Michael Williams's and O. Ciancio and S. Nocentini's contributions critique the idea that science is or should be entirely objective. Forestry is more than simply accumulating scientific information that allows one to grow a crop of trees as efficiently as possible. Scientific understanding must be assessed within the framework of an ethical system. Williams argues that writing history is an intellectual process that interprets events in the light of a value system. The new scientific paradigm these authors see emerging is one that emphasizes holism, an increasing recognition of the complexity of the natural world, and humility. The new field of ecosystem management is one of its by-products. They also point out that the practical result of the paradigm shift is a greater respect for indigenous land-use practices in the developing world and management for a greater variety of forest resources or ecosystem services in the developed world. The question of value systems and ultimate goals is also critical to the restoration ecologist. M. Hall points out that the ultimate goal of restoration ecologists in the United States has generally been to "re-wild" the land or restore it to its presettlement condition, while in Italy the goal has been to "re-garden" the land or retain beneficial human elements of the cultural landscape. He leaves open the question of whether human activities can improve on nature or whether they ultimately degrade it.

By way of summary, *Methods and Approaches in Forest History* contains several thought-provoking articles and is particularly useful as an entrée in English into the field of forest history in continental Europe. Its most serious deficit is probably the very brief, almost truncated, nature of many of the papers (five to ten pages long). I wish the authors could have provided more detail in their studies—metaphorically, could have placed leaves and flowers on their trees.

GORDON WHITNEY

Alexander Bird. *Thomas Kuhn*. (Philosophy Now.) xii + 308 pp., figs., bibl., index. Princeton, N.J.: Princeton University Press, 2000. $39.50 (cloth); $16.95 (paper).

Alexander Bird presents us with a carefully argued, sympathetic, but critical philosophical reading of Kuhn's model of scientific change, from *The Structure of Scientific Revolutions* to his last articles. He writes insightfully on Kuhn's concepts of normal and revolutionary science, paradigms, the idea of "seeing" different worlds (informed by additional psychological evidence), incommensurability, and progress. Not surprisingly for an analytical philosopher of science, Bird is most preoccupied with Kuhn's concept of incommensurability. Through detailed examination of Kuhn's thesis in light of the development of a realist semantics by Saul Kripke and Hilary Putnam and successor doctrines that correct weaknesses in their causal theory of reference, Bird argues that most instances of incommensurability between successive scientific paradigms dissolve on closer examination. While Bird admits that occasionally scientists may adopt different exemplars that reshape their perception when the exemplars in question are heavily visual in character (e.g., skilled laboratory science), theoretical changes in science do not result in perceptual change and corresponding separate referential worlds.

Bird argues that Kuhn's apparent radicalism in adopting the incommensurability thesis resulted from his conservative appropriation of the logical empiricists' descriptivist and holist account of the meaning of scientific terms. For Carnap, the meaning of a theoretical term is given by its place in a complete framework (holism) and the descriptive properties of the term define its reference (descriptivism). Kuhn extends this picture to one where scientific terms separated by a scientific revolution can both mean different things, since they are relativized to different theoretical frameworks, and yet still continue to refer to the world, licensing Kuhn's talk of scientists operating in different worlds. Bird sees this as trying to have your cake and eat it too. Either "oxygen" and "dephlogisticated air"—not "phlogiston," as Bird suggests (p. 185)—are terms that refer to the same entity, though with different meanings; or, their meanings being different, and meaning determining reference, "phlogiston theory" does not refer at all. Either it is an incorrect theory about real substances that we continue to study or it never referred to the world at all.

At this point we run into a persisting disciplinary divide between the methods of historians and analytical philosophers of science. Bird's argument depends on sympathetically fleshing out what Kuhn could have maintained sensibly in light of the analytical distinctions and practiced intuitions of the last forty years of philosophical debate, replete with twin earths, grue/green paradoxes, and the like. The goal is to create a completely consistent account of reference and meaning against which to evaluate models of scientific change. Kuhn's position, and that of many historians and historically oriented philosophers of science, by contrast, is concerned with

elucidating the causes and consequences of scientific change in thick, historical detail, and imaginary considerations of possible differences in the reference of "water" on a twin earth are meaningless.

