

are made clear, most of them have originated in social trends or happenstance events that are outside the scope of the analysis. The elaborate typology of scientific organization is a cumbersome analytical apparatus.

Despite these flaws, the book is a major contribution. Whitley has identified social-structural factors that interact in complex ways to determine how scientists behave. If sociologists of science give the book the attention it deserves, it will be a gold mine of research ideas. Even in its present typological form, the analysis makes us notice many big and little questions. Why are chemistry and physics organized in radically different ways? Why are economists, the theoretical elegance of whose field rivals that of physics, so disdainful of facts? Why are research administrators more influential in biomedical science than in physics? Why are journal articles so short in chemistry and so long in sociology? (This last is not just a matter of scientific versus humanistic trappings; the more precise and mathematical sociology becomes, the heftier its articles grow.) The book abounds with such questions and answers some of them.

When researchers pursue Whitley's leads, they assuredly will prove him wrong about this and that detail. But nobody henceforth will have an excuse to generalize from an idealized model of "science" to its diverse fields without taking account of the kinds of socially rooted differences he shows between sciences.

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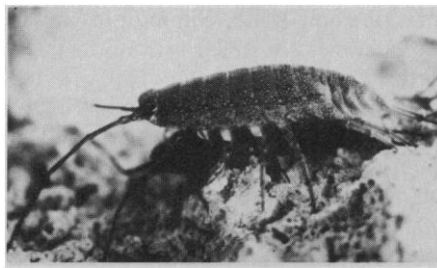
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Land-Dwelling Crustaceans

The Biology of Terrestrial Isopods. S. L. SUTTON and D. M. HOLDICH, Eds. Published for the Zoological Society of London by Clarendon (Oxford University Press), New York, 1984. xxvi, 518 pp., illus. \$55. Symposia of the Zoological Society of London, no. 53 (July 1983).

In 1893 the Reverend Thomas R. Stebbing of Worcester College, Oxford, remarked in his treatise *A History of Crustacea*:

The Isopoda form a vast and widely distributed army. They are all of retiring habits, never needlessly courting attention, and they have never tempted mankind to search for them as food. Amidst this prudent love of



A terrestrial isopod, genus *Ligia*.

obscurity, the services which they doubtless often render as effective scavengers are in some measure counterbalanced by the damage which some of them inflict on submarine structures and the depredations committed by others on the fruits of the garden. In proportion to their importance in the economy of the world, the Isopoda have hitherto attracted little of popular notice.

Although there are thousands more species of isopods known to science now than in Stebbing's time, these crustaceans remain relatively obscure to most biologists. About 4500 species have been described, and at least as many more, particularly from the tropics, await description. Almost half the described species are terrestrial, inhabiting a wide range of environments at all latitudes. Many species inhabit xeric environments, and one (*Hemilepistus reaumuri*) is even a dominant animal of North African desert habitats. Terrestrial isopods (pill bugs, sowbugs, and woodlice) are the only crustaceans to have entirely abandoned the aquatic world, and as such they have attracted the attention of some ecologists and evolutionary biologists. *The Biology of Terrestrial Isopods* reports and reviews recent research on these isopods and will be of interest to a wide range of ecologists and physiologists.

Prior to 1950 few biologists worked on terrestrial isopods; today several dozen study them. Most of these biologists are represented in this volume, which comprises 26 papers by 41 contributors, 13 of whom are North Americans. The coverage has been restricted to physiology, ecology, and behavior, and matters of systematics, evolution, and biogeography are not considered; in particular the possibility that the terrestrial isopods are an artificial (polyphyletic) group is not addressed. The contributors have a perhaps unwarranted tendency to extrapolate results for a few genera to all terrestrial isopods.

The book is divided into two sections, Structure and Physiology and Population Biology. Most of the papers fall within the realm of physiological ecology, however, and this is clearly the emphasis of

most contemporary research on terrestrial isopods. The editors have ensured that each paper is well focused and includes an abstract or summary. Virtually all the papers are informative and well written, and a few are especially notable.

The contribution by M. R. Warburg *et al.* is especially important in updating Eric Edney's work on effects of climate on oniscidean distribution and abundance. R. G. Chiang and C. G. H. Steel generate a model for using isopods to investigate arthropod hormonal systems. Their work is supported by Y. Kataura's study documenting the role of androgenic gland hormones in regulating sex differentiation. The importance of terrestrial isopods as monitors of pollution is evinced by S. P. Hopkin and M. H. Martin's study identifying heavy metals from the digestive ceca of woodlice at concentrations higher than have been recorded from soft tissue of any other terrestrial animal. W. Wieser presents a succinct, thorough review of physiological attributes that have contributed to the success of terrestrial isopods, and H. Schmalfuss illuminates the morphological-behavioral adaptations of the group. Several field-oriented studies are reported, including a review by Sutton *et al.* of population biology in seven species of woodlice in which the hypothesis of *r*- and *K*-selection is found inadequate to explain observed life history patterns. In a somewhat related study, N. Takeda establishes a strong case for pheromone-based aggregation behavior in oniscideans and its role in water conservation and growth.

Other topics covered in the volume include the role of the gut in osmoregulation, neuroendocrinology, cuticular transpiration, fine structure of pleopod lamellae, marsupial structure and organization, function of the digestive ceca, hemolymph pressure studies ("hemodynamics"), diseases of isopods, feeding and digestive biology, and ecology and behavior of desert and tropical isopods.

This book contains a wealth of information. Perhaps most important of all, it demonstrates the suitability of isopods as experimental subjects for studies of population biology, endocrine biology, physiological ecology, invertebrate social behavior, and numerous other biological topics. As J. Cloudsley-Thompson notes in the introduction, "Woodlice neither bite nor sting, and they are easy to rear and maintain in captivity."

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