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Introduction

Meine Damen und Herren:

Let me ask you what might connect the following seemingly very different themes? Firstly, many people in this audience have experienced the difficult years for teenagers, full of conflict and anger for the world. Is this just an unexplained fact of life? Or have you wondered whether there is any meaning in this? Secondly, we often notice that people tend to cooperate with one another even if they are strangers at first. This is remarkable because why would you help somebody else in the first place rather than look for yourself? What answer does biology give? Finally, a completely unconnected question seems to be why flight Air Florida 90 did crash in the Potomac River (Washington D.C.) in January 1982? As you might have guessed, the connection is today's speaker – the highly distinguished evolutionary biologists Robert Trivers, the presenter of the Ernst Mayr lecture for this year. But before I come back to hint at the answer to these topics, we first have a look at Robert Trivers' scientific career.

Robert Trivers was born in Washington D.C., and – jumping directly to his academic waypoints – first went to Harvard to study mathematics but soon decided that a law degree would suit him better. For this, he had to study towards a Bachelor's degree in US History, which he received from Harvard in 1965. In the meantime his personal life had taken some unexpected twists and turns with the result that Robert became interested in psychology. But this science at the time (and perhaps still today) was not of the intellectual rigor and challenge that defines Robert Trivers intellectual mind. So, he left the University, in a time when the government was very interested in improving school teaching. As a result, Robert took on a job of writing science textbooks for children. Inevitably, evolution had to be mentioned as an important fact of life, yet much to the dissatisfaction of Christian conservatives. Their resistance and influence made it very difficult to publish this book and, hence, the work was not receiving the reception it should have had. But the job had one lucky side because

as part of the entire program, Robert Trivers was assigned a teacher in biology. This teacher, the ornithologist Bill Drury, turned out to be very important for Robert's own career, since he taught him the principles of evolutionary biology. Moreover, Drury put him in touch with Ernst Mayr at Harvard. Ernst Mayr eventually convinced Robert Trivers that there was no other place worthy of being a graduate student than Harvard and, in particular, Ernst Mayr's and Ernest Williams' groups.

Robert Trivers was an unusual student in many ways. He entered the field through the backdoor so to say. He never had finished a regular curriculum in biology and even convinced Ernst Mayr that he had not to do chemistry, which both in fact considered a waste of time. Regardless, as from 1968 he studied and took a PhD degree in evolutionary biology with Ernest Williams and Ernst Mayr in 1972. Robert Trivers first stayed as faculty at Harvard (1973–1978), then moved to UC Santa Cruz (1978–1994). During the time at Harvard, geneticists like Richard Lewontin were provoking personalities. Uneasy with their science, Robert Trivers felt motivated to focus better and think more clearly about genetics. Also Santa Cruz is not always an easy place either but surely there were stimulating and provoking people assembled in the faculty at the time. Today, Robert Trivers is a member of the faculty at Rutgers University New Jersey (since 1994), and currently a fellow at the Wissenschaftskolleg zu Berlin (2008/09) where he finishes his book on self-deception.

What rarely ever appears in Robert Triver's official CVs are his connections with Germany, of which I think he is very proud. In fact, Robert's father, Howard Trivers, also had connections with Harvard and from there received a fellowship to study with the philosopher Karl Jasper at Heidelberg 1932–1933. Howard Trivers then lived in Germany in the difficult years of 1934 to 1938. He was duly recruited into the State Department's service after the end of the Second World War as an expert on Nationalsocialist Germany, first posted to Copenhagen (1950) and then to Berlin (1957–1962). Hence, young Robert learned Danish, and then German plus Greek in a Gymnasium at Berlin-Dahlem. So, Robert Trivers could say, "Ich bin ein Berliner", and I think this is certainly even more appropriate when "Berliner" also stands for an unusual and creative approach.

