manuscripts supplements his famous edition of the *Mathematical Papers*. Cambridge University Press has just published the first volume of my edition of *The Scientific Letters and Papers of James Clerk Maxwell*.

On a rather broader front, the literature abounds with interpretative studies, of which C. Jungnickel and R. McCormmach's study of German physics, *Intellectual Mastery of Nature* (Chicago University Press, 1986), stands pre-eminent among recent publications. It would be a pity if physicists wanting to make use of historical work remained unaware of all this effort. □

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Holy grail or snark?

J. Ellis

The Higgs Hunter's Guide: Frontiers in Physics. By J. F. Gunion, H. E. Haber, G. Kane & S. Dawson. *Addison-Wesley: 1990. Pp.425. £41.35, $49.50.*

WHAT is the most pressing problem in particle physics today? All confirmed experimental results agree dramatically with the Standard Model, giving us no clue how to progress beyond it. But the Standard Model is very cumbersome and inelegant, containing three distinct sets of gauge interactions, nine *a priori* arbitrary quark and lepton masses, four assorted mixing angles and phases to describe the charged-current weak interactions, and two other parameters thrown in by hand to break spontaneously the electroweak symmetry group. The latter 15 parameters all describe the couplings and mass of the mythical Higgs boson, supposed purveyor of masses to all the other elementary particles, but as yet unseen by experiment and the subject of furious theoretical debate. These seem reasons enough to cite the quest for the Higgs boson as the most pressing problem in particle physics, though some might cite the unification of all the interactions and understanding the proliferation of different particle types (the "flavour problem"). However, I consider the origin of mass and the mechanism of symmetry breaking prerequisites for addressing these important problems, particularly because the reasons for thinking that the Higgs boson should be accessible to present or planned accelerators are better than those for expecting detectable manifestations of unification or flavour physics.

With the recent start-up of the Large Electron–Positron Collider (LEP) and advanced plans for the Large Hadron Collider (LHC) accelerator in Europe and the Superconducting Super Collider (SSC) in the United States, this book reviewing strategies for detecting the Higgs boson is therefore particularly timely. Moreover, the authors are among the best qualified to write on this important topic. Indeed, they provide the reader with a large amount of useful and accurate information about the expected properties of the Higgs boson and how to search for it in e^+e^- and hadron–hadron collisions. Nor is their attention focused only on the minimal Standard Model, because much of the book discusses nonminimal Higgs sectors, such as appear in supersymmetric and technicolour models. There are also discussions of axions, majorons and composite models. Also very useful are lengthy appendices containing detailed Feynman rules and formulae for Higgs decay rates. There is no doubt in my mind that this book should find a place in the office of any particle physicist interested in the problem of spontaneous symmetry breaking, which should include everyone working in high-energy physics.

I have only a few minor quibbles with the content of the book. It would have been good to have had a more extensive and elementary introduction to the motivation for spontaneous symmetry breaking in gauge theories and a general discussion of the Higgs mechanism. Some comparison and contrast with the theory of superconductivity could also have been appropriate, and might have made this excellent book more accessible to students and nonspecialists. Likewise, some discussion of the "naturalness" or "hierarchy" problem as a motivation for supersymmetric and technicolour models would also have been welcome.

As is perhaps inevitable in a topical book such as this, it has to some extent already been overtaken by events. Much of the discussion of a possible light Higgs boson has been rendered moot by the success of LEP at CERN, where just the Aleph experiment alone has already excluded any Standard Model Higgs boson weighing up to 41 GeV, and the combined data of all the four LEP experiments probably exclude the entire mass range up to 49 GeV. LEP has also given many limits on nonminimal Higgs bosons. By comparison, in their figure 1.1, the authors predicted that LEP and the Stanford Linear Collider should be able to reach a mass of 30 GeV only in 1993. Unfortunately, the SLC has been unable to muster sufficient luminosity to have any significant impact on the search for the Higgs boson.

These minor defects could easily be corrected in a second edition and do not detract from the great worth of this book, which will be an invaluable handbook until experiments find the Higgs boson or whatever replaces it, and probably long afterwards as well. This book will surely serve its avowed purpose of guiding the Higgs hunter towards her or his prey, and also interpreting whatever game she or he succeeds in bagging. □

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Lucky dip

Stuart Sutherland

Images and Understanding. Edited by Horace Barlow, Colin Blakemore and Miranda Weston-Smith. *Cambridge University Press: 1990. Pp. 401. Hbk £40, $69.95, pbk £15, $24.95.*

IN 1986 the Rank Prize Funds financed a conference on the use of images. Because I forgot to go, I can comment freely and without bias on the proceedings, now published somewhat tardily by Cambridge University Press under the title *Images and Understanding*.

The conference was nothing if not interdisciplinary for there were papers by psychologists, neurophysiologists, philosophers, computer scientists, and for good measure a writer, a theatre producer and a choreographer. Despite all the evidence refuting the belief, today even scientists seem to think that if enough people are gathered together, something good is bound to emerge. In this case what emerges is less a treasure trove than a lucky dip, which contains few pearls but has many trinkets whose glitter may amuse for a while.

Perhaps the most original contribution is that of John Willats who combines a practical knowledge of the visual arts with a formal training in engineering and a somewhat less formal one in psychology. He notes that paintings can attempt to represent surfaces either as seen from the observer's viewpoint or as they really are in 3-D space. Perspective is the prime example of the former category. An example of the latter is orthographic projection, in which selected surfaces are shown in their true physical shape, giving object-centred descriptions of at least part of the scene. Thus in P. Bonnard's picture, *Nude in a Bath Tub*, the top and one end of the bath are depicted in their true shapes, rather than in the shapes they would project to the retina. Willats also categorizes pictures and drawings by their denotational system, that is the rules or conventions for interpreting the marks in the picture. In a denotational system that is viewer-centred the brightness and colour of the marks reproduce an image on the retina that approximates as closely