Book reviews

*DNA Protein Interactions and Gene Regulation.* Edited by E. Brad Thompson and John Papaconstantinou. University of Texas Press, Austin 1987. xii + 292 p. No alphabetical bibliography, no author index. $32.50 (hardcover).

This book gives a broad view about protein structure and protein-DNA interaction, with emphasis on factors regulating gene transcription and specific DNA sequences interacting with these factors.

*DNA Protein Interactions and Gene Regulation* is divided into two parts. The first deals with bacteriophage Lambda factors and other bacteriophage and bacterial genes such as *Lac* or the cyclic AMP receptor gene. The second part is about eukaryotic protein interacting with DNA. Four chapters are devoted to the hn ribonuclear particles involved in mRNA maturation. There is a section about the nuclear matrix protein and the proteins involved in specific transcription, such as RNA polymerase II and topoisomerase I. The last six chapters deal with hormone receptors as a model of cellular signals directly interacting with specific DNA sequences that are situated upstream the gene specifically activated by the DNA-hormone receptor interaction.

The book as a whole provides a comprehensive account of the methodologies used when studying DNA-protein interactions: studies on mutants in the DNA promoter region, modification of a protein active region with specific reagents, studies of DNA and protein structure and their interaction at the nucleotide and aminoacid level with computerised molecular models, protection of target DNA against nucleases or methylation by protein binding, *in vitro* transcription, Nuclear Magnetic Resonance, construction and transfection into cells of chimeric plasmids. The spectrum of topics covered is quite complete if we except the more recent gel retardation experiments.

Most of the chapters are concise, clear and precise. For example, the activation of transcription by the cII protein of bacteriophage Lambda is presented in great detail (chapter 4). The target DNA region (pRE promoter) has been investigated at the DNA level, nucleotide after nucleotide, using mutant analysis. Each change in the 50 basepair region has been investigated with deoxyribonuclease and methylation protection experiments. The result of these experiments and the mutation of the cII gene have led to build a model of the cII domains and their function relative to protein-protein and protein-DNA interaction. The generalization of the model to other promoters in the Lambda phage is also made by the authors. They discuss symmetry of the cII protein complex with recognizes direct repeats, that is an asymmetric DNA target.

Another interesting example is given in a review of protein factors and nucleoprotein complexes involved in specific transcription by eukaryotic RNA polymerase II. The key points in the elucidation of eukaryotic gene transcription and regulation mechanisms are summarized here. First, analysis of transcription factors contained in cellular extracts. Then, the purification, using chromatography methods, of such factors, and this has led to the same kind of studies as those quoted above concerning prokaryotic systems. One criticism has to be made about the list of references, which never go beyond 1985 with the majority of quotations being around 1983 — up-to-date papers are not included in this edition. The main recent progress in the binding of eukaryotic transcription factors to DNA are thus missed. Nevertheless, the book gives an excellent introductory account to the field of DNA-protein interactions and gene regulation.

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A very good multtext introduction to applied animal population genetics

*Population Genetics and Fishery Management.* Edited by Nils Ryman and Fred Utter. Washington Sea Grant Program, Seattle 1987. xviii + 420 pp. Species index. $35.00 (cloth) or $17.50 (paper).

Population genetics and fishery management have been coexisting for many years with few interactions, and this book is the first to deal with both subjects. It results from a series of lectures presented at the University of Washington School of Fisheries during 1982.

The necessity to consider genetic implications on fishery practices has arisen from the problem of defining a biologically meaningful unit (stock). Similarly there is a need to acquire a better knowledge of the modifications of fish populations under “man’s exploitative activities”. The underlying idea is to reach a rational fishery management for the years to come.

Even if this book is primarily intended to both geneticists and fishery managers, its main body has been written by geneticists and the book is therefore of interest to all concerned with the genetic structure of populations and species. Twenty-four authors took part in the fifteen chapters describing different topics and each chapter can be read independently. A large part of the book describes extensively the different techniques that can be used in population-genetic studies, their fields of application, interpretation of the results, and the theoretical concepts related to population structure. Another part concerns the implications of genetic and evolutionary concepts in fishery management. The two parts are connected by examples mostly taken from studies on Salmonidae.

