. 122, 150.

8. SSR, pp. 151, 204, 4, 5.

9. Margaret Masterman, "The Nature of a Paradigm," in *Criticism and the Growth of Knowledge*, eds. Imre Lakatos and Alan Musgrave (Cambridge University Press, 1970), pp. 59-89.

10. SSR, p. 175.

11. SSR, p. 176.

12. SSR, pp. 170, 171.

13. Del Ratzsch, *Philosophy of Science: The Natural Sciences in Christian Perspective* (Downers Grove, Illinois: InterVarsity Press, 1986), p. 55.

14. *Ibid.* See also Bill Mundy, "Science and Religion: Two Approaches to Understanding Reality," *Dialogue* 2:1 (1990), 12-14.

15. Stephen Toulmin, "The Historicization of Natural Science: Its Implications for Theology," in *Paradigm Change in Theology*, pp. 233-241.

16. SSR, p. viii, italics supplied.

17. Frank M. Hasel, "Reflections on the Trustworthiness and Authority of Scripture," in *Issues in Revelation and Inspiration*, eds. Frank Holbrook and Leo van Dolson, Adventist Theological Society Occasional Papers, vol. 1 (Berrien Springs, Michigan: Adventist Theological Society Publications, 1992), pp. 208-209.

18. See Mundy, p. 13.

19. SSR, p. 170.

20. SSR, p. 94.

21. Mundy, p. 13.

22. Cordell Strug, "Kuhn's Paradigm Thesis: A Two-Edged Sword for the Philosophy of Religion," *Religious Studies* 20 (1984), p. 269.

23. See Ellen G. White, *The Ministry of Healing* (Mountain View, California: Pacific Press, 1905), p. 462.

*Frank M. Hasel, born in Germany, is completing a Ph.D. in religion at Andrews University Theological Seminary.*