

other arthropods. Interestingly, this is the second review published on this topic within the same year. The first one 'Invermectin as an antiparasitic agent for use in human' by W. C. Campbell appeared in *Annual Review of Microbiology*, vol. 45, 1991.

Insect damage to trees is another area of special concern to entomologists. To what extent and what type of induced responses trees exhibit to such herbivory and how do they regulate herbivore populations are issues considered in the review written by Errki Haukioja. The range of insect pests associated with eucalyptus and the magnitude of destruction caused by them to this forest tree have been comprehensively presented by C. P. Ohmart and P. B. Edwards.

Other articles of interest included in this volume are: a) 'Biosystematics of the chewing lice of pocket gophers' by Ronald A. Hellenthal and Roger D. Price, b) 'The function and evolution of insect storage hexamers' by William H. Telfer and Joseph G. Kunkel, c) 'Arthropod behaviour and the efficacy of plant protectants' by Fred Gould, d) 'Sensilla of immature insects' by Russel Y. Zacharuk and Vonnice D. Shields, e) 'Whitefly biology' by David N. Byrne and Thomas S. Bellows, Jr. and, f) 'Bionomics of leaf-mining insects' by H. A. Hespenheide.

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Annual Review of Entomology 1992. Vol. 37. T. E. Mittler, F. I. Podovsky and V. H. Rash eds. Annual Reviews Inc., Palo Alto, California, USA. 1992, 688 pp. Price: USA \$44; elsewhere \$49.

As usual this thirty-seventh volume of *Annual Review of Entomology* enlightens us with reviews on the advancing aspects of entomology. It is hardly possible to achieve a balanced coverage of this vast subject, nevertheless this review caters to a diverse readership. Critical and in depth analysis is rampant throughout the review and changing perspectives of many subject areas have been redefined and delineated. In

my opinion, the one on chemical ecology of aphids as a fundamental topic and the other on tactics of management of pesticide resistance as an applied topic stand out as the most appealing.

This volume has, in all, twenty-six reviews, of which many are on the fundamental and applied aspects of ecology. The frontier areas in physiology and biochemistry rank next while morphology, systematics, evolution, bionomics, biological control, pathology, toxicology, agricultural entomology, apiculture and medical entomology get their due coverage. Indeed, there are few topics of specific interest, viz. forensic entomology, poly DNA viruses, and integrated pest management in woody landscape situations; perhaps these had been chosen due to the desire for critical and indepth reviews in these areas, and to meet the changing needs. With this overall view gathered at first glance, let me be prudent to discuss the reviews.

The review on blood sucking parasites highlights the distinction between the qualitative and quantitative values of vectorial capacity and reproduction number. Thereby it proclaims a revolutionary, comparative approach to the epidemiological problems, which can be applied to plant diseases and their vectors as well. Thought provoking ideas on the phylogeny and evolution dominate the scene in the review on small ermine moths. It will certainly enrich our knowledge on phylogeny and evolution of insects as a whole. The voluminous information that had flown in the past decade on aphids with regard to their alarm and sex pheromones and their chemical ecology is superbly condensed in another review. The concept of the receptors on the antenna, namely the primary and secondary rhinaria had been made clear and all relevant details of host location and mate selection with reference to the chemical ecology are explained. Management of pesticide resistance in arthropods had been attempted so far with tactics that seemed theoretically capable. These tactics had been found to be either too naive or unrealistic for large scale field implementation. An excellent review on this aspect brings to light this fact and it has been now established that pesticide resistance management is tangible only if it is fought as a

socioeconomic cum scientific challenge.