The various chapters are not always set up thematically but this may help the reader to do his or her own synthesis; some overlapping occurs due to the independence of the chapters, but this helps to keep in mind basic principles. We must also note the very extensive literature that will be extremely useful to anyone who wants to get into this discipline.

The book starts with a short historical account and an analysis of the reasons for which the two disciplines have interacted only in the last decade. Chapters 2, 11, 12, 13 are devoted to the use of the different techniques available for detecting and studying genetic variability. The central role of electrophoresis is stressed in chapter 2; its basic principles and terminology are thoroughly treated along with the description of its limits and applications to fisheries programs. Although the authors (Utter, Aebersold and Winans) conclude that “It seems that electrophoresis will remain a leading procedure because it can readily generate large volumes of reliable genotypic and allele frequency data”, another promising tool is the study of mitochondrial DNA (mtDNA), treated in chapter 11 by Ferris and Berg. This technique gives valuable information in fields where electrophoresis remains insufficient to detect divergences or variability. A table comparing electrophoretic and mtDNA data on one and the same organism shows that a larger number of characters can be considered with the latter (more than a hundred, against 50). Use of this method combined with the analysis of nuclear genes gives complementary data on migration or hybridization that are not obtainable from classical mechanical tagging. Chapter 11 is quite exhaustive and very accessible to beginners. It is followed by a chapter taking as an example the mtDNA of Salmonidae. We can perhaps regret the absence of a chapter devoted to new methods in molecular genetics. Recombinant DNA investigations would possibly be of interest in the study of stocks' dynamics. The topic of chapter 13 is the role of chromosomal manipulations in fishery management. Mostly induced polyploidy and gynogenesis are dealt with, and only a small part is devoted to the role of chromosomal rearrangements as population markers; these have probably not their full value in the context of fishery management.

The second section of the book addresses the methodology of analysing and interpreting genetic data. The description of genetic variation in subdivided populations (chapter 4, by Chakraborty and Leimai) and the evaluation of genetic distances (Chapter 8, by M. Nei) are the subjects of two chapters. Both are treated like lectures on the statistical basis of population genetics. Although this topic constitutes a very large field in itself, these two chapters enable non-specialists to acquire a fairly good
idea of the parameters and fundamental concepts of
the genetic theory that have to be considered when
studying population structures.

The basic theory of inbreeding, and the related
concept of genetic drift, as well as their conse-
quences in increasing homozygosity, are introduced
in chapter 3. Introgression and hybridization are
treated as a dynamic process in chapter 7 (by D.
Campton). We retain from these chapters that reor-
ganisation of genomes and gene pools makes
difficult the “desire to manage fish as discrete popu-
lations or species”.

In the last chapter, Nelson and Soulé attempt to
answer basic questions, such as: How must popula-
tion genetics be incorporated into fishery manage-
ment programs? How can genetic markers be used
in the evaluation of mixed fisheries? What are the
important factors in managing hatchery stocks, and
what are the consequences of stock transfer? What
is to be concluded from man’s activities (pollution,
intensive fisheries and introduction of exotic spe-
cies) and what can be proposed? Answers may be
disappointing for those who wish a new “magical”
guide, but in pointing out the theoretical back-
ground of the nature of the information given by
genetics, the authors indicate directions into which
research should be developed. Given the present
state of our knowledge, we must avoid the loss of
genetic variation and “the stance of management
must be a conservative one”. Unless we become able
to clearly define biologically the “stock concept”,
predictive theories cannot be enounced. Priority
must be given to research about the responses of
populations to selective pressures and on the forma-
tion of stock structure.

Although population biology concepts are quite
new in the field of fishery management, they are now
taken into account and will probably give rise to new
developments. In the meantime, we should hope that
managers will find arguments to counter tendencies
from socio-political and economical pressures that
always favor increases in fishing effort as a short-
term policy. The conclusion is written by Nelson and
Soulé, telling us that in our ignorance “management
must be wary of change.”

