
Book Reviews

Bell, G.: The Masterpiece of Nature. The Evolution and Genetics of Sexuality. London: Croom Helm 1982. 635 pp. Hard bound £ 25.00.

This book is a theoretical treatise about the probability and necessity of bringing the taxonomic distribution of the various ways of reproduction to our understanding with the aid of a uniform principle of explanation. The author holds the view that the occurrence of various modalities of reproduction in various groups of organisms and even in closely related species is not caused by history but rather to be explained functionally, that is in the sense of a fitness-concept on the basis of a selection theory.

Unfortunately the author partly uses a terminology that is a bit confusing, for he e.g. under the aspect of genetic effect combines polycytogenicasexual reproduction with diploid parthenogenesis, although it is well established, and also accepted by the author, that each case of parthenogenesis arose secondary from a bisexual reproduction mode. Characterization of apomixis as a monosexual reproduction (and not as a asexual propagation) would also be better. In the whole there is no distinction between metagenesis and heterogeny for metazoa, which are mostly used as examples in the book. So it makes no sense that in general the term of the alternation of generations is used here only in the sense of alternation of nuclear phases, and not as more customary as the alternation of different types of reproduction. Furthermore it remains unclear why the alternation of nuclear phases, which generally is considered as an essential characteristics of sexuality, is considered as a so called epiphenomenon of sexuality!

First of all and principally the author discusses this question: What are the advantages in terms of selection for the bisexual-amphimictic way of reproduction, considering the extra energy that sexuality needs. Furthermore why is this way of reproduction preferential in present day eucaryotes, whereas some species or even whole taxa prefer automixis, pathenogenesis or vegetative propagation (exclusively or alternating with amphimixis) and renounce completely or partly genetic recombination. The customary answer is that origin and maintenance of bisexual reproduction during evolution effects genetic diversity of the descendants which improves the selection, because genetic diversification creates in this way an adaptation potential; this should be favourable for the maintenance of the species.

According to the author this hypothesis can not sufficiently explain why bisexual-amphimictic reproduction has prevailed over the way of reproduction he calls asexual, but has not always and everywhere succeeded. The author discusses therefore various other hypotheses, using population-genetic models, which differ with regard to alternative selection of individuals and groups, to inter- and intra-specific competition, and to the environmental concept; the latter differ in the consideration of the changes in time or a more synchronous and spatial differentiation. Against these types of models, which always have to be simplifications and start from arbitrary selected parameters, one can always interject that they are never in agreement with the infinitely complex

natural conditions. It is therefore not surprising that different authors who make models for the same situation come to divergent and even contradictory results, depending on the premises used and the parameters inserted.

The next 172 pages are filled with a detailed list from the literature about which type of reproduction is found in which group of metazoa not having bisexual-amphimictic reproduction. The author admits that he only took into consideration publications in English or French. In this framework the author looks primary for any ecological characteristics by which species with vegetative or parthenogenetic reproduction as a rule are different from species with sexual reproduction. He thinks he has found some statistical relations. These strengthen his view that the way of reproduction of an organism is not caused historically, but functionally by selection under certain environmental conditions.

Finally the author discusses the compatibility of the different hypotheses presented and, on the base of the selection theory, speculates on the genetic consequences of sexuality in comparison to "asexual" reproduction, using all the material compiled about the distribution of amixis, partial mixis, automixis, and amphimixis in metazoa. He comes to the conclusion that the hypothesis, called "tangled bank", which puts in the foreground the synchronous adaptation of many intra-specific genotypes in many synchronously existing different biotope niches, is the most likely one. It can explain on the one hand the general preference of sexuality in its amphimictic form and, on the other hand also, in many taxa, the observed balanced coexistence of bisexual-amphimictic reproduction with vegetative propagation or parthenogenesis and automixis respectively.

At the end the author tries (with a similar combination of theoretical experiments, models and statistical considerations) to combine the well known facts of automixis, recombination- and mutation-intensity, the various types of nuclear phase alternations and the dimorphism of gametes with ecological and morphological facts. From these the preferentially functional condition of the respective phenomena (e.g. the distribution of iso-, aniso-, and oogamy) should be explained. For this also the situation in protists and in multicellular plants is included.

The book concludes with a glossary of the terms used, a list of references (80 pages), as well as indices of plant- and animal names, cited authors and the terminology used in the text. The selection of references is partly arbitrary; e.g. one does not find the name of Max Hartmann, whose fundamental work on sexuality and reproduction is not cited. This is not surprising not only because those books have been written in German, but also because the topic has been treated from a view point quite different from the present author.

On the whole the presentation in Bell's book is without doubt stimulating, even when the conclusions of the author are not always convincing. This is so also for readers coming from a more experimental approach, who perhaps from the viewpoint of the speculative-descriptive would accord it of a limited value.

C. Hauenschild, Braunschweig