greater and possibly unnecessary detail on the debates between constructivism and realism. Especially in the context of undergraduate education, I believe such space could be better used addressing how science and technology shape social, cultural, and political life. For example, anti-racist and postcolonial studies are addressed in a section at the end of the chapter on "Feminist S&TS and its Extensions." Other areas like technology assessment, science and technology policy, social construction of technology, and large technical systems receive little discussion.

In this review, I have alluded to contemporary debates over the core and boundaries of S&TS for examining Sismondo's *An Introduction to Science and Technology Studies*. Those who recognize the sociology of scientific knowledge, actor-network theory, laboratory studies, and controversy studies as the core of S&TS will appreciate this focus. For those interested in technology studies, policy issues, and critical S&TS, readers may find an introduction that gives undo emphasis to the philosophy and sociology of science. To address this heterogeneity, this introduction could be presented in terms of the disciplinary, methodological, and theoretical diversity of S&TS, conveying for students a sense of the field's dynamism. How to introduce science and technology studies is a provocative question because the difficulties of defining the field suggest its most generative characteristics.

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Christopher Hitchcock (ed.):
Contemporary Debates in Philosophy of Science.
Blackwell Publishing. Oxford, 2004. 348 pages.

This book is the first in a new series of philosophy textbooks by Routledge. The concept of the *Contemporary Debates* series is interesting. The idea is to introduce students to contemporary debates via real philosophical debate. Rather than collecting classic articles, the editor organizes a series of real philosophical encounters. All the contributions are written specifically for the volume and the authors have agreed on the specific question they disagree on. The objective is to avoid a situation where the supposedly opposing views end up talking past each other. This idea is fresh and promising. Everything depends, however, on the editor. Both the issues to be debated and the authors have to be chosen carefully. Furthermore, the authors require more supervision than in an ordinary

philosophical anthology.

Christopher Hitchcock has succeeded quite well with this volume. Although the volume covers the whole field of philosophy of science, Hitchcock has successfully picked eight debates that give a good sample of the kinds of issues and approaches that can be found in the contemporary philosophy of science. All the issues are currently actively debated among philosophers of science and many of the contributions in the volume are real contributions to the broader debate. The students are not provided with summaries of old positions, but with samples of the real thing. Students will like this, but so will others. A collection of well-written papers about important issues is also helpful for those who want to know what is going on in philosophy of science.

The first pair of articles is about thought experiments in science. James Robert Brown defends the view that thought experiments provide *a priori*, but fallible, knowledge about nature. His opponent John D. Norton argues that thought experiments do not transcend empiricism and that thought experiments are arguments. The issue of epistemic significance in thought experiments is very interesting, but both papers are disappointing. Brown fails to provide any real arguments for his Platonist view of thought experiments. The analogy with mathematical thought experiments is not enough. The problem with Norton's paper is that his notion of an argument turns out to be rather obscure. But even with this vague notion of argument, he fails to show convincingly that thought experiments are arguments. Various uses of thought experiments can be reconstructed as arguments, but this does not make them arguments themselves. Of course, the shortcomings of these articles can be seen in a positive light: they invite students to think for themselves and to come up with better arguments.

The question for the second pair of authors is: does probability capture the logic of scientific justification? Patrick Maher defends the affirmative answer and Clark Glymour and Kevin Kelly argue that a more fruitful approach is that of formal learning theory. Maher starts with the everyday notion of confirmation and tries to show that it can be explicated with the help of probability theory in a theoretically fruitful manner. Maher presents his case in an elegant manner, but he does not discuss the notion of "theoretical fruitfulness" or other criteria of adequacy for his theory. As a consequence, the students that are not familiar with this style of philosophical analysis are bound to remain puzzled about the actual epistemological relevance of his contribution. Rather than using 12 pages for presenting formal proofs for his theorems, Maher should have used some of those pages to explicate his philosophical aims and methodology. The issue is not just whether probability captures the logic of confirmation, but what "capturing" means in this context. The critique of Bayesian theories of confirmation by Glymour and Kelly is much better in this respect. Understanding some of their arguments, however, requires some technical competence from students.