This book is most valuable, and in view of its price
we could not expect a better edition.

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Monoclonal antibodies from humans

Humane monoklonale Antikörper. Diethard Baron
and Udo Hartlaub. Gustav Fischer, Stuttgart 1987.
x + 168 p. Unalphabetical literature list, no author
index. DM 48.00 (paper).

Monographs usually start with a short introduc-
tion to the field in a broader sense. So does this book
with an introduction to basic immunology. Such in-
troudcions are skipped by readers experienced in
that particular field. Beginners, however, may derive
their basic knowledge initially from such short sum-
maries rather than from basic textbooks. That is why
such introductions should at least not contain seri-
ous misstatements. This one does; the self-nonself
discrimination is delegated to the macrophages in
this book: “The macrophage recognizes the antigen
as foreign...”, and the rest of the immune response,
including T and B cell activation, is described as be-
ing dependent on that first step, self-nonself dis-
rimination by the macrophage. For non-
immunologists: This has to be wrong, since the self-
nonself discrimination has to rely on antigen recog-
nition structures, T cell receptors and antibodies,
and these are not expressed by macrophages. The
misintention is repeated later in the book, in the
paragraph on feeder cells: “these cells can be used
without problems, although one should assume that
the mouse macrophage would destroy the foreign
human hybridoma....”. One can only hope that Ger-
man students of medicine or biology are critical
enough to find out about the wrong statements.

Nevertheless, the main part of the book is enjoya-
ble. It is a detailed compendium of techniques for
the production of human monoclonal antibodies in-
cluding a discussion about the advantages and dis-
advantages of each technique, starting with the
source of B cells, the choice of the fusion partner and
their selectable markers. Since a good human fusion
partner is still missing, alternatives for the immor-
talization of B lymphocytes are discussed like Epstein-Barr virus transformation. After a chapter on cell culture, appropriate attention is given to screening methods, and finally to bulk production of antibodies including purification. Throughout the methodology part, the relative ease in the production of mouse monoclonals is compared with the problems one is confronted with when attempting to make human monoclonals. Why and when human monoclonals are preferred over mouse ones is also discussed; the main field for this application is obviously the in vivo use. Possible future applications for human monoclonal antibodies in the therapy of malignancies, infectious diseases and graft rejection are reviewed mainly with optimism and with a little due scepticism.

Although not translated from English, the book contains some awkward Anglicisms. I do not mean the use of English words like “panning” or “well” as foreign borrowing, that is O.K., it is rather the translation of words like “to secrete”, “to detect”, or “to transfect” into phonetically similar, but awkward words instead of using the smoother German words (e.g. “sezernieren”) which are (for two of the examples) derived from the present tense of the Latin verb and not from the perfect, as is the case with the English word.

Taken together, the book is highly recommended for those working on the bench or otherwise involved with the production of human monoclonal antibodies. Those not trained in immunology should, in addition, consult a textbook on the science of self/nonself discrimination for the basics.

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Embryogenesis in Angiosperms. V. Raghavan.
Cambridge University Press, Cambridge 1986.
xiv + 303 p. Indexes. £27.50 (cloth, jacket).

Professor Raghavan's monograph provides a refreshing insight into the many varied aspects of embryogenesis in flowering plants. The stated aim of the author is to present 'an integrated version of the facts about the morphology, ontogeny, biochemistry and genetics of different modes of embryogenesis'. The author has in general succeeded in his objective, and this volume is rich in facts and information and emphasises a multidisciplinary approach to understanding the problems underlying embryogenic development in plants.

The first chapter focuses on potential research areas using various microscopical, cultural, biochemical and molecular techniques and discusses these methods in relation to previous descriptive aspects of embryology. Chapter two is concerned with the ontogeny of the embryo and endosperm. The following chapter provides a detailed description of the cellular and biochemical events of embryogenesis, which includes protein synthesis. The fourth chapter describes the various experimental aspects of embryogenesis and includes the in-vitro development of zygotic embryos (including proembryo culture) and the control of precocious germination.

