Christopher John Humphries

Systematics, biogeography and conservation

Born in Derby, England, 1947. 1966-69 student at the University of Kingston-upon-Hull; 1969-72 Ph.D. student at the University of Reading; From 1972 — present held various jobs at the Natural History Museum, London; 1972-74 Assistant Curator, European Herbarium; 1974-80 Head Curator of European Herbarium; 1980-90 Principal Scientific Officer, General Herbarium; 1990 — present Senior Research Scientist. Also held two research fellowships at the University of Melbourne (1979 — 80, 1986). Author of more than 90 publications in the fields of general systematics, plant systematics, cladistic biogeography and art curation. Monographs include: *The Hamlyn guide to trees* (1981, in English, Spanish, German, French and Dutch); *Cladistic Biogeography* (1986); *A generic monograph of the Compositae: Anthemideae* (1993); *Cladistics: a practical course in systematics* (1991); *Catalogue of the Natural History drawings by Joseph Banks on the Endeavour voyage (1768-1771) held in the British Museum* (Natural History) (2 vols. 1984, 1987). Edited volumes include *Ontogeny and Systematics* (1988); *Austral Biogeography* (1991); *Systematics and Conservation Evaluation* (1994); *Banks' Florilegium* (in 22 parts 1980-89). — Address: Department of Botany and Biogeography & Conservation Laboratory, The Natural History Museum, Cromwell Road, London SW7 5BD.

My work at the Wissenschaftskolleg was primarily on two topics: conservation principles and conservation applications. I was one of the team of nine researchers of the "Schwerpunkt Biodiversität", and indeed one of the gang of four who will edit our final joint publication, the book entitled: *Priority Areas Analysis; Systematic Methods for Conserving Biodiversity**. The aim of the book is to produce a slim, punchy guide to the principles

* See section III *(Aufsätze)* of this volume, pages 205 ff.

and practise of systematic methods of reserve selection and their applications to the real world problems. Indeed, the original plan was to evaluate the contributions by ecologists and systematists using conservation constituency.

Since UNCED and the signing of the *Convention on Biodiversity* in Rio in 1992, for many nations the present theme and major challenge in conservation biology is to stem the unprecedented loss of biodiversity. A wide number of approaches will be required and presently there are a number of different debates. The goal of conserving as many species as is possible is one such debate that pervades much of literature, and the associated reserve design discussion for *in situ* protection has centred around interpretation of empirical studies on how best to "capture" biodiversity in space and time. A whole set of essential questions has revolved around where to place protected areas in relation to the features or species we wish to retain, and it was in this arena that I worked for much of my time at the Wissenschaftskolleg.

My first assignment was to write a chapter about *complementarity,* a subject we virtually unanimously concluded comprises one of the unifying principles of our various UK, Australian and South African approaches. Analysis of published and unpublished papers led to the conclusion that complementarity had independently been recognised in the early 1980s and had been applied to area selections at both global and regional scales. One generality is that, with limited options and resources for reservation, it is a sensible approach to select the most complementarity areas for any given units of biodiversity whether they be characters, species or higher ranking surrogates, such as land systems or other ecological and geological features. Crucially, quantitative methods have been devised which optimise the number of features for every area to be included in a reserve network by selecting complementary sites. Quantitative methods then tell us what is the absolute minimum required to satisfy the goal of representation, and act as the baseline for reserve design. Thus for any given region, if every site was unique to that area, then it would be necessary to include every site in the reserve network. Conversely if every attribute being measured occurred in just one area, then only one site would be required to fulfil the criterion of representation of at least one each of every attribute. In practice there are various degrees of overlap between one site and another, and the task of determining a practical reserve network often demands detailed analysis of many different combinations of choices. Associated with complementary are the principles of *irreplaceability* (sites essential to a reserve network) *and flexibility* (alternative choices of essential site combinations), which were written up by colleagues Tony Rebelo and Bob Pressey in adjacent chapters of the book. For me it was particu-

larly gratifying to see these and other aspects of the project come together and become unified into an agreed point of view. Also, to turn some of the ideas into working computer software routines showed that being together had a useful synergy, and produced some concepts which now have so much value in our work back in the Natural History Museum.

