" 'Infectious Germs.' Under the microscope are symbols for Jews, communists, and homosexuals (triangles), alongside the British pound and the American dollar." [From *Racial Hygiene*; *Der Stürmer*, 15 April 1943, p. 1]

Proctor also overlooks a number of relevant secondary works. In the opinion of this reviewer, he underestimates the role of Ernst Haeckel and his Monist League, and consideration of Daniel Gasman's *The Scientific Origins of National Socialism* (1971) might have been useful in this regard. Nancy Stepan's *The Idea of Race in Science, Great Britain, 1800-1960* (1982) offers much on the "sociology of knowledge" that could have provided supportive material. George L. Mosse's seminal work *Towards the Final Solution* (1978) to some extent anticipated several of Proctor's concerns and would have been of great value in helping to provide a more general setting for *Racial Hygiene*. Robert Pois's *National Socialism and the Religion of Nature* (1986) devotes attention to the "environmentalist" aspects of Nazi biological science (the subject of Proctor's chapter 8, "The 'organic vision' "). More crucial, though, is the apparent overlooking of Leon Poliakov's *The Aryan Myth* (1974). If Proctor had consulted this work, he never would have made the statement, on p. 14, that "prior to Darwin, it was difficult to argue against the Judeo-Christian conception of the unity of man, based on the single creation of Adam and Eve." In this most important book, Poliakov points out that pre-Darwinian Enlightenment thinking, or at least an aspect of it, had furnished just such arguments and, in so doing, had laid the basis for the "scientific racism" with which Proctor is concerned. All the works cited above, to one extent or another, point out that the racist vision of National Socialism in particular and Western civilization in general was in fact a singular blend of cold scientism and an often politicized form of equally anti-humanistic nature mysticism, ironically enough a reaction to science's robbing the world of mystery. This brings into sharper focus the lack of consistency, discussed on pp. 290–291, between claims upon so called "value-free" science and the ability of the National Socialist movement to place it in the service of race, "of some mystical thing in itself."

None of this contradicts what Proctor has said in a book that is essential reading for any serious student of modern Western history in general and the history of science in particular. But, reflection on the themes presented in these works would have added to our appreciation of the terrible threat posed by a science devoid of humanistic concern. Moreover, the poignant centrality of this issue to science as part of the total human experience would have been cast into sharper and hence even more disquieting focus.

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A "New" Protein

Ubiquitin. MARTIN RECHSTEINER, Ed. Plenum, New York, 1988. xviii, 346 pp., illus. $59.50.

Ubiquitin was first isolated in 1975 from bovine thymus. Now, only 13 years later, Martin Rechsteiner has assembled a monograph that brings together much of the information that is available about this protein. Those already familiar with this small polypeptide, whether by intention or by serendipity, will not need to be convinced that this attention is due.

The uninitiated should understand that ubiquitin is a very special protein. As its name implies, it is everywhere, at least in eukaryotic cells, and is one of the most, if not the most, evolutionarily conserved proteins known. It is unusual, being found both free and covalently conjugated to other proteins. In some cases conjugates are rapidly degraded, whereas in others the function of the conjugated protein is probably modified. As Rechsteiner points out in his introduction, ubiquitin approaches actin, tubulin, and the histones in abundance. It is, therefore, surprising that it was not discovered until 1975. What is perhaps more surprising is that histones are among the proteins that are stably modified by ubiquitin, as are some cell surface receptors. Furthermore, since this volume was assembled ubiquitin has been shown to modify actin and to be associated with microtubules and the remnants of disrupted cytoskeletal structures characteristic of certain human neurodegenerative disorders, including Alzheimer's disease.

The book is an up-to-date (given the limitations of producing such a volume) collection of reviews by researchers who are active in diverse areas, ranging from intracellular proteolysis to chromatin structure and transcriptional regulation, the heat shock response, and cell-surface receptor function. The 12 chapters make it clear that ubiquitin is so remarkably conserved because all parts of the molecule are critically important, each possibly for different reasons. One chapter deals with the molecular genetics of the ubiquitin system. The ubiquitin multigene family is unusual, with loci encoding multiple, tandem arrays of spacerless ubiquitin repeats as well as loci encoding ubiquitin fused to unrelated carboxy-terminal extensions that include zinc finger motifs. Two chapters give current accounts of the enzymes that mediate the attachment and detachment of ubiquitin to and from other proteins. Recently, two of these enzymes (the loci encoding them having been identified earlier and independently) have been shown to be required for DNA repair and progression through the cell cycle.

Much of the book, seven chapters, deals with what is the most studied aspect of ubiquitin, its role in selective protein breakdown. Two describe the purification and structure of ubiquitin, the effects of chemical modifications on the activity of ubiquitin in this system, and the use of polyclonal immunochemical probes to study these complex processes. Several chapters discuss factors, including tRNA, primary sequences, and both normal and abnormal structural features, that are thought to play roles in targeting or selecting proteins for degradation via the intracellular ubiquitin- and ATP-dependent non-lysosomal proteolytic system. Rechsteiner and coauthors describe multisubunit, macromolecular ATP-stimulated proteases, one of which appears to preferentially degrade certain ubiquitin-protein conjugates in this system. The last of these chapters spends considerable time describing the apparently ubiquitin-independent degradation of proteins and the heat shock response in *Escherichia coli*, then ends by considering the possible relationship between selective protein degradation and the eukaryotic heat shock response. The identification of ubiquitin as a heat shock protein clearly signals that it may play a role in protecting cells (at least in higher organisms) from the effects of stress.

Lastly, two chapters make it clear that attachment of ubiquitin to histones and cell surface receptors such as the lymphocyte homing receptor appears not to lead to the degradation of these conjugates but rather may serve to regulate or modify their function. Though the enzymes responsible for conjugate formation and reversal in these systems are probably similar to those that have been described in the protein degradation system, the rules that define their specificity may be different.

Because ubiquitin is such a "new" protein, there is little in this volume of which those now working closely with the systems described will be unaware. Such workers will, however, probably welcome this as the first book of its type on the subject. For the as yet uninitiated biochemists, immunologists, neuropathologists, cell biologists, geneticists, and others who are likely to find themselves trying to answer the question What does ubiquitin do? the book is a resource for formulating their own ideas.

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