Somatic embryogenesis, the production of embryos from the somatic or sporophytic cells of a plant is described in Chapter five. The author stresses that greater care is required in describing and classifying the origin of embryoids in tissue culture. Raghavan recommends that the term embryo should be used as suggested by Haccius (1978) to mean 'a new individual arising from a single cell and having no vascular connection with maternal tissue'. The genetics of somatic embryogenesis is also considered and the role of somatic embryogenesis as a tool to understand the molecular events of early plant development is briefly discussed. Although work has been initiated on the identification of developmental mutants (temperature-sensitive variants) in carrot cultures, the author concludes that genetic studies of somatic embryogenesis are rather limited.

Chapter six is devoted to pollen embryogenesis, which provides an excellent example of cellular totipotency in higher plants. This chapter includes a survey of pollen embryogenesis in angiosperms where dicotyledonous and monocotyledonous plants are considered separately. Evidence of direct embryoid formation from cereal microspores is presented and reinforces the concept that there is no
a priori reason to assume that regeneration of plantlets from cereal microspores must proceed via an intermediate callus phase. The genetics of pollen embryogenesis is also considered and the prospects of recombining alleles which control pollen embryogenesis in useful plant breeding germplasm are briefly mentioned. The author concludes that future work should examine and identify the molecular events that are responsible for diverting the microspore from a gametophytic to a sporophytic mode of development. In order to address this question methods for the high frequency induction of pollen embryogenesis should be attained on a reproducible basis.

Chapter seven is concerned with the regulation of gene activity during embryogenesis. Again, much of the information available on gene expression during zygotic, somatic and pollen embryogenesis is based on experiments conducted with model organisms. The main limitation to our understanding of the regulation of gene activity is the inaccessibility of early developmental stages to molecular analysis. Professor Raghavan indicates that some of the developmental problems of plant biology must first be studied and resolved at the cellular level before meaningful molecular techniques may be applied.

When reviewing a book, there is a tendency to focus and concentrate on areas of work with which one is particularly familiar. I will resist the temptation of being unduly critical of the final chapter (applied aspects of embryogenesis) but feel obliged to note that plant breeders/geneticists will be somewhat disappointed. Four main areas are covered: embryo rescue, clonal multiplication, haploids and germplasm preservation. Unfortunately the contents of this chapter are presented in a rather superficial manner and do not do justice to the excellent preliminary chapters which lay the foundation for the exploitation of embryogenesis in crop improvement. A further minor criticism is the poor reproduction of some of the text-figures, e.g. figure 5.6 on page 149. Nevertheless, Professor Raghavan is to be congratulated on producing an authoritative account of embryogenesis and I can recommend this monograph to scientists wishing to obtain a relatively up-to-date overview of embryogenesis in angiosperms.

Haccius, B., 1978. Question of unicellular origin of non-zygotic embryos in callus cultures. Phytomorphology 28: 74-81.

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Conservation of plant genetic resources

International Symposium on Conservation of Genetic Resources of Aromatic and Medicinal Plants. Edited by Miguel Mota and José Baeta. Estação Agronomica Nacional, Oeiras (Portugal) 1987. 150 p. No indexes. Paper, price not given.

This volume consists of the proceedings of the International Symposium on Conservation of Genetic Resources of Aromatic and Medicinal Plants of the Section ‘Genetic Resources’ of the European Association for Research on Plant Breeding (Eucarpia), held at Oeiras, Portugal, from May 9-11, 1984.

The genetic resources of aromatic and medicinal plants are generally neglected when plant genetic resources are under discussion and the meeting aimed at redressing the balance, pointing out their undoubted economic value and the threats, where they exist, of genetic erosion. Although the International Board for Plant Genetic Resources (IBPGR)/United Nations Development Programme (UNDP) scheme for genetic resources in Europe does not include them in its major priority list, a number of countries, particularly those in the Mediterranean region, have expressed interest in these plants. The Agrimed programme committee of the European Economic Community (EEC) has also taken interest in spices, aromatic and medicinal plants. Finally, the International Union for the Conservation of Nature and Natural Resources (IUCN) has set up, in collaboration with the World Health Organization, a project to promote the conservation of medicinal plants. The Organization for Economic Co-operation and Development (OECD) arranged a meeting in Paris, in November 1983, to consider medicinal plants for conservation.
The interest in this group of plants is due to the fact that people are increasingly realizing the value of natural products in medicine and in the biological control of pests. Furthermore, they constitute a precious base for breeding programmes as well as for biological techniques aimed at creating new crop varieties and producing a wide range of useful substances.