This becomes clear when Bird examines Kuhn's 1990 response to realist semantics, ironically exemplifying incommensurability: where Bird sees persisting muddleheadedness and almost deliberate obfuscation in Kuhn's effort to return to real historical examples, for Kuhn only such a method can explain science. I think many would take the point further than Kuhn, who sought to curry favor with analytical philosophers after objecting strongly to the sociological interpretations of his work. Why should we believe that there is a consistent theory of reference to be had, when "reference" is just another slippery term in human language (something the competing paradigm of structuralism/poststructuralism considers in a way completely opposed to the revolution in semantics that Bird traces)? For the historian, the question "Who discovered oxygen?" is a great examination question precisely because no definitive answer is to be had.

For investigating a philosopher like Kuhn, who insisted on the continuing importance of incommensurability despite his many later qualifications and reservations on other points, Bird's method is especially curious. At the end of a detailed and nuanced examination showing that what Kuhn could have meant—when interpreted by antidescriptivist theories—cannot be supported, Bird admits that a "minimal realism" is, of course, assumed throughout the course of his examination, "that the entities, kinds and properties that are available for reference are standing features of the world" (p. 191). How is it reasonable to assume this as the basis for examining a theorist who argued for a many-worlds realism and denied progress except as increased puzzle-solving? For Bird, even if minimal realism were denied, his semantics would survive unscathed since that would only show that even our best theories failed to refer (p. 206). Historians may develop a better understanding of issues of reference and modeling scientific change by reading this book, and surely historians need to engage these issues more clearly in their own work. But few (even among those of us who accept a minimal realism and are dissatisfied with Kuhn) will be enthusiastic about adopting a position so unabashedly platonic and unfalsifiable.

WILLIAM T. LYNCH

Ullica Segerstråle. *Defenders of the Truth: The Battle for Science in the Sociobiology Debate and Beyond*. x + 493 pp., bibl., index. Oxford: Oxford University Press, 2000. $35.

Of the numerous books in recent years devoted to the science wars, most take a characteristic stance on the problem of scientific realism versus antirealism and associated claims about the plausibility of science's claims to objectivity versus epistemological relativism in science. Contributors to the science wars usually defend a position that is supposed to cut across the special sciences, thereby depicting science in generalizable terms at the expense of precision about any one science. Ullica Segerstråle's *Defenders of the Truth* is a welcome departure from the norm, since it addresses many of the dominant themes of the science wars but concentrates solely on the sociobiology controversy.

The book is divided into three main sections, the first of which provides the historical overview of the main themes, figures, and national and cultural agendas. The nine chapters in this section ably describe the science underlying sociobiology and explore how scientific work produced at some remove from sociobiology receives different treatment once associated with it. The predominant theme is that science, regardless of whether it was originally attached to a larger, nonscientific agenda, is cast as a deliberate social program once it is judged to have social implications. This observation is equally true of cases of science advocacy and criticism. The second section of the book departs from the historical stance of the first to reexamine earlier themes from a sociology of science perspective. Its six chapters provide a detailed analysis of the interplay between scientific and nonscientific values as they are mediated and represented by individual and institutional actors. What emerges from this discussion is a view of sociobiology in which the social positioning of scientific issues is critical to the success different constituencies have in delivering their message. Science is as much about the dynamics of power as it is about truth. As for truth, it dominates the final section. Here Segerstråle looks back over twenty-five years of sociobiology and evaluates what has been gained through the debate. In Segerstråle's view, sociobiology has been an underlying factor in the production of some very good science, work that has genuinely advanced biology. Yet the essential point to make is one not about scientific realism, but about how science figures in the historical advance of our conceptions of what constitutes human nature. The book ends with chapters in which human nature, Enlightenment rationality, and the existence of