Robert Trivers is certainly one of the most influential evolutionary biologists of our times. There is no time to mention all of his important contributions in detail, so let us just pick two topics. If one looks back at the 1970's, a big change in evolutionary biology was underway, initially fired up by Bill Hamilton's insight that genes and not populations or species are the most important units of selection. This led to the concepts of inclusive fitness and kin selection, later popularized by Richard Dawkins in his "Selfish Genes" book (1976) for which Robert Trivers actually wrote the foreword to the original edition. One key discussion of the time was how natural

selection could favour and select for genes that code for altruistic acts, that is, "genes" that "cause" help for others to the detriment of own success. The solution comes through the realization that the same genes can be found in the helper and in the one being helped. This is the case among relatives where it occurs with a known probability. A sister, for example, would share exactly the same gene for helping ("altruism") with probability of one half. Hence, if help for the sister ensures benefits that are more than two times higher than the cost for the helper, it would on average lead to more copies being propagated among two sisters than without the help. But just at that time when everybody focused on genes, Robert Trivers showed that such a solution was not the only one that could lead to mutual help, and thus to the evolution of altruism and cooperation. In fact, cooperation can evolve, too, if altruism is reciprocal even if the two interacting individuals are not related to one another and do not share genes. In this scenario, help provided by one individual to a recipient is paid back by the recipient to the original donor at some later point in time. Robert Trivers famous concept of "reciprocal altruism" was thus born (1971), a concept that proved to be highly influential to this day. For example, it forms the basis of much of the research on strategic games analysed by economists today. By the way, the concept of "reciprocal altruism" also explains riddle number two mentioned at the beginning, i.e. unrelated individuals can evolve to cooperate based on reciprocal altruism. In fact, "reciprocal altruism" is much more than just that – it is a general principle of cooperation that challenges the standard notions of morality as usually discussed in the social sciences, and which requires certain psychological capacities such as self- and social awareness.

Throughout his career, Robert Trivers was interested in what makes evolution tick – and to a large extent this is the story of cooperation, of conflict and of genes. Thus, his other contribution that I want to mention here is the analysis of the parent – offspring conflict. Robert Trivers demonstrated that the asymmetrical genetic relatedness between sisters or brothers among themselves, compared to the relationship as viewed from the parents must lead to inevitable conflicts over what resources should be given to whom. The genetical crux of the problem is that parents have the same genetic relationship to each of their sons (or daughters) and to their offspring in turn (the grandchildren). Viewed from the son's perspective, however, a brother's offspring is genetically only half as closely related than own offspring. Hence, a son would rather see the parents care for him than for the brother whereas this would be equivalent options for the parent. As a consequence, Robert Trivers showed, conflicts between offspring and parents become unavoidable because parents, for example, withhold their investment into current offspring in favour of future ones whereas current offspring would prefer more. This conflict is found throughout all branches of living organisms. There is again more to this insight than meets the eye, because

here Robert had connected deep evolutionary principles based on genetics to psychological phenomena such as conflicts erupting during adolescence. For his work on the study of cooperation and conflict, that is, for social evolution, Robert Trivers had received the Crafoord prize 2007, which is considered to be Nobel prize of biology.

I could mention many more important themes where Robert Trivers has given us important and stimulating insights, such as for example in the field of sexual selection and sex ratio theory, or on questions of morphological symmetry in organisms. In his study year at the Wissenschaftskolleg zu Berlin, Robert Trivers is finishing a book on one of his long-standing interests – the power of self-deception in humans. Indeed we are very well endowed with the capacity to hide reality even before our own awareness. During the Santa Cruz time, Robert wrote a paper on how an Air Florida Flight might have crashed. It appears the crew deceived themselves about the real situation ignoring the reality of ice having formed on the wings, which led to a catastrophic loss of aerodynamic lift. (He wrote a paper on this case in 1982, with Huey Newton, then imprisoned chairman of the Black Panther Party.). But why are we such powerful self-deceivers? The short answer is that we might have evolved to hide our true intentions even from ourselves so as not to inadvertently reveal important strategic information to an adversary and competitor. Such could be the power of this selective advantage that this capacity sometimes can be damaging.

But tonight Robert Trivers is talking about one of this superficially simple but actually quite hard subjects – genetics, and in particular, about genetic conflicts. On this subject, he and Austin Burt have co-authored a book (2006; Harvard University Press). But I will of course not pre-empt his talk, but just leave you with this: Robert Trivers' career is a remarkable example showing how University systems can make great people—it is not the endless discussion about changing systems or the need for credit points, but it is the other people that are there, the scientists, the role models, those that encourage and those that provoke. The formalized routes we fancy so much today is not really what inevitably made great scientists in the past. Turning to tonight's lecture, much of what Robert Trivers has worked on, especially the role of genetics for the understanding of phenotypic evolution, Ernst Mayr himself would have been very sceptical about and Mayr could never get excited about selection at the level of genes. But this is the great thing about science – you stand on shoulders of giants to see farther than them and to be able to take a new route. Robert's shoulders are of the same category and he has indeed shown us many new paths to follow.