The volume comprises 18 papers by authors from various European countries, with a rather high proportion from Portugal. A few papers are of a general nature and scope, such as: The conservation of medicinal and aromatic plants — the need for a cooperative approach; Portugal as a genetic reserve of aromatic and medicinal plants: Aromatic and medicinal plants in the Mediterranean region; Medicinal plants used in Italy and their centres of diversity. The other papers deal with the characteristics of some plant species or groups, such as Lavandula, Lavatera, Salvia, Papaver, vetches and peas.

Through these papers, the value of aromatic and medicinal plants for industrial and pharmacological purposes is stressed, as well as the possible decrease of the wide range of chemical diversity they represent, especially in the Mediterranean area. It was therefore recommended that (1) adequate information should be assembled on species and populations of aromatic and medicinal plants which are threatened with extinction or decrease of their distribution areas and hence of their genetic diversity; (2) computerized data bases be supported for the storage and retrieval of information; (3) in situ conservation of endangered species and populations be undertaken reinforced in natural reserves; (4) ex situ conservation of the materials collected be organized through the creation of seed banks and living plant collections, so as to ensure that germ plasm is made available for biochemical and pharmacological evaluation as well as for cross-breeding programmes.

Due to the various organizations involved in the conservation and utilization of plant genetic resources in Europe, it was also recommended that a European network be established with a view to developing a coordinated action programme aimed at conserving, evaluating and utilizing the genetic resources of aromatic and medicinal plants in Europe and North Africa.

The proceedings of this European symposium do convey an important message which is now of worldwide importance, that is the urgent need to conserve the plant genetic resources of the planet, considered as part of mankind's heritage. The reasons of genetic erosion are well known, whilst at the same time it is acknowledged that progress in the field of breeding of crop species and varieties cannot be achieved without securing a rich pool of genetic diversity. The development of plant biotechnologies aimed at selecting new varieties or creating higher-yielding and resistant crops, through somatic embryogenesis, haploid lines, somatic hybridization, somaclonal variation, also relies on the need for genetic diversity. The conservation of the latter is thus an urgent task. The EUCARPIA symposium will certainly contribute to this goal.

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Genetics from within

Genes, 3rd edition. Benjamin Lewin. John Wiley & Sons, Chichester, August 1987. xxii + 761 two-column pp. Glossary. £35.75 (hardcover, jacket).

The countless intricacies of gene expression and regulation have occupied the forefront of scientific research in molecular biology for the last 15 years. Benjamin Lewin has powerfully contributed to give shape to this field, as the author of a three-volume treatise 'Gene expression', then as the editor-in-chief of the highly influential journal 'Cell'. He is also enjoying a respectable popularity as a textbook author, since 'Genes' is now in its third edition. The declared purpose of the book is to provide a coherent view of genetics from the perspective of molecular biology. Accordingly, the book covers all topics, from DNA replication to protein synthesis, whose understanding may contribute to solve problems in formal or population genetics.

The book provides all the required raw material and also makes explicit connections with genetics.
For instance, there are details on the molecular biology of various transposable elements in Drosophila (Chapter 30) and these are given in the light of the phenomenon of hybrid dysgenesis, clearly explained in the main text, and illustrated with a figure. This is the junction point where the book stops, as the author leaves to others the task of analyzing the contributions of hybrid dysgenesis to the structure and evolution of natural populations.

Some modern and important topics — the topology of DNA, the intricacies of splicing mechanisms, RNA catalysis — are given appropriate emphasis. The order of the chapters (which is somewhat changed with respect to the 2nd edition) is ingenious. It provides alternations between structures and processes, DNA and RNA, prokaryotes and eukaryotes. In this manner, the reader is not given time to get bored.

