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Introduction : how much is enough, but not too much

(Ernst-Mayr-Lecture am 27. Oktober 1998)

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Imagine you are – as I have just been – in the lobby of the New Oktani Hotel in Tokyo and wait for the elevator to bring you up to your room in the 20th floor. As the elevator arrives and the doors open, you find the cabin filled with five Sumo wrestlers. You know something about maximal load and make a quick calculation, but nevertheless enter the cabin. The elevator accelerates upwards, you pass the 12th, 13th, 14th floor, but then you hear a strange cracking sound above you that reminds you of some breaking metal. The elevator slows down; another snap; the cabin quivers, stops and begins to fall: slowly first, but then faster and faster. You pass the 10th floor, the 5th floor, and then – you wake up.

Jared Diamond loves this story, not primarily because he might be interested in Freudian dream psychology, but because of his deep concern for proper design: both technical and biological. How is the capacity of a system matched to its prevailing load? What are the safety factors that should result from a given trade-off between costs and benefits? Elevator companies – just like any company and, in fact, just like any biological system – must avoid going bankrupt; and for this they must avoid developing a reputation for crashing as well as producing elevators that never crash but are so expensive that they are outcompeted by rarely crashing rivals. How much is enough, but not too much? This is a question Jared Diamond keeps asking time and again.

With this question in mind, let us turn from elevator cables to snakes. Now imagine finding yourself in the Burmese rain forest and observing a 100-kg python having just swallowed a big prey mammal. Should the snake, which feeds only in intervals of one or two months, keep its digestive machinery fully activated all the time, or should it instead maintain a low activity and then, after each of its infrequent feeding bouts, switch on its gastrointestinal secretions, upregulate its enzymes and transporters, and even stimulate the rapid growth of entire organs that are involved in its digestive metabolism? In other words: should the animal adopt a steady-state

or a stop-and-go strategy? Jared Diamond knows the answer through extensive multifaceted research he has recently performed in his laboratory and published in *Nature* just two weeks ago.

Such questions lie at the interface between physiology and evolutionary biology. Jared Diamond has brought these two separate fields together and has founded what is now known as "evolutionary physiology". For too long a time have evolutionary thinkers regarded biological organisms as bloodless figures in a virtual chess game; and physiologists have been interested more in the blood than in the game. Jared Diamond weaves these threads together. Originally trained as a physiologist and membrane biophysicist at Harvard and Cambridge (England), where he received his Ph.D. in 1961, he is at present Professor of Physiology at the Medical School of the University of California at Los Angeles (UCLA). There he investigates the cellular mechanisms of molecular transport through biological membranes, for example the transport of sugars and amino acids through the inner linings of the small intestine. But the special twist he gives to these biochemical studies is the way how he places the data obtained in the laboratory into a larger evolutionary perspective. He takes the Darwinian notion seriously that nothing is free in the biological world, as it is in the world of economics; that everything costs biosynthetic energy, takes time, and occupies space, whatever the valid currency – energy, time, or space – might be. In this context he has provided us with a series of elegant, quantitatively detailed experimental studies which clearly demonstrate that the market-place which sets the biological safety factors, is nothing else but natural selection. How much is enough on this market-place, but not too much? What are the evolutionary forces that shape the quantitative design of life? These are questions which Jared Diamond and his co-workers have pondered over for a quarter of a century – but which he is *not* going to discuss today.

For there is yet another side to this polymath-scientist, Jared Diamond. All over the years he has pursued a parallel career in ecology and evolutionary biology – a career largely propelled by an on-going series of expeditions (17 to date) to New Guinea and other tropical islands in the south-western Pacific Ocean. Here, Jared Diamond, who had become a fanatical bird watcher by the age of seven, followed in the foot steps of Ernst Mayr. He used this tropical world of jagged mountains and deep, isolated valleys as an observation field to tackle major problems in evolutionary biology; for example, to study the ecological factors underlying species diversity, extinction and immigration rates, and allopatric speciation patterns, which he observed in the seemingly uninterrupted expanses of tropical rain forest.

But nothing was to beat the story of *Amblyornis flavifrons*, the story of the long-lost Golden-fronted Gardener Bowerbird. This bird was previously known only from a few specimens found in a Paris feather shop in 1895. Ernst Mayr had already been sent out by Lord Rothschild to rediscover the bird, but failed; and so did

many others after him. Finally, only four remote mountain ranges remained, where the species could be found, if it still existed at all. Then, in 1979, Jared Diamond succeeded at the top of one of them, the Foja Mountains of Irian Jaya, and in addition discovered the bower and courtship of this spectacular golden-crested bird. All these 30-year long ornithological studies will be summarized in the forthcoming book "Speciation and Ecology of the Birds of Northern Melanesia", a joint venture of the first two Ernst Mayr Lecturers. In addition, these studies on birds have stimulated Jared Diamond to write a series of papers on the paradoxical evolution of some human genetic diseases, such as Tay-Sachs disease and diabetes. Moreover, in New Guinea Jared Diamond developed a keen interest in the microscopic variety of the local human tribes inhabiting this cluttered environment and speaking nearly a thousand different languages, many as different from one another as English is from Japanese. He learned one of them, Fore, and found it "deliciously complex".

At this juncture, let me mention, just as an aside, that he speaks about 12 languages, among them German. As a sophomore at Harvard, he won the Annual Latin Price for the student who best translated a poem from Horace into English verse. He won the price the following year again, and again the next; then he stopped competing – to give the classics majors a chance. Nowadays he enjoys and practises his linguistic skills in devoting much of his time to popular science writing. His bi-monthly articles in the News and Views section of *Nature* are an aesthetic delight, both intellectually and artistically.

As Catherine Seipp from UCLA has recently remarked, Jared Diamond's breadth and depth of knowledge is enough to humble any highly intelligent person. So it is not surprising that the Mac Arthur Foundation gave him one of its prestigious Genius Awards (in 1985). Among the large number of other prizes and honours including many Book Prizes and Distinguished Teaching Awards, he received an Honorary Doctorate from Sejong University in Korea (1995): neither for his work on membrane biophysics, nor for his studies in the evolutionary ecology of New Guinea birds, but for his contributions to the greater understanding of the Korean alphabet.

As you will experience yourselves in a minute, Jared Diamond continues to dazzle the scientific community and the public alike with his expertise in wide-ranging fields of knowledge. This is illustrated most strikingly by his two major books, "The Third Chimpanzee" (1991) and "Guns, Germs, and Steel" (1997), which have been translated into more than 10 languages (not by himself, though); and it is borne out as well by his 546 publications in scientific journals (if I have counted correctly). "Guns, Germs, and Steel", the book that won the Pulitzer Price this year and sold 25.000 copies the week thereafter, provides the background for the

2nd Ernst Mayr Lecture, in which Jared Diamond will present nothing less than a history of *Homo sapiens* on a scale of continents and millenia.
When Mary Cohen, his wife, a clinical psychologist and Professor at UCLA Medical School, was once asked "What is it like to live with a genius?" she replied: "After a while you learn that even a genius is human". So let me now clear the stage for Mary Cohen's husband.