Naturally, there is a huge gulf between the theoretical ideals of systematic methods and the actual practice of designing a practical scheme that will satisfy the many different criteria of reserve selection. For my second task I started to research and write up one of the later chapters about the application of systematic principles to real problems, on different global, regional and local scales. Using data compiled earlier by two Spanish colleagues, Isabel Castro Parga and Juan Carlos Moreno Saiz, I worked with Paul Williams to analyse one regional problem — the effectiveness of the existing "national" and "natural" park system within the Iberian peninsula. This led me into using measures of efficiency to determine the differences between idealised reserve networks and the existing reserve system to determine which new areas would be essential to include in a new scheme designed to preserve as much biodiversity as possible. The results showed that existing schemes selecting reserves for widely different and often opportunistic criteria were not very efficient and showed considerable redundancy by comparison to the optimised schemes. I was also fortunate to have access to similar data sets for South Africa and various parts of Australia, which will eventually form the core of this chapter.

Being away from home gave me a lot more free time than usual, and so at weekends I tended to use at least a few hours re-writing a new edition of *Cladistic Biogeography* (first edition, 1986, Clarendon Press, Oxford), with Lynne Parenti, an ichthyologist from the Smithsonian Institution. During five months we managed to write about half of the book using e-mail. Since the first edition, the subject of cladistic biogeography has moved in fits and starts with various new developments that need to be integrated into a new work. Cladistic biogeography is a method of historical analysis that combines modern systematics with vicariance interpretations, and has as its basic premise that Life and Earth evolved together through time. Therefore, the promise is that we should be able to search for patterns of relationships among areas of endemism throughout the whole world. Our aim is to present a comprehensive review of theory and methods, summarising the academic history leading to its formulation, and presenting practical examples for the systematist who may wish to incorporate biogeography into taxonomic revisions. We also postulate that the least understood biogeographic problem is the timing of the opening of the Pacific Ocean in the Jurassic / Triassic and the relationships of the terrestrial areas around the Pacific rim. We have

examined many of the different theories in an effort to determine one coherent explanation.

I came to the Wissenschaftskolleg with many high hopes, with specific goals and a great desire to make the conservation project work. Although we did not achieve all that we set out to do, we got on with each other reasonably well as we travelled down a fairly long road. The interactions within the group were endless and invariably stimulating. I learned a lot. I also enjoyed the company of the other fellows immensely, particularly the "collective intelligence" biologists and the other participants who joined in with our seminar series. I am particularly grateful to Elena Lazos, Erhard Denninger, Ashok Desai, Sandra Mitchell, Gustav Ranis, and Wolfgang Streeck for their thoughtful contributions. I thoroughly enjoyed the Thursday night dinners, with everything from intense debate on Bosnian war crimes to the history of comparative religions and even Swiss jokes. The Wissenschaftskolleg is in a beautiful setting, although living and working in the same room becomes less attractive as the days grew longer and warmer ! However, it was a wonderful place in which to think and I basically learned that not everything has to be so frenetic as life in Blighty. Indeed, towards the end of July the weekends became most precious as I raced to meet my self-inflicted deadlines. I am not the first to say it, but life for the solo fellow really was like being in a monastery with college high table. I was pleased to make acquaintance with colleagues in other Berlin institutions and it was a privilege to get to know the Berlin Botanic Gardens almost as well as I know Kew Gardens. My thanks to the staff but particularly Brigitte Zimmer, Werner Greuter, Walter Lack, Beat Leuenberger and Sylvia Arroyo. Travelling to the former East Germany was irresistible. The transport system was superb. Potsdam became a fond favourite for me, as well as for my wife, son and daughter during their brief holiday visits.

I made many friends during my 5-month stay amongst the fellows and staff alike. I wish to thank everyone at the Wissenschaftskolleg for making it a fruitful time.