One problem an author faces, when covering so much ground, is that of reaching an equal level of competence in all chapters. As chief editor of "Cell", the author has been in contact with most of the modern molecular biology which forms the core of his book. Nevertheless, and as expected, I am the least satisfied with the chapters that are the closest to my domains of expertise. Here are some unfortunate cases. The section on the nature and source of mutational events (Chapter 2) gives the erroneous impression that most mutations are accidents due to lesions, or to the presence of modified bases in DNA, whereas their vast majority are simple replication errors. The section on the energies of secondary structures (in Chapter 3) does not distinguish between facts and models. The section on codon recognition (Chapter 6) is not too consistent with current knowledge. For instance, the evidence is building up against the use of the inosine-adenine pair in vivo. On the other side, the common reading pattern (U.A.G) by the so-called 'V' in bacteria (probably Nishimura's O5U or uridine-5-oxyacetic acid) is not even mentioned. Such reading patterns contribute to shape codon usage, and thus have important consequences on gene expression. But, in my view, the most serious error is in Chapter 32, which deals with immunology. In Figure 32.1, the T cell receptor is shown as recognizing separately the antigen, and the MHC molecule. Now, MHC polymorphism is of enormous importance in evolution, since it is a major determinant of the resistance of populations to infectious diseases. The MHC molecules do bind the antigens, thereby selecting those views of the antigens that will serve to diagnose their foreign or non-foreign character. From the primary error on the role of MHC molecules, the author naturally falls into a second error concerning B and T cell interactions, when he writes (p. 660) that T cells 'must recognize the antibody-antigen complex presented by the B cell'. This is not true, as shown by Lanzavecchia in 1985. Another, more general reproach to the book, is its succinct bibliography, relying too much on mini-reviews published in 'Cell', and too much on American authors. There are seven pages (465-472) on the mitochondrial genetics of splicing in yeast, but none of the French names associated with this domain is mentioned, be it in the text, or in the reference list.

The main virtue of the book is in the way it presents and explains the experimental systems used by scientists to explore various domains of research. Thus, it is particularly recommended to mature students or even researchers who wish to read specialized articles and understand quickly what has been done and why. I hope the book will remain alive through many future editions.

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Multi-text book for animal producers

General and Quantitative Genetics. Edited by A. B. Chapman. Elsevier, Amsterdam 1985. xiv + 408 pp. (21 x 29.5). Subject index. Dfl 250.00 (hardbound). (Available in the U.S.A. from Elsevier, P.O. Box 1663, Grand Central Station, New York 10163, for $92.50.)

This volume is one of a series designed to provide workers in agriculture and particularly in animal production with 'a comprehensive and up to date review... covering the entire range of technical knowledge... required in animal production'. This
book is therefore one unit within a complex and has to be judged in relation to the market for which it is intended. The contributors are from the U.S. and several European countries. Little preliminary knowledge of genetics appears to be assumed and much emphasis is laid on relating the application of fundamental principles to animal improvement and husbandry.

The book is divided into four sections dealing, respectively, with individual (Mendelian) genetics, population genetics (about half the book), cell genetics and genetic engineering. This seems to be a good balance for the purpose intended.

J. F. Crow in discussing transmission genetics gives a characteristically clear and helpful exposition (though I cavil at the expression '... the gene causing beta haemoglobin...'). He also, helpfully, introduces the reader to the possibility of mapping by restriction enzymes. This is followed by a chapter on inheritance associated with sex.

The major section on population genetics is mainly by W. D. Hohenboken and comprises ten chapters ranging from the formal treatment of gene frequencies to effects of mating system. Topics such as heritability, repeatability, genotype × environment interactions, selection indices and mating patterns are dealt with clearly and at length and should be readily appreciated by animal scientists wishing to learn more about the genetical basis of animal breeding.

