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Introduction

Primate Synthesizer

(Ernst Mayr Lecture on 11th November 2003)

On 3rd June 1966, a paper written by a 24-year-old Ph.D. student at Worcester College in Oxford appeared in the renowned international periodical *Science*. Although that paper was only three pages long and written in restrained tones, it was destined to exert a transforming influence on a basic tenet of primatology. That basic tenet, then a generally accepted view, was that tree shrews occupy a key position at the base of the primate evolutionary tree. These pointy-snouted, long-tailed, excitable small mammals were regarded as a *missing link* between ancestral placental mammals (“primordial insectivores”) and primates. Yet with a comment woven almost imperceptibly into the text – “that any relationship of the Tupaiidae to the Primates is very tenuous” – that former Ph.D. student and today’s Ernst Mayr Lecturer embarked on a radical revision of our conceptions of ancestral primates. This undertaking eventually resulted in a new definition of the key adaptations of genuine primates.

Bob Martin’s first step was to focus attention on reproductive biology. The breeding behaviour of tree shrews – as presented in his Ph.D. thesis – is indeed so unusual that he was able to exclude this group of animals quite justifiably from our ancestral lineage. Just consider: The offspring are left alone in a separate nest, and the mother visits them only once every 48 hours for just 5 minutes to offer them her teats like the famed Etruscan wolf. Such behaviour is undeniably quite unusual for a supposed primate.

The lemurs, Bob Martin’s companions during his postdoctoral research in Madagascar, subsequently led him onto the right track, namely to the interpretation that our distant primate ancestors, small-bodied and nocturnal, must have been active in the fine branches of tropical rainforest trees. Furthermore, they were apparently much closer to the ancestral placental mammals than previously believed. In other words, our primate roots are deeper than once supposed. Today, more than three decades later, here in the Leibniz Lecture Theatre of the Academy, this will also be Bob Martin’s credo: credo et conclusio.

But first of all let us hark back to the beginnings, as the Oxford Ph.D. student took up residence at the Max Planck Institute for Behavioural Physiology in Seewiesen, Bavaria, with a scholarship from the German Academic Exchange Service. He was very fortunate in that his Ph.D. research was supervised simultaneously by two future Nobel prize winners: Konrad Lorenz and Niko Tinbergen. In later years, Bob Martin translated into English five books authored by Konrad Lorenz. The last of his translations was of the so-called Russian manuscript, which had resurfaced only posthumously. Lorenz – intellectually still entirely in the thrall of his time in Königsberg – had written this manuscript on loose, un-numbered scraps of paper while he was a Russian prisoner-of-war in Armenia.

Following the completion of his Ph.D., Bob Martin moved on to a division of the French National Museum of Natural History in Brunoy, where he conducted post-doctoral research on mouse lemurs in a team led by Jean-Jacques Petter. This was a formative period not only because of the initiation of his work in Madagascar but also because he courted the boss's daughter and subsequently persuaded her to cross the Channel with him as his wife when he transferred to London. Since that time, Anne-Elise – Mrs. Martin – has illustrated many of his publications with exquisite pictures of furry primates.

Later on, we again find Bob Martin with his lemurs in the forests of Madagascar. Even after his appointment as Lecturer in Biological Anthropology at University College London, at the age of 27, and his subsequent rapid ascent of the ladder to a professorship, he remained faithful to his lemurs. He studied their nocturnal, cathemeral or diurnal activity patterns, their endocrinology, their urine (which he examined for traces of hormones using radioimmunoassay), the broad array of their social relationships, but above all the phylogenetic implications that emerged from these comparative physiological and sociobiological investigations. Most recently, he has extended this broad-based approach still further with excursions into molecular systematics.

If I were asked today to name the primates that have continually accompanied Bob Martin throughout his entire scientific career, I would naturally pick out the prosimians, those gremlin-like primitive primates. I was unable to establish whether he duly sets out on a May night once a year to celebrate the Feast of Lemuria reported by Ovid. In any event, during the 15 years that he spent with us in Zürich as Director and sole Professor at the Anthropological Institute, I never once spotted him behaving according to the legend of Lemuria, venturing out barefoot on a moonlit night, scattering black beans behind him, striding to the nearest fountain, circling around it and reciting nine times: "Yield, ye paternal spirits".

But those spirits do not yield in the slightest. In recent years, several of his students have conducted new projects in Madagascar, the land of the lemurs. It would, of course, be quite unjustified to try to squeeze Bob Martin into the straightjacket of a lemur specialist. In the mid-1980s, while we were trying to attract him from University College London to Zürich – an undertaking that was eventually crowned with

success – an English colleague wrote to me “You will like him, he is a generalist”. And that is precisely what he is. Indeed, I would go so far as to say that he can be described today as *the primate synthesizer* worldwide.

This can be illustrated by reference to two themes: the brain and primate phylogeny. We can visit on the one hand his allometric analyses of the development of brain size during the radiation of the mammals, and on the other his synthesis of primate evolution, in which he has endeavoured – as always with a strong emphasis on theoretical aspects – to unite data from palaeontology and molecular biology.

Turning first to brain evolution: For physiologists, it was a long-recognized fact that of all bodily organs our brain has by far the greatest energy turnover. However, Bob Martin was the first to focus the attention of evolutionary biologists on this energetic bottleneck and on the strong correlation that exists among mammals, from the smallest to the largest, between brain mass and the basal metabolic rate of the organism as a whole. He pursued this focus to its limits in a progressive *Nature* paper (1981), in which he formulated the hypothesis that, in the final analysis, it is the energetic resources that the mother can make available to the developing embryo and fetus that determine the maximal possible brain mass. Launched more than 20 years ago, this “maternal energy hypothesis” has weathered various academic storms to survive to the present time.

The most voluminous of his publications, richly illustrated by his wife Anne-Elise, is the 800-page *magnum opus* entitled *Primate Origins and Evolution* (1990). This bears witness to the second great synthetic undertaking that we owe to Bob Martin: a multidisciplinary analysis of primate evolution. And that is the topic that will be addressed today. But the intellectual signposts that Bob Martin erects in this treatise, and the fascination of the seductive arguments that engage his readers, extend far beyond the primates. One only needs to read in his chapter 3 about the “confusion between classification and phylogenetic reconstruction”, to sense how the puritan scales should fall from the eyes of all drum-beating cladists.

Just recently, I visited Bob Martin at his new workplace at The Field Museum in Chicago, where he has been engaged since his departure from Zürich just over two years ago. This is one of those great Anglo-Saxon research institutions that, above and beyond its role as a museum, counts among the leading scientific centres of *comparative biology*. As we sat in his old English-style, wood-encased office high above Lake Michigan discussing methods for analysing brain allometry, or as one morning we walked along the stormy shore of this inland lake reminiscing about the early years in Seewiesen, about Erich von Holst and his successors, Bob Martin was once again in his element as the familiar *primate synthesizer*. Although he is fully occupied as Provost and Vice President of Academic Affairs, as administrative manager of almost 200 scientists and a budget of several million dollars, he was in the process of framing a new thought experiment, a palaeontological project in India. By means of this project, he aims to test his latest hypothesis, namely that the isolated Indo-Madagascan land-mass could have played a pivotal role in the early

evolution of the primates and of other placental mammals. Scientifically provocative, intellectually far-reaching: Bob Martin, whose latest synthesis – but first of all his lecture on ancestral primates in the land of the dinosaurs – we await with great interest.