The third issue is related to scientific realism. Jarrett Leplin defends the view that a theory's predictive success can warrant belief in the unobserved entities postulated by it and André Kukla and

Joel Walmsley argue that this realist position is not convincing enough. Leplin passionately argues that the burden of proof is on the anti-realists and that coming up with plausible anti-realist argument is much harder than is usually thought. Kukla and Walmsley challenge Leplin's optimism about realism. They argue that the success of science does not warrant even the weakest form of scientific realism. It turns out that much of the never-ending debate between realists and anti-realists depends on the concept of explanation.

In their debate John T. Roberts and Harold Kincaid provide opposing views on the question of whether there are laws in the social sciences. Roberts argues that there are no such things in the social sciences, whereas Kincaid argues that it still makes sense to talk about laws in the social sciences. The relevance of this exchange is broader than philosophy of the social sciences. The notion of law is similarly troublesome also in other special sciences. Roberts and Kincaid offer very different accounts of the laws of nature, and consequently their conclusions concerning laws in the social sciences are opposites. It remains an open question, however, whether they disagree about anything else. Both seem to argue that causal generalizations still have a legitimate role in the social sciences.

The fifth debate concerns causation. Philip Dowe defends the position that causal connection requires continuous physical connection and Jonathan Schaffer argues that various sorts of absences and omissions can also be causes. Dowe's argument builds on the account of causation developed by Wesley Salmon and himself. He basically shows that his account can make sense of negative causation. Schaffer's paper is a full-front attack on both Dowe's argument and his approach to causation. His piece is entertaining, but it is also an important contribution to the discussion concerning the aims and methodology of philosophical theories of causation.

Huw Price's and Craig Callender's debate is about philosophy of physics. The issue is whether low-entropy past is something to be explained or not. Price argues that it is and Callender that it is not. As Callender shows, the discussion has some interesting similarities to the debates about natural theology in 18th Century philosophy. He argues that we should follow David Hume and abstain from trying to explain the initial conditions of our theories. Price's point is that the low-entropy past is something more than an initial condition and for this reason it is a proper object of scientific curiosity.

Sahotra Sarkar and Peter Godfrey-Smith provide opposing views of question of whether genes encode information about phenotypic traits. Sarkar argues that the concept of information has a legitimate use in this context and Godfrey-Smith disagrees. Both authors agree that the usual metaphor of 'genetic code' is highly misleading, but they disagree whether there is a notion of information that does some legitimate work in this context. Sarkar argues that his notion of semiotic information shows that it makes sense in some contexts to talk about genes coding for some particular phenotypic trait. Godfrey-Smith for his part argues that there is no generally accepted notion of information that is stronger than the standard Shan-

non-Weaver notion and that could be legitimately used in the biological context. He argues that the only things that genes can be said to really encode are proteins for which they are templates. The route from these proteins to phenotypic traits is too messy and complicated to be understood in terms of coding or transfer of information.

The final debate deals with a hot topic in evolutionary psychology. The question is whether the hypothesis of massive modularity of human mind makes sense. Peter Carruthers thinks that it does and James Woodward and Fiona Cowie provide arguments for the opposing view. In his paper Carruthers tries to clarify the notion of module and to argue that this notion is indispensable in understanding human cognition and its evolution. For their part, Woodward and Cowie present a skeptical case against the claims of massive modularity. They show that the notion of module used by the evolutionary psychologists is vague and plagued by difficult methodological problems.

As a whole, this anthology provides a good sample of contemporary philosophy of science. Naturally many important topics are not covered, but the volume gives a real taste of current philosophical debate. The debated issues are real and well-defined, and not obscure conflicts of various -isms whose philosophical relevance is only understood by the participants.

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Daniel Lee Kleinman:
Impure Cultures – University Biology and the World of Commerce.
The University of Wisconsin Press, 2003. 205 pages.

"Universities are threatened by commercialisation." These are the sorts of claims that have often inspired traditional research into university-industry relations. In his book *Impure Cultures – University Biology and the World of Commerce* Daniel Lee Kleinman explores the influence of the world of commerce on academic biology by studying one specific laboratory called the Handelsman lab. Without making a normative judgement about the role of commercialisation, he focuses on the indirect effects of commercialisation, rather than on the direct (funding-related) relations between science-based firms and academic scientists, which concernes the "traditional" literature on university-industry relations. Kleinman argues that there is a *commercial culture*, which indirectly and pervasively influences academia.

By following the researchers and research practices in the Handelsman lab as a participant observer, Kleinman started to distinguish some of the commercial factors that influence the every-