Committee I
The Evolution of Man

DRAFT - 8/15/88
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TRADITIONAL ETHICS, ETHICAL DECISION THEORY AND EVOLUTIONARY ETHICS

by

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The Seventeenth International Conference on the Unity of the Sciences
Los Angeles, California November 24-27, 1988

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1. FOUR MAIN CURRENTS IN CONTEMPORARY ETHICS.

Ethics has always been the heart of religions and one of the most respected philosophical disciplines. In the last decades philosophical ethics has undergone a drastic change, it multiplied. Today four new disciplines, - analytical ethics, decision theoretical ethics, evolutionary ethics and, finally, applied ethics, such as medical ethics, bioethics, etc.- dominate the field. Analytical ethics (Broad 1950, Hare 1950, Rawls 1971) revived traditional ethics by introducing new formal concepts and logical methods with the purpose to make the language of traditional ethics more precise.

The second discipline, ethical decision theory (Harsanyi 1976, Sen 1970, Leinfellner 1978) found a new, scientific answer to the Kantian question: "what shall we do", when we face an ethical conflict. Decision theory already had used mathematical and statistical models of decision and game theory, a new interdiscipline, to explain and compute solutions for social, economic and individual conflicts. By including ethical conflicts, decision theory specialized to solve these types of conflicts. Harsanyi called this new ethical discipline a general theory of human social behavior, which proposed a variety of models how to solve optimally ethical conflicts between even opposing alternatives. To solve ethical conflicts does not mean simply to maximize the individual's own utility, but rather

optimizing the stability of a group or society. There is a clear distinction between maximizing and optimizing. Maximizing is the egotistic strive to get the absolute best, without regard to anybody else's grievances. Optimizing means to get only the best possible, especially in situations, where we may harm or suffer from the "others" (the society) and depend, at the same time, on the uncertainty in our environment and on risk.

In ethical decision theory ethical conflicts turned out to be conflicts between individual (egotistical) interests and collective welfare or altruism. To solve ethical conflicts formalized, ethical principles have been imposed on rational decision models of decision and game theory , such as the Pareto principle (the golden rule), freedom, equality, justices. Shortly: the "ethicizing" of decision theory began with Braithwaite, Arrow, Sen, Harsanyi, Rawls, Leinfellner, to mention just a few (Braithwaite (1955, Arrow 1963, Leinfellner 1979).

Finally, the third new trend in ethics applied the concept of evolution to ethics and regarded our present ethical behavior as the end product of a historical evolution, lasting over generations. The evolution of ethics and ethical behavior turned out to be, as Löwenhard expressed it (Löwenhard 1981), an interactive cultural process, using the mechanism of adaption, selection and learning. In addition, evolutionary ethics, influenced by evolutionary epistemology shattered the paradigm of "aprioriism". Knowledge is now the "a posteriori" product of biological evolution, and is conditioned by the previous states of the development of our sense organs, the neuronal efficiency of our brain, especially of the mammalian, limbic system and the

neocortex, in brief, by the previous experiences of our mental and cultural evolution (Popper 1972:194, Oeser 1976:48))

Sooner or later evolutionary ethics included sociobiology, (Wuketits 1984: 179-201, Leinfellner 1986a, 1988a) genetics, anthropology and the mathematical models of game and decision theory to explain the evolution of ethics within the context of our cultural evolution. Today, evolution of ethics consists of a series of solutions for the same ethical conflict, which may last for generations. It is a temporal sequences of better or worse solutions of the same conflict and presupposes a storing capacity (memory) of the individual's and the generations good and bad experiences, an exchange of information and is therefore a typical learning process.

Of course, not all evolution means progress, but evolutionary ethics regards the "ethical progress" as transmission of a particular culture by imitating, learning, teaching, education of the infants and by genetic evolution as a process from generation to generation, which optimizes the stability and survival chances of societies. Stability means the existence of relative, invariantly used customs which are used again and again and are nothing else than repetitions of the evolved, optimal solutions for the same conflict as generations pass by. Optimization is therefore the hidden motor of ethical evolution. It is unimportant, wether we consciously, rationally or unconsciously solve ethical problems. Evolution of ethical behavior is an indeterministic process, since it may be disturbed and haunted by uncertainty and risk. At the end the relatively stable solutions, used again and again in our societies render our

society, group, family more stable, and as we will see more just. However, we can never predict that ethical evolution will lead to an absolutely ethical society, but only to a more or less ethically better one.

