
Introduction

The 19 papers presented in this issue arise from two complementary Discussion Meetings held in London in the summer of 2002. The Discussion Meeting of 26 and 27 June held at The Royal Society was entitled 'Comparative functional genomics of chloroplasts, mitochondria and their bacterial homologues—new perspectives on symbiosis in cell evolution'. This was an open meeting in the sense that anyone interested could register, attend, and contribute to the discussions following the lectures, or to the general discussion. The second meeting, on 28 June, was held at the Novartis Foundation (<http://www.novartisfound.org.uk/>), and was entitled 'Molecular evolution of photosynthesis and respiration'.

The Royal Society Discussion Meeting included 14 invited speakers from six countries (Canada, Germany, The Netherlands, Sweden, UK and the USA). Their papers form the largest part of this issue. The Royal Society meeting also had 21 posters from authors in seven countries (see electronic Appendix A available on The Royal Society's Publications Web site). In addition, the list of 140 registered participants from a total of 10 countries reveals the very broad interest of the meeting, with participants, of all ages, drawn from universities, many kinds of research institute (including medical and agricultural institutes), the field of publishing, schools, and simply individuals with the interest and motivation to attend. This meeting attests to the openness and inclusivity of Royal Society Discussion Meetings. Participation in the Novartis Foundation Discussion Meeting was by invitation, simply for reasons of space, and therefore the meeting was potentially more exclusive, although no request to attend was refused. Participants included most of The Royal Society Discussion Meeting's speakers and chairmen. The Novartis meeting had 33 participants and six invited speakers from three countries (France, UK and the USA). Five of the speakers contributed papers to this issue.

Genomics has now raced far ahead of our understanding of why genetic compartmentation exists in eukaryotic cells, how it arose, and what it means. We suggest that the papers in this issue form a novel and coherent theme from which major advances in understanding the evolution of cells may be anticipated. The complementarity of the two meetings was particularly fruitful. No account of the function of genomes in chloroplasts and mitochondria can ignore the primary functions of these organelles—photosynthesis and respiration—processes of the utmost importance without which life, as we would recognize it, is scarcely possible. Nevertheless, one sometimes gains the impression that the genomes themselves are subject to such intense scrutiny that the function of their gene pro-

ducts is overlooked. At the same time, recent and dramatic advances in understanding the structure, function and mechanisms of the components of biological energy transduction, for quite legitimate reasons, tend to be discussed independently of their origin and evolution. One or two speakers on molecular mechanisms adopted the view that the meetings were very interesting, but what they had to say themselves was not really about evolution. It might also be fair to say that molecular mechanisms of energy transduction were fairly unfamiliar territory to some distinguished contributors to evolutionary theory. At the end of the three days there could be no doubt, as Wolfgang Nitschke said in the final lecture, that 'Evolution lurks everywhere'.

The discussions presented here are based on verbatim transcripts of the discussions that took place at The Royal Society. In one case, we asked participants with related interests to provide additional, written questions to a paper whose contents are of direct relevance to the meeting, but differ significantly from those of the lecture itself. We thank those participants, and the paper's first author, Siv Andersson, for the written questions and answers. In all other discussions, only the original discussion is represented, edited to achieve consistency in style. Like it or not, these discussion transcripts are recognizable as accounts of what actually took place. It is important to remember that one of the driving forces of scientific progress is controversy. One of the benefits of the discussions published here is that it becomes obvious which points are controversial, and what the contrasting views are. It is for the reader to decide how much of the lively discussions can be attributed to reasoned arguments supported by evidence, and how much to clashes of interesting and distinctive personalities with strongly held opinions. It is surely a mistake to try to minimize or eliminate the latter.

The discussion itself was greatly facilitated by the outstanding vigilance and energy of the volunteers who carried the microphones to where they were needed. These were the PhD students Caroline Aspinwall of University College London, and Jörgen Ström of Lund University. The subsequent task of converting extracts of eight C90 audio cassettes into accurate text was undertaken by another volunteer and meeting participant, Carol Allen. This was an unexpectedly demanding task requiring a rare combination of scientific understanding, patience, an ear for a wide range of examples of spoken English, computer literacy, tact, and humour.

The invited chairmen were Bob Whatley and Chris Leaver of the University of Oxford, and Angela Douglas of the University of York. Bob Whatley in particular has made major contributions to this field, represented *inter alia* in a seminal paper arising from a related Discussion Meeting held in 1978, 'The cell as a habitat' (Whatley *et al.* 1979). The Royal Society's administrative secretary for our meeting was the amazingly thoughtful and efficient

One contribution of 21 to a Discussion Meeting Issue 'Chloroplasts and mitochondria: functional genomics and evolution'.



Figure 1. A familiar analogue of plant and animal cells, which contain, within themselves, compartments that evolved from other cells. These compartments convert energy in photosynthesis and respiration, yet they also contain genes and functional genetic systems that are required for life. Chloroplasts and mitochondria still resemble the bacterial from which they evolved.

Suzi White, along with Froniga Lambert and Hannah Jemmett. The Novartis Foundation Meeting was introduced and supported by the Foundation's Deputy Director, Greg Bock, and greatly facilitated by his personal assistant, Allyson Brown. Ruth Hinkel-Pevzner, in The Royal Society's Editorial Department, provided kind

words to authors and editors, and was a uniquely patient and accommodating commissioning editor for the proceedings published here. David Montagu, Helen Winser and Jessica Mnatzaganian of The Royal Society's Production Department helped greatly in progressing publication. We also thank those who refereed the papers, some at very short notice and with the most rapid of turn-around times. Ruth Linton wrote an accurate and amusing popular summary of the meeting (see electronic Appendix B available on The Royal Society's Publications Web site). The production team and presenter, Quentin Cooper, of the BBC radio programme *The Material World* provided excellent additional publicity and some light relief (http://www.bbc.co.uk/radio4/science/thematerialworld_20020627.shtml). Thank you also to Anders Liljas of Lund University for the loan of the Russian dolls (figure 1) pictured in the publicity flyer and printed programme.

Finally, we thank the members of the Hooke Committee of The Royal Society for accepting our ambitious proposal for The Royal Society Discussion Meeting. Organizing both meetings was both a pleasure and a privilege. From the outset, we aimed to recruit speakers and participants from a very wide range of fields and disciplines, thereby setting the stage for a new synthesis, from which real innovation and ideas will emerge. We believe this is what we got. In the introductory words of The Royal Society's Executive Secretary, Stephen Cox, whom we also thank, 'It does exactly what it says on the tin'.

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REFERENCE

Whatley, J. M., John, P. & Whatley, F. R. 1979 From extracellular to intracellular: the establishment of mitochondria and chloroplasts. *Proc. R. Soc. Lond. B* **204**, 165–187.

Visit <http://www.pubs.royalsoc.ac.uk> to see electronic appendices to this paper.