

THE MASTERPIECE OF NATURE

**The Evolution and
Genetics of Sexuality**

GRAHAM BELL

Sex represents the most important challenge to the modern theory of evolution. In the first instance, it was long assumed that it evolved, not as the result of the normal Darwinian process of natural selection, but through competition between populations or species, an hypothesis elsewhere almost universally discredited. Secondly, attempts to develop a Darwinian theory of sex were hampered by the realisation that sexual reproduction usually implies an enormous reduction in fitness because sexual females transmit genetic material only about half as fast as asexual females.

This book attempts to resolve this dilemma. After discussing the nature of sex and its consequences for the individual and for the population, the various theories of sex, including two recent and unfamiliar hypotheses are reviewed. Since the value of these theories is held to reside wholly in their ability to predict the patterns of sexuality observed in nature, the next section of the book is an extensive review of the circumstances in which sexuality is attenuated or lost throughout the animal kingdom, and these facts are then used to weigh up the merits of the rival theories.

The final section of the book deals with other major features of genetic systems, especially self-fertilization, genetic recombination, gamete dimorphism and the alternation of generations. It attempts to ascribe function to these all-pervasive phenomena, which in the past have all too often been taken for granted.

This book has important implications for all those researching in the areas of genetics, ecology and evolutionary biology.

Graham Bell is Associate Professor of Biology at McGill University, Montreal.

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Edited by Peter J. Baron, Bsc. Hons, PhD

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THE EVOLUTION AND GENETICS OF SEXUALITY

GRAHAM BELL

CROOM HELM
London & Canberra

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... the larger and more perfect animals are now propagated by sexual reproduction only, which seems to have been the chef d'oeuvre, or capital work of nature ...

- Erasmus Darwin (1803) *The Temple of Nature; or, the Origin of Society*. J. Johnson, London. (Additional Notes, p. 36 of first edition.)

The formation of the organs of sexual generation ... seems the chef d'oeuvre, the master-piece of nature ...

- Erasmus Darwin (1803) *Zoonomia; or, the Laws of Organic Life*. Thomas and Andrews, Boston. (Sect. XXXIX 5.2, p. 404 of second American, from third London, edition.)

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- 1862 'We do not even in the least know the final cause of sexuality; why new beings should be produced by the union of the two sexual elements, instead of by a process of parthenogenesis . . . The whole subject is as yet hidden in darkness'.
— C. R. Darwin
J. Proc. Linn. Soc. (Botany) **6**, 77-96
- 1889 ' . . . the part that amphigony has to play in nature . . . is not only important, but is of the very highest imaginable importance.'
— A. Weismann
Essays on Heredity, p. 281
- 1932 ' . . . genetics has finally solved the age-old problem of the reason for the existence . . . of sexuality and sex . . .'
— H. J. Muller
Amer. Natur. **66**, 118-38
- 1975 'The main work of providing a workable theoretical structure for understanding the enormous diversity of life cycles remains to be done.'
— G. C. Williams
Sex and Evolution, p. 119
- 1976 'One is left with the feeling that some essential feature of the situation is being overlooked.'
— J. Maynard Smith
J. Theoret. Biol. **63**, 245-58

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Croom Helm Ltd, 2-10 St John's Road, London SW11

British Library Cataloguing in Publication Data

Bell, Graham
The masterpiece of nature.
1. Sex (Biology)
2. Evolution
I. Title
574.1'66 QH481

ISBN 0-85664-753-5

Printed and bound in Great Britain by
Biddles Ltd, Guildford and King's Lynn

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For my father

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