Today all ethical systems, (here, ethics is used as equivalent to morals) share a common interest: to solve ethical conflicts. Whereas traditional ethics gives us only yes or no answers, what we should do or not, i.e.how we should solve a single ethical conflict, typical solutions in evolutionary ethics are different. Since they are stretched over generations ethical solutions are characterized by an increasing proportion of altruistic solutions. Ethical conflicts are conflicts between extreme egotistic and extreme altruistic interests, their optimal solutions establish a relatively or evolutionarily stable compromise between both extremes, which is not necessarily always a 50:50% solution, as proposed by "love your neighbor as you love yourself or by Kant's categorical imperative. If we have on a unit length on the left side ß=100% altruism (A) and on the right side (1-ß)= 100% egotism (E), then altruism will increase, when ß increases (see chapter 4 and 5). Both extremes are only highly abstract ideals according to Schlick. A solution at a certain time, of a certain ethical conflict is, for example, a mixture of 53%A (altruism) and 47%E (egotism) (Leinfellner 1985).

From a game theoretical point of view there exist three kinds of stable, optimal solutions. The first approximates a fixed, steady equilibrium or compromise between the competing alternatives. This solution leads to steady, ethical customs or cultural states, as in the case of religious equality before god,

incest avoidance or village fissioning. Interestingly, the second, equally good solution is cyclic. This will help us to explain why we have so many, periodically changing ups and downs in style, cycles in our moral development, in sexual behavior, in politics, economics and culture, especially in styles of art. A cyclic solution reminds us of the ups and downs of a sinus curve or of a pendulum swinging equally to the right and to the left.(Leinfellner 1988a: 41-43) The third solution permits cooperative, symbiotic outcomes where both parties support each other.(see chapters 4,5 and Leinfellner 1984: 251-256, 1986b: 141-147)

Thus, relatively stable solutions of ethical conflicts create, by approaching an optimal solution, the "cells" of cultures: customs or rites, which are characterized by relative invariance, stable equilibria or by minimax strategies. This tendency is, for example, clearly expressed in Christian ethics by "Love your neighbor as you love yourself". Philosophically by the categorical imperative: Act on maxims which can at the same time serve as universal principles".(Leinfellner 1978:52-57,1985-:331-349). Here maxims represent the egotistic interests, principles the altruistic ones. Hares "univerlizability", Harsanyi's interpersonal Rawls original position and his minimax principle (Rawls 1973: 17-20) are similar decision-theoretically explained, optimal solutions, where the decision maker "puts himself into the shoes of the others", i.e., compares his values with the values of the "other" for the purpose of finding an optimal, just solution.

Certainly, the main problem of all ethical systems is the

quest for absolute values and highest norms which found a clear religious answer in the Decalogue. On the other hand, evolutionary ethics searched for the empirical origin of "pre-religious" values and customs, rules, the predecessors of today's ethical principles. This task does not necessarily contradict the religious and the rational explanations of the origin of ethical rules and principles.

"Ethicizing" decision theory therefore is the missing link between traditional and evolutionary ethics. It succeeded in three steps. The first was the "Ethicizing" of static game and decision theory. This first step has imposed on static game and decision theory (theory of solving single conflicts by optimizing individual and group interests and computing the equilibria or compromises) a variety of ethical rules, such as the Pareto principle (expressing a minimal ethical desiderium), equality, freedom (Braithwaite 1965, Arrow 1963: 28-31, Nash in Luce-Raiffa 1958: 124-128). By superimposing more and more ethical rules in mathematical form (Fleming 1938, Harsanyi 1976, Sen 1970, see Leinfellner 1978:52-55,1979:486-490) normal game theory changed to ethical decision theory i.e. to a new extended game and decision theory, capable of solving ethical conflicts. Thus, normal game and decision theory which already successfully have solved private, economic, social and political conflicts were able to solve ethical conflicts.