Abundant information has flown in on the function of insect wings and all these have been brought out in a nutshell in yet another review. Integration of information available on morphology and insect flight has been achieved with the evidence obtained through scanning electron microscopy studies, high speed cinematography coupled with computer software to analyse the flight patterns and aerodynamic interpretations. However, the information given under evolution, gross form, and functional differentiation of wings of different orders of insects seems to be available in many textbooks and these details could have been curtailed. Yet another contribution to the chemical ecology is the one on use of infochemicals by natural enemies. The information is distinctly significant as it deals mainly with third trophic level. The observation that current plant breeding practices unfortunately do not consider effects of plants on this trophic level is timely and thought provoking. It is hoped that a good beginning will be made in this regard immediately. To make us aware of how an introduced species of bees had extraordinarily established in an alien situation to an extent of becoming notorious and a threat to beekeeping, a nice review is included on africanized honey bees. This categorizes their biological differences to enable their management. Precious and scanty information on iron economy in insects is analysed well in all its consequences by a review which focuses the many problems to be solved. Biochemical properties of insect yolk proteins in relation to their interaction with receptors on the oocyte surface is a novel topic as not much is known on this. This volume has a marvellous article on this aspect of cell biology of insects, entirely devoted to biochemical and molecular biology of yolk proteins. No doubt, it will be well received by the biologists, physiologists and biochemists.

Insect science could be used for strange purposes and indeed this point is nicely anchored in an article on forensic entomology. The manner in which such obscure information is collected and presented in an indepth review deserves appreciation. Insect cuticle has chitin and sclerotin, of which the details of the former had already

been reviewed well in volume 32. A state-of-the-art paper on cuticle sclerotization is presented now and it fulfils a longfelt need. This small but important topic will go a long way in the development of philosophy of use of antisclerotization compounds in insect control. With support of solid state NMR procedures it is proved that sclerotins are covalently bonded proteins by the process of tanning. Thus the molecular structure of cuticle is now totally elucidated. The rationale behind the review on the male reproductive system, especially its maturation and endocrine regulation, is that such information is available abundantly with reference to females. But it is a paradox that there is no review on the females even in the *Annual Review of Entomology* in the past ten years. I wish the *Annual Review of Entomology* will take cognisance of this need in the near future and arrange for an up-to-date review encompassing both male and female reproductive systems. Aphids are important pests and it is quite natural that there is yet another review on these, but now devoted to their life cycles and evolution. This review has claimed that it is based on the five major transitions in aphid life cycles namely origin of parthenogenesis and viviparity, evolution of extensive polyphenisms, adaptation for synchronizing growth and reproduction with host phenology, gain and loss of host alternation and loss of sexual phase. Nevertheless there is nothing much significant in this review as it has moulded the already available information proposing new classification and interpretations. An updated information is provided on feeding mechanisms of non-predatory larval mosquitoes and their nutritional relationships. However, a new scheme of classification of feeding modes proposed in this review, to me, appears superfluous as it does not seem to remove the existing confusion. Perhaps, this view is substantiated by the fact that mosquito species are rarely absolutely restricted to single feeding mode.

Botanical aspects getting impeached with entomological aspects is nothing unusual as it is a natural phenomenon. A review on this deals with ecology and evolution of fruit feeding insects and how these are interwoven with plant vertebrate relationships. This is a novel topic which will be more useful to

botanists and biologists in general. A critical and indepth analysis of a very narrow, specific topic is the one on poly DNA viruses. The information is of very special nature concentrating more on the host parasitoid interactions of Braconidae and Ichneumonidae and how the poly DNA viruses act as mutualists and pathogens in this relationship. Perhaps, this is the only review wherein I had a monotonous feeling while reading; probably it is due to the less than orderly arrangement of the matter. Mathematics when integrated with biology can lead to very concrete concepts and I am glad that the *Annu. Rev. Entomol.* continues to cater to this need. Reviews on sampling insect populations for integrated pest management decision making and chaos in insect population dynamics will fall in this category. Mathematical components of the integrated pest management decision making processes have now been dealt with in a non-mathematical form and this will be a boon for the integrated pest management specialists as it will lead to concrete steps in framing rules for effective decision making. It is well known that insect population ecology had been reviewed so far in the light of biological issues at physiology and population levels. Now a major literature review is available on the nonlinear and complex nature of insect populations and it is fascinating that it evaluates the ramifications of this literature with respect to important ecological issues. This way of developing mathematics and encouraging it to penetrate deep inroads into entomology will go a long way in defining many complex and important issues especially on the ecology of insects. *Annual Review of Entomology* deserves kudos for this achievement.

