structuralism, covering the views of Benacerraf, Hellman, Resnik, and himself. I am not so sure that structuralism really deserves to be singled out in this way; if I were organizing a book like this, I would include Resnik–Shapiro *ante rem* structuralism with the other contemporary realist views, and I would include Hellman's modal structuralism with the other contemporary anti-realist views. But of course, this is Shapiro's book, not mine, and it is understandable that he thinks that structuralism deserves a bit more space.

For the most part, Shapiro's discussions of the various contemporary views are accurate and very good. If I have any complaint at all here, it is that I think he might have devoted a bit more space, in the chapter on realism, to bringing out the different varieties of post-Gödel–Quine ontological realism that have emerged in recent years, and perhaps more importantly, to the different ways in which realists have tried to answer the Benacerrafian epistemological challenge. Shapiro says quite a bit on this topic in various places in the book—for example, in the chapter on structuralism, he discusses the ontology and epistemology of (his and Resnik's) *ante rem* structuralism, and in the chapter on anti-realism, he describes my own work on the ontology and epistemology of realism—but I think it would have been nice for the reader to see the various contemporary realist views brought together.

In sum, Shapiro has written an excellent book. It will be most useful, I think, as a secondary source for (graduate and undergraduate) students in philosophy of mathematics courses; and for graduate students and professional philosophers who do not know much about the philosophy of mathematics but want to be introduced to the area (anyone with a half-way decent philosophical background should be able to follow the book); and for professional philosophers of mathematics, who can use the text as a quick (but, of course, incomplete) source book on the views of the various figures that Shapiro covers.

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W. HUGH WOODIN. ***The axiom of determinacy, forcing axioms, and the nonstationary ideal.*** De Gruyter series in logic and its applications, no. 1. Walter de Gruyter, Berlin and New York 1999, vi + 934 pp.

In the 1980's, the author of the book under review showed that in the presence of large cardinals (a proper class of Woodin cardinals suffices) the theory of the inner model $L(\mathbb{R})$, the smallest model of ZF containing the reals and the ordinals, cannot be changed by set forcing. Combined with results of Martin and Steel (JSL LVII 1133), the techniques used in this proof soon yielded that the existence of infinitely many Woodin cardinals below a measurable cardinal implies that the axiom of determinacy (AD) holds in $L(\mathbb{R})$. In the other direction, AD gives a rich structure theory for $L(\mathbb{R})$, including the fact, again due to the author, that there are inner models of ZFC in which certain countable ordinals are Woodin cardinals. Applying the existence of such models, this book introduces a method for forcing over models of determinacy, and uses this method to lift the influence of determinacy to models of the axiom of choice.

The main results of the book are best stated in terms of a strong logic introduced in the last chapter. A sentence is said to be valid in Ω-logic if it holds in all models of ZFC with a certain second-order property (A-closure for a certain set of reals A). For example, a sentence that holds in all well-founded models of ZFC is valid in Ω-logic, and any sentence that can be forced to hold is Ω-consistent; indeed, the question whether the statement "φ is valid in Ω-logic" is equivalent to "φ cannot be forced to be false" is the key open question in this area (the positive answer is known as the Ω-conjecture). Under the assumption of a proper class of Woodin cardinals, every sentence for $H(\omega_1)$ is either valid or false in Ω-logic. Further, there are sentences corresponding to the forcing construction introduced in this book that give a similarly complete axiomatization of the theory of $H(\omega_2)$ in Ω-logic. This