The second step was the incorporation of uncertainty (caused by randomness) and of risk (expected harm, disadvantages or advantages) into psychological versions of decision theory.(Allais-Hagen 1979: 3-148). This changed ethical decision

theory to an intrinsic statistical theory. Intrinsically statistical means that such a theory permits only average and group predictions about future, ethical behavior. Further, decision theory under uncertainty and risk incorporated the influence of biological adaption and selection into game and decision theory.

The last step has been the iteration of conflicts. Iteration changes static decision theory to a dynamic theory, well known as the theory of dynamic differential games. (Eigen & Schuster 1979, Maynard-Smith 1982, Leinfellner 1984,1987). "Dynamizing ethical conflicts" introduced important,intelligent factors, such as cognition, memory, learning and inferencing into dynamic game and decision theory. Suddenly it could explain theoretically evolutionary processes including adaption and selection. Finally it led to an explanation how the evolution of intelligence could possibly work (Leinfellner 1984, Leinfellner 1987)

Quite generally ethical decision theory rests on three presuppositions. 1) On the pessimistic thesis of man's ethical and social nature, usually known as strive to maximize his own egoistic profit, utility and advantages. This expresses the fact that we carry with us in our genes a pre-cultural, animal and asocial heritage which acts as a competitor and antagonist to our ethically oriented culture, and 2) on the existence of perpetual social and ethical conflicts i.e conflicts between extreme egoistic and extreme altruistic interests, which we have to solve and terminate. They are perpetual because of the randomness and changes in our environment and in our society. 3) Finally on the assumption that the optimal terminations of conflicts have

generated in the course of evolution our relatively invariant customs, usages, rituals, institutions, whose rules and commandements help us to solve our conflicts.

Evolutionary ethics deals with the fundamental problem of all societies: how optimal and stable solutions for conflicts between egotism and altruism or between the individuals' egotistical interests and the welfare of the society evolved during the history of our culture. This amounts to an empirical, evolutionary explanation from where the precursors of our ethical principles and rules come, which we find expressed very clearly in our advanced religions.

2. EVOLUTIONARY ETHICS, GENETICS AND COEVOLUTION OF GENES AND CULTURE

Evolutionary ethics and modern sociobiology provide a new answer to the question how the ethical rules or principles evolved. Both disciplines reject the older Darwinian view that ethical rules,(the traditional principles) have been created solely by biological selection and biological adaption. Certainly, we are not accustomed to thinking about ethics in terms of genetics or biology. Modern sociobiology, however, has contributed to the study of the evolution of ethics and moral customs in an astounding way and genetics has revealed new insights into the roots, practice and the rise of ethical solutions of conflicts in our societies.

For thousands of years, philosophers have been haunted by the question of how the human mind may be related to our physical nature. After more or less unsuccessful metaphysical speculations as to whether the mind is dependent on the body, or the body on

the mind, today's empirical sciences, above all brain physiology, sociobiology, genetics and anthropology, have found a new answer to the old question. It has become obvious that the individual mind is passage to, and part of, our present objective, social form of mental life, our culture including our ethical behavior. But the vexing question arises again :is culture a castle in the air and completely independent of our biological substructure? Or is it dependent on the latter? Or are "downstairs" and "upstairs-", body and mind, just two ingredients, interconnected parts of one solid dynamically evolving system which we call culture?

The most dramatic development in this connection occurred during the 1950s, when all of a sudden our knowledge about "downstairs" changed radically. Genes were now considered the cradle of life, and the determinant factors of our biological evolution (Dawkins 1976: 2-94, 1986:11-131,216). When biologists began to decipher and read the information stored in the genes of our chromosomes, genes turned out to be a DNS- or nucleotidian-memory of the species, where experiences from the past of the species are encoded and stored.From that time genes serve as the ultimate physical carriers of information and rules by which inheritable characteristics of animals, including humans, are transmitted to succeeding generations.