Of course, for once there is a change in our outlook on the role of ants in pest management. Usually the nuisance aspects of ants in agroecosystems is magnified but now a contrasting view is feasible and it is facilitated by the review on ants in pest management. Though this review is perhaps of very specific value to those involved in tropical rainforests, it throws open a new idea of predatory aspect of ants in pest management and the dire need to harness this value. It is high time we realize the biological control attributes of the ants, which has been inadequately studied so

far. It is implicit that to have a fundamental understanding of pheromonal communication, we should have a physics background and mechanics aspect of diffusion should be understood. Annual review of entomology has satisfied this changing need in its review on the odor plumes. The molecular and turbulent aspects of diffusion are very important, of which the latter dominates plume development for effective pheromone communication in insects. This unique review broadens our vision on the effective pheromone deployment for integrated pest management programmes. A distinct way of analysing insect migration is to view it through the eyes and mind of an economist, who is able to define it in terms of the costs involved and relate the same with benefits that accrue to the insects themselves, while undertaking migration. This has been achieved in the article on the costs of migration in insects. The deliberations of this article discuss the costs of energy, risks due to increased predation or not finding a suitable habitat, construction of flight apparatus and reproduction costs; and this valid discussion will no doubt meet the changing needs of the science of entomology.

In this volume, there is a review which justifies insect-pest management for woody landscape situations and this devotes its attention solely to the management of nurseries. The rationale behind discussing such a specific situation in the *Annual Review of Entomology* is not discernible at least to me. Perhaps the editorial committee of the *Annual Review of Entomology* had optimized otherwise. So far, the evaluation of natural enemies had been viewed rigidly in terms of mortality in host populations with and without these enemies. But there is an impending need to approach this problem logically and make it reasonable by integrating other sources of mortality that act inseparably with natural enemies. This approach will be facilitated by the components of construction of life tables of affected populations and this volume of *Annual Review of Entomology* befittingly provides a review on this changing scenario. Though *Bacillus thuringiensis* (Bt) was developed as microbial pesticide in late 1950s by E. A. Steinhaus, the feasibility of its better use has further increased with advances in recombinant DNA

technology that has facilitated the cloning of toxin genes and their expression in plants. With lots of information pouring in, the reader may find the review on this aspect timely and the authors have done enough justice to Bt research by writing a quality article. The endotoxin chemistry, the primary structure of toxin related mode of action throws insight into complexity of the situation which may help in understanding the mechanism of selectivity and toxicity. The recent phenomenon of resistance to Bt is covered limitedly. This could be further elucidated by studying the active sites of toxin and their role in toxicity. Perhaps, studies leading to characterization of insect receptors would be worthwhile. The eusocial insects are fascinating for their division of labour and it is amazing that there is flexibility mingled with plasticity in this aspect of their biology. There is an unique blending of centralized and decentralized processes of social integration, of which the behavioural processes exhibit tremendous flexibility, being regulated by the hormonal and genetic factors. Thus social organization is the net result of the plasticity in the division of labour and behavioural flexibility of individual workers. These realities have been reviewed well in this volume.

Finally, I decide to conclude this review by making few general observations; I observed that most of the reviews are by the scientists hailing from universities and other institutions of learning in the United States of America and United Kingdom/Europe. Also the literature reviewed has mostly originated from these sources only. While observing this and keeping in mind the reviews appeared in the earlier volumes, I feel reasonable in putting forth a suggestion that the editorial committee may bring out reviews on topics specific to other geographical regions. Otherwise, the review has been excellently outlined, planned, designed and well presented. Of rare and unusual occurrence is a typographical error on page 400 where the year of reference No. 195 is cited as 1995.

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Annual Review of Public Health 1992. Vol. 13, G. S. Omenn, J. E. Fielding, L. B. Lave, eds. Annual Reviews Inc, Palo Alto, USA. 1992. 552 pp. Price: USA \$49; elsewhere \$54.

Public health medicine has come of age in the West, growing from the status of one of the less glamorous specialties of medicine to that of a profession which draws from the best of a whole gamut of disciplines, including clinical medicine, epidemiology, biostatistics, social sciences and management for its practice. This is amply evident from reading the *Annual Review of Public Health*, vol. 13. The book provides a comprehensive and exhaustive review of topics that are at the 'cutting edge' of public health practice in 1992.

The book is divided into five sections: Epidemiology and biostatistics, Environmental and occupational health, Public health practice, Behavioural aspects of health, and Health services, and a symposium on selected clinical syndromes associated with ageing. There are 24 articles in all. The selection of the topic for the symposium reflects the concern for the problems of the greatest dimension to the public health planners of the twenty first century.

The three articles on physical activity and health underscore the importance of this key variable in current thinking on health. S. N. Blair *et al.* review current knowledge about physical activity in all its dimensions. The emphasis seems to have shifted from threshold theories, advocating a minimum intensity and duration of physical activity, to the viewpoint that any physical activity is good, but the final word is far from having been said. It is revealing to learn that even in a nation with a high sporting tradition such as the United States, only 8% of men and 7% of women reach the recommended activity levels. 'Inactivity in the US must be a public health problem of comparable magnitude to smoking, obesity, high blood pressure and high blood cholesterol', observe the authors. One can only guess at the situation prevalent in India! Two more articles on physical activity (E. H. Wagner *et al.* and D. M. Buchner *et al.*) discuss the problem with special reference to elderly adults.

'HIV Infection and AIDS in Children' (T. C. Quinn *et al.*) focuses on a

comparatively lesser known aspect of this widely publicised scourge: the epidemiology of AIDS in children. Especially notable are the inequities introduced in health status by AIDS; which has emerged as a major cause of death in 1-4 year olds among hispanics and blacks in the US. With heterosexual transmission having been established as a major mode of spread, the importance of monogamous relationships has been highlighted, but only to be dismissed as a futile(!) approach.

'Selected Methodological Issues in Evaluating Community Based Health Promotion and Disease Prevention Programmes' (T. D. Koepsell *et al.*) is a comprehensive review of high relevance on the methodological issues of policy and programme evaluation. The importance of specifying the theoretical model, including the mechanisms through which a programme is expected to act, is stressed. The sections on randomization of communities, and longitudinal versus repeat cross sectional surveys are very illuminating.

Health Effects of Low Level Ionizing Radiation' (A. E. Upton, R. E. Shore, and N. H. Harley) is a well-researched article presenting the state of current knowledge, or rather, the current lack of knowledge, about radiation hazards at the low exposure range. The lack of real information leaves the field open for much polemics, most of it about hypothetical possibilities. This is a developmental dilemma for most of the third world, who have to balance investments in energy against possible future health hazards. The article 'Biological Interactions and Potential Health Effects of Extremely Low Frequency Magnetic Fields from Power Lines and Other Common Sources' (T. S. Tenforde) perhaps illustrates the point made by Skrabanek about the 'poverty of epidemiology' (Skrabanek, P., *Perspectives in Biology and Medicine*, 1992, 35, 182-185); even if increment in risk to certain carcinomas are induced by ELF magnetic fields, is it of much clinical significance among all the other competing risks?

Social marketing has come to stay as an accepted strategy to 'sell' public health messages to the underdeveloped populations. But public health practice, with its ethic of public good, is in essential conflict with the philosophy of marketing, with its roots in profit