child. Almost no one has used them. Betty LeBlanc surely would not. She is Catholic and opposes abortion.

Few biologists are likely to read these books, which are aimed at a popular audience. Perhaps they should. They may not learn much science. But they would learn something important about how their science is packaged and sold. Nonspecialist readers would be better off with *Proceed with Caution*, a superb analysis of the science and social implications of genetic testing by Neil Holtzman, professor of pediatrics at Johns Hopkins. Although it is not about the genome initiative, it covers much the same ground as the books reviewed. And it is far better value for the money.

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Between Bosons and Fermions

Fractional Statistics and Anyon Superconductivity. FRANK WILCZEK. World Scientific, Teaneck, NJ, 1990. x, 447 pp., illus. $68; paper, $28.

The fundamental particles of physics have long been divided into two classes, bosons and fermions. They differ in their statistics, which are, roughly speaking, +1 for bosons and −1 for fermions. For the last 20 years or so, there has been a current of speculation that there might exist other particles with statistics somewhere in between. Since this might be anywhere in between, such particles were called anyons. In the mid-1980s, these particles were indeed found as excitations in the fractional quantum Hall effect system. This is the first book to appear on the topic of anyons in condensed matter physics, a topic now very fashionable because of its possible relevance to high-temperature superconductivity. It consists of 100 pages of introductory material followed by 340 pages of reprinted articles.

Wilczek's way of giving us fractional statistics departs a bit from the usual style of scientific exposition. The book is organized not only into main sections but also into numbered subsections. This sort of organization is more familiar to philosophers than to physicists. One does discern the rarefied and slightly mysterious atmosphere of the *Tractatus Logico-Philosophicus* at times, beginning with the ethereal Japanese print on the dust jacket and noticeable throughout in occasional shifts in orthography (David Bohm acquires an umlaut) and terminology ("average field theory" for "mean field theory"). The articles apparently each represent a separate insight and contribute to the impression of physics as a succession of epiphanies rather than as the progressive accumulation of knowledge. You get used to it after a while and discover that this approach serves the author well most of the time. The explanations are clear and to the point; the format concentrates the mind. Sometimes things don't work out so well, since a linear development is not enforced by this style; pages 44–46 are identical, word for word, to pages 89–91.

The basic ideas of the subject are well laid out. A very good job is done on certain points that are glossed over in the reprints, such as why two-dimensional space is special, what is an actual field configuration that typifies a topological equivalence class, and what happens to generally accepted theorems connecting spin and statistics when the latter is fractional. I was particularly pleased to see that certain shaky assumptions that are usually not mentioned by practitioners in the field are stated and discussed. In particular, the tricky question of the boundary conditions that must be applied before topological arguments can even begin is treated in the chapter on the Hopf invariant. Also, the usually unstated condition that particles cannot pass through one another, at the basis of the braid group classification of two-dimensional trajectories, is discussed and critiqued. The topological approach does have a certain amount of dirty linen to be washed. Wilczek does it here in public, and I, for one, am all for it.

There are a number of points in the introduction that are original and bear reading several times, as they don't appear in the reprints. The two best examples are a very pretty chapter on the question of domain walls between degenerate anyon ground states and some considerations on what the anyon picture implies for the stability of various fractional quantum Hall effect states. There is one section that I did read several times without being sure whether I was any the wiser or not—this was on the idea of a generalization of spontaneous symmetry breaking to something called spontaneous projectivization. (No space to explain that here, I'm afraid.) A very few bits didn't bear reading at all. This seemed to happen when the author went into condensed matter physics background material. The paragraph on the integral quantum Hall seemed to miss the point entirely. In general, however, the beginner should be able to read straight through the introduction with some effort and much profit and be ready for the reprints.

The reprints are a rich mine of stuff. The original paper of Aharonov and Bohm is there, as is a remarkable paper by Finkelstein and Rubinstein from 1968 that already contained many of the ingredients of the modern theories. Wilczek's papers from the early '80s are not slighted and lead directly on to a number of papers under the headings of Foundations and Anyons in Model Field Theories. By this time the reader is happy with Chern-Simons terms and is prepared to enter the modern history of the subject, which begins with the fractional quantum Hall effect in 1984. The final hundred pages or so are devoted to high-T_c superconductivity. If the reader is only interested in the last topic, three of the reprints themselves contain excellent introductory material, namely Laughlin's paper from *Science*, a paper by Chen, Wilczek, Witten, and Halperin, and a paper by Canright and Girvin. Nothing is missing.

And yet something *is* missing. The strong interest in anyon theory today is due almost entirely to its application to high-T_c superconductors. But none of the papers makes a really serious attempt to show that the theory is applicable to these materials. The reader is treated only to arguments by analogy when what he or she really wants is an argument from energy. The anyon excitations need a certain type of ground state to support their existence, and that ground state must minimize the expectation value of the microscopic Hamiltonian of certain compounds made with yttrium, barium, copper, and oxygen. I make that statement here because the point doesn't get much attention in the book. While reading, I often felt as if I was watching a foot race that had begun even though the starter's gun had not sounded. The most urgent thing for anyon theorists to do now is to face this issue. The whole point of condensed matter theory, after all, is to connect the microscopic with the macroscopic. It cannot afford to have such wide gaps. Surely there is a philosopher out there who wants to write the *Tractatus Empirico-Microscopicus*.

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Fisher's Letters

Statistical Inference and Analysis. Selected Correspondence of R. A. Fisher. J. H. BENNETT, Ed. Clarendon (Oxford University Press), New York, 1990. xviii, 380 pp., illus. $90.

The year 1990 marked R. A. Fisher's centenary, and many sessions were held by statistical societies in his honor. The present volume of correspondence on statistical topics is an especially noteworthy contribution. Its publication appears to complete the valu-