Suddenly, our biological nature began to look like a huge computerized factory, where instructions resembling the rules of computer programs are stored away in the library of our genes for future use. Astonishingly, we find here the blueprints not only for the construction of our body, for our metabolism and our sexual behavior, but also rules for our socio-cultural behavior, for rites, customs, institutions. It is therefore

not astonishing that they regulate our social behavior as regards, for instance, avoidance of intraspecific killing, incest taboo, courtship, and discrimination between ingroups (family, hordes, groups) and outgroups, to mention only a few. In short , our socio-cultural behavior was supposed to be preprogrammed and regulated by genes, called regulatory genes.

But the old question once more began to haunt the sociobiologists: where did these regulatory genes of our socio-cultural life and of primitive ethical and moral behavior come from? Did they already exist in the chromosomes of our primitive ancestors before the dawn of culture, or has the cultural evolution "inscribed" these rule like instructions into our genes? Modern sociobiology has assumed the latter, almost incredible hypothesis.

We agree with Lumsden and Wilson (Lumsden & Wilson 1981), that long lasting, optimal cultural, social and moral rules of behavior, rules for forming institutions etc., which optimize the stability and survival of the society, have become encoded in our genes during the millennia of cultural evolution. Institutions and customs etc., if they optimize the stability and survival of our society, are "written down" in the programs of the "library"-(our chromosomes), enough to fill 12o volumes of the Encyclopaedia Britannica. It seems that suddenly we have, instead of one biological, Darwinian evolution, two evolutions: the biological and the cultural evolution. But Wilson and Lumsden deny any form dualism, they are interactionists and assume that both tracks of evolution are intertwined and interact in the following complementary sense. Firstly, after a long period, lasting for generations, of acquiring, learning, teaching and traditing customs,

which support the society's stability and survival, these customs will get established or institutionalized. Secondly, this is done, sooner or later, by being "written down" and stored in the library of our chromosomes, in the genes. Thirdly, the encoded information and rules in the genes start to influence and steer our cultural life in some kind of a feedback.

The whole model of coevolution is a very complex, dynamic transmission system with feedback or loops. Systems employing feedback possess closed loops. In feedback systems a fraction of the original output (customs rites) is returned to the input (the genes), like in any learning process. Therefore a long lasting sequence of established, optimal solutions of ethical conflicts (customs, rites institutions), will get encoded in the genetic storing system, our genes and will from here again steer, control and push foreward by optimization the society's stability. In a dynamic control-system like coevolution, the information returns from the controlled process (cultural evolution) to the genes and transmits its response back to the cultural evolution (customs, rites). During this loop information is modified and adapted to an optimal response -to help attain an optimal continuation of coevolution- Of course, optimal always means: optimizing stability of the society.

Coevolution is therefore a selforganization of the precursors of our present ethical principles, the realively stable usages, rites, customs and institutions. They are the evolutionary products of the coevolution. Learning, teaching and tradidting of optinal customs create rites which, in course of the evolution will be, as in all closed-loop systems "written down " and stored in the genes, from where they influence the course of coevolu-

tion. These encoded information (rules) enforce or weaken, shortly control the continuation of the coevolution, vice versa the cultural evolution controls the biological evolution.

Thus, genes and culture guarantee synergetically and genetically the cultural stability of behavioral traits and customs as generations pass by. It seems that culture uses for security reasons a double bookkeeping system: one part of which is deeply hidden in the genes; while the other is our conscious knowledge that has been amassed in oral tradition about right ethical and moral conduct and finally showed up in our books about ethics and moral behavior. Thus the above mentioned problem of consciousness finds an original new solution :it shows up in linguistic,interpersonally understandable form. This explanation resembles the Freudian and Jungian division of our psyche into the unconscious (id) and the conscious part (ego or perception, self perception, feeling, imagination, awareness, adaption to the reality, memory, thinking, etc.) with the superego, our culture and their interaction (sublimation,suppression)

3.CAN GENES INFLUENCE OUR ETHICAL BEHAVIOR ?

According to evolutionary epistemology, genes regulate, and are responsible, not only for the Darwinian struggle for survival, but clusters of genes or supergenes may be responsible for the evolution of distinctive anatomical, brainphysiological, cognitive and behavioral traits of our organisms and therefore, for the specific way of how we feel, behave socially, image, and think, decide and act. Genes, however, are not stupid dictators. They reward, as Mach and Schlick already anticipated (Leinfellner 1988d: 117) in a clever way certain genetically optimal actions,-

sexual behavior, customs and, last not least, ethical behavior, with a plus of pleasure or pleasant feelings; while suppressing unfavorable ones through the accompanying displeasure.

It is clear that not all the ethical, social solutions can be caused and regulated in a deterministic sense by the genes. The gene-hypothesis, together with Jacob and Monod's operon hypothesis, regard rules as information, stored in operator-genes. They influence and regulate life supporting, ethical decisions, semi-unconscious, sentimental preferences, etc., an influence which finally shows up in our conscious imperatives, commandments and instructions, shortly as ethical "oughts". This is exactly what Lumsden and Wilson understand under "epigenetic rules"(Lumsden & Wilson 1981:7, 36, 208-222). Enculturation or learning and teaching the young among people's own generation, enforce epigenetic rules, a process which begins already to work in higher mammalian animal populations. On the one side, incest taboos, pleasant social family behavior, imitation of social customs are enforced by learning, teaching and education of the infants. On the other side, they exist in encoded form in the genes as rules genetically anchored and stored rules. Both regulate and influence primitive social and moral behavior in an ethical sense. The verbal expression and conceptualization is only the last "conscious" step in the coevolution of eucultures.

In brief, since a deterministic influence is unlikely, we have to assume that genes can only make us inclined to do something, but they cannot force us.

According to evolutionary epistemology and to Wilson and Lumsden, coevolution has created the ways and forms of how we see

our world, the "hardware" or the "glasses" through which we see the world- an argument which has been worked out in details by Popper (Popper 1972) and the Viennese evolutionary epistemologists (Wuketits 1983,1984). We know that genes exert a physiological influence on our peripheral sensory filters, they produced the older primary programs, or the "software" for the interneuronal coding processes, for the functions of our limbic system and our neocortex and through the latter regulated the semantic functions of our language and finally the preference for certain customs and for optimal ethical solutions. Thus, we can say they are even responsible for the oldest part of our "software".

But the longer coevolution worked, the more our forebrain took over the control of the centrally located, secondary cognitive procedures of perception, preferences, evaluation, of our ways of learning and decision making, of our representation of vision, color classification, name formation, the development and meaning of facial expressions and gestures, of tastes and emotions, the instinctive behavior of human parents, the forms of fears and phobias, incest, preferences for taste, aesthetic forms and even our experience of space and time. Thus the younger,secondary "software" is an indirect product of the genes and a direct of the evolution of our mammalian limbic system and of our human neocortex.

To sum up, our genes, our brain and the momentary state of our culture, which, as we already know, are the products of past evolution mutually influence the future evolution of our culture. Therefore our ethical preference behavior, the artifacts and mentifacts of our culture, the institutions, mental concepts, theories and the technical inventions transmitted by

learning and teaching among the members of societies are intermediate stages of a perpetual evolution.

The mutual interdependency of culture, the human brain and the genes resembles more a series of interdependent games between two opponent teams (genes versus human brain-culture), than a continuous development; each team consists of many, and often divergent, participants or factors which influence the solution of each ethical conflict. Each participant may influence the other participant's actions through its moves, vice versa. Participants can compete, or they may even cooperate, if it is optimal for them. This gives us a game theoretical picture how ethical and cultural evolution is moving along the two tracks: the biological and the cultural evolution which taken together produce the coevolution. Each of them pushes the other ahead; their visible end products are the rules how we solve our ethical conflicts in an optimal sense, the relatively stable customs, beside artifacts (artistic and technical realizations) and mentifacts, abstract ideas and theories.

But all optimal solutions of ethical conflicts, all established customs remain stable only for a certain period of time; they may cease to work or be improved, when the environment changes and /or cultural or biological selection sets in. Also technical, social and cultural innovations -in medical ethics or in bioethics, life supporting machines, organ banks, gene manipulations etc.- may need new ethical solutions.

Lumsden's and Wilson's gene-culture coevolution theory, rests on the assumption that the relatively stable products of our culture, our institutions, customs and ethical rules, our mental concepts, theories and the technical inventions, the

arti- and mentifacts, which are transmitted among the members of societies by imitation, learning, teaching are recorded and stored in our brain's external linguistic memory such as books,- libraries or Popper's third world (Popper & Eccles, 1977:36--50,408-410,547-554). Finally they will be recorded,too, and stored in our genes, but they loose their efficiency, when they don't guarantee any longer societal stability and survival.

Coevolution complements Darwin's theory of biological evolution by merging natural selection with cultural selection. Cultural evolution is no longer a mere biological, genetic evolution. Darwin's motor of evolution, the maximization of survival, has been replaced by the optimization of cultural or social stability. In cultural coevolution, Darwin's competitive, gamelike struggle for survival is getting less and less important: cooperation, symbiosis and synergetic interaction between genes and culture become the steering factors of ethico-cultural coevolution. Thus the new sociobiology and evolutionary epistemology have literally revolutionized Darwin's sociobiology. From now on, genetic and cultural evolution are mutually interacting evolutionary paths which form the self-organizing process, the "gene-culture-coevolution". This will become more and more important for the explanation of the origin and the evolution of ethics.

Biological, genetic evolution channels and steers the cultural evolution, vice versa. New social and ethical traits which render their carriers better adapted to the environment and to their society, enforce through generations societal stability and influence the biological evolution. There is a caveat: "evolutionarily stable" means only "relatively stable",

"stable for a certain period of time" (maybe months or years, hundreds or thousands of years), that is, as long as no grave changes disturb the already achieved stability. In the same sense is "ethically stable" a relative notion. Unforseen big random events, social innovations etc. may render relatively stable customs and ethical behavior suddenly unstable, make them disappear from the cultural scenario, to be replaced by better ones. Whereas present Darwinian sociobiology is based on a "bottom-top" (downstairs-upstairs) deterministic causal influence of genes on culture, neosociobiologists have weakened this bottom-top causality to a soft (statistical) and a mutual causality. Additional feedback of culture on genes, in brief, the "top-bottom" soft, causal influence of our culture on the genetic evolution got the upper hand.

4. THE EVOLUTIONARY ORIGIN OF ETHICS OR GENES VERSUS THE HUMAN BRAIN ?

The present, synergetic function of gene-culture coevolution and the quest for an evolutionary explanation of the origin of culture, of ethical principles and rules is quite a different story. Wilson's and Lumsden's bold theory (Lumsden & Wilson, 1984) assumes that the dawn of our culture began, when once, in the misty past, a group of regulatory supergenes (the Promethean genes) took over the "government"of all biological genes. They have freed our ancestors from the rigorous dictatorship of the mere biological genes. As a consequence of this revolutionary step, these supergenes began to build up step by step our limbic system, the neocortex, and our social consciousness and the evolution of our present euculture began..

Historically speaking, supergenes "started" the evolution of our forebrain; the intelligent forebrain in turn "created" the ethically important free choice, or what we call "free will or human freedom" which enables us - unfortunately or fortunately - to rebel even against our biological nature and against evolution itself. The antagonism between the genes (our primary genetic, biological inheritance) and our mind, intelligence and culture (our secondary inheritance) has been seen by sociobiologists as some kind of evolutionary conflict between the genes and their primary rules on the one side and the human, limbic system, the neocortex with their secondary rules, on the other side. Dawkins said once that the genes never should have freed culture by developing the nervous, neuronal system and our brain, since this evolutionary step has freed at the same time man from the dictatorship of our biological genes. From that point on the genes have given up their power to a cluster of supergenes and to the human brains and to our culture. The bad news is: our ability to commit suicide, genocide and even destruction of all life on earth which demonstrates our "omnipotence" over the genes. We gained the possibility and power to act even against optimization of survival of all forms of life on earth. The good news is: self-destruction and extinction is not any longer an unforseen, unpredicted random event it can