However the discussion of stabilising selection is less than adequate. No explanation is given for the fact that stabilising selection is so common in nature (and probably also in domesticated species), and the description of the advocated use of stabilising in a selection programme I find confusing. Likewise the discussion of heterosis, while well supplied with practical examples and analytical approaches, lacks any treatment of the possible biochemical causes of heterosis. This is a pity because there is a good deal of recent work on species ranging from invertebrates to mammals which bears in a useful fashion on this area which is still of very great importance in many areas of animal breeding. The discussion of the use of selection indices, on the other hand, is thorough and includes a consideration of the need to include weighted economic returns when several characters of economic significance are being selected concurrently.

I found the chapter on chromosomes to be of more than average interest partly because of the information it contains on domesticated species. Among other intriguing observations it contains is the fact that a particular centric fusion between chromosomes 1 and 29 occurs in no less than 28 breeds of African, Asian and European cattle.

The chapter on genetic engineering is rather disappointing. Given the success in gene transfer in mice and a range of other species together with the flurry of activity in related work with fish and amphibians, I thought rather more could have been made of current work and of the exciting potential for many domesticated species.

While the overall coverage, the quality of production and the standard of exposition are all good the book is, in places, rather short on examples. It will, no doubt, be found useful by some animal scientists, but it is difficult to see it as particularly good value for money.

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A provocative view of the evolutionary role of genetic assimilation

Animal evolution in changing environments with special reference to abnormal metamorphosis. Ryuichi Matsuda. John Wiley & Sons, Chichester and New York 1986. xviii+355 p. Three indexes. £43.20 or $44.95 (cloth, jacket).

Shortly before his death, Matsuda produced a book replete with interesting ideas about developmental processes in changing environments. Some of these ideas are uniquely his, developed over many years' work with insects; some were first postulated in the literature, including particularly the Russian, but all are woven into a synthesis. The first seven chapters (together accounting for only 53 pages) present the theory and its background; the remaining 17 are a
phylum-by-phylum catalog of examples that illustrate and purportedly support the thesis. The catalog is rich, though not exhaustive, and constitutes a valuable means of entry to a remarkably diverse literature (more than 1,500 references are cited). The book is well organized and easy to use; there are separate author, subject and generic name indices.

It is, however, Matsuda's conclusions about the interaction of the environment, hormonal regimes, and developmental processes that deserve significant attention. Unfortunately, many readers will be put off by Matsuda's eclectic and inconsistent writing style. He attributes his own meanings to terms (e.g., his neoteny is Gould's paedomorphosis) that many recent workers are attempting to standardize in order to provide a common ground for discussion. He does not always provide rigorous definitions for many usages. His grammar and spelling are haphazard (for example, p. 18: halmatomorphosis and halmatometamorphosis). The reader should really try to be objective about these flaws, and search for the ideas presented.

To Matsuda, 'abnormal metamorphosis' is any divergence from what he considers to be the standard pattern of early development within an egg membrane, followed by hatching and a free-living larval period as soon as whatever stages constitute a larva are reached, followed by a juvenile-adult period characterized by a new set of morphological (and physiological) features. Matsuda implies that these changes occur from an ancestral condition within lineages, though he notes that for many invertebrate groups in particular, there is not a well supported phylogeny. Matsuda stresses that changes in developmental patterns are the results of interactions with stressful and changing environments. He acknowledges the neo-Lamarckian aspects of his theory by strongly emphasizing the evolution of structural modifications associated with abnormal metamorphosis by means of genetic assimilation, which he considers to be a major evolutionary factor.

Abnormal metamorphosis is of two major types. One is through environmental influence in post-oval (post-embryonic of many other workers) development, which largely affects structure and number of larval stages. The other is through environmental influence that results in 'embryonization', the incorporation of free-swimming larval stages in related species with small eggs into the period of intra-oval development in enlarged eggs, which is thought to result in acceleration in development, but not necessarily acceleration of the whole development process. Matsuda identifies the multiple environments of parasitic forms, and those of the interstitial fauna, as the most stressful. He identifies halmatometamorphosis (structural changes of larvae, including suppression of numbers of stages) as an extreme mode of developmental pattern change, often seen in parasites, and 'progenetic neoteny' as another major mode of 'abnormal metamorphosis', but one that is the product of 'less stress' in a stressful environment. Matsuda believes that salinity and temperature are examples of 'morphogenetic factors' that influence development — interstitial animals adapt, initially non-genetically, by changing their response mechanism to 'environmental induction'. An interesting but poorly developed assertion is that pollution so acts to produce 'higher taxa'.

It is Matsuda's discussion of process and mechanism, especially of embryonization, that deserves the most attention. This is a topic that has received very little attention previously, and it is largely ignored in Gould's 'Ontogeny and Phylogeny' (1977, Harvard Univ. Press). Matsuda identifies a number of proximate environmental causal factors that induce egg enlargement, including salinity, temperature, photoperiod, water depth, etc., and gives as examples a number of taxa for which each factor might be causal. There is no discussion of taxa in the same situations in which embryonization is not induced, however. Matsuda infers that environmental stimuli novel to the taxon somehow trigger an alteration of the endocrine mechanism, especially for vitellogenesis. Therefore larger eggs due to increased yolk volumes are produced. That a large yolk mass is associated with modification of early development is not induced, however. Matsuda infers that environmental stimuli novel to the taxon somehow trigger an alteration of the endocrine mechanism, especially for vitellogenesis. Therefore larger eggs due to increased yolk volumes are produced. That a large yolk mass is associated with modification of early development is well documented; Matsuda infers that suppression of free-living larval stages also may be a consequence of the effect of large yolk volume. Matsuda stresses that a very large, yolky egg constitutes a very stressful physico-chemical environment for development. He also suggests that suppression of larval stages results in acceleration of some stages of development, and he identifies categories of accelera-
tion. He proposes a sequence in which a ‘new’ environment induces accelerated development, which results in a modified phenotype, which includes a change in endocrine mechanism. Unfortunately, the examples that he uses to support this idea, particularly of frogs and salamanders, are not useful when processes are examined in detail and throughout the lineages.

Matsuda asserts that new environmental stimuli first temporarily alter endocrine function, then genetic changes accumulate to fix endocrine function at a level to control yolk production ‘under pressure of natural selection’. This is genetic assimilation, the fundamental mechanism of genetic fixation of the environmentally induced phenotype. Thus, in his view the modified phenotype appears first, and if successful and if the right kind of genetic structure underlies it, it will become genetically fixed. Following this ‘proximate evolutionary process’, selection ‘improves’ the structural and physiological changes that the organisms have undergone during the proximate period. Therefore embryonization through altered development produces structural changes and eventually new taxa. Viviparity, usually characterized by yolk-poor eggs, among other features, is dismissed as a disorder of the vitellogenic endocrine process. Matsuda (weakly) argues that embryonization, producing large eggs, facilitated direct development on land, and is important in the evolution of terrestrial organisms. No attention is paid to egg retention mechanisms, in contrast to direct development. Genetic assimilation has been demonstrated experimentally, but it has never been seen to be a dominant evolutionary force. Reactions of readers of this book will depend mainly on their attitude about the importance of this process. It is genetic assimilation that leads Matsuda to identify himself as a neo-Lamarckian, and to propose pan-environmentalism in evolution. To Matsuda, ‘environment’ includes both morphogenetic and selective factors, and morphogenetic factors (such as embryonization) induce, ‘by response of the genotype’, variation upon which selection works. Matsuda complains of the ‘state of constipation’ in evolutionary biology caused by the neo-Darwinian perspective, which he believes inhibits exploration of the proximate process of evolution. A number of other recent authors have expressed dissatisfaction with the current state of the evolutionary synthesis, and a persistent theme among these dissenters is the proximate mechanism whereby phenotypic diversity is produced. One should not be put off by Matsuda’s pronounced neo-Lamarckianism, for he has had important insights and has much to offer.

Despite some flaws of argumentation, Matsuda’s synthesis of thought about the interaction of environmental, endocrinological, and developmental phenomena is well worth attention. It provides opportunities for new analysis and offers a re-orientation for those concerned with the developmental basis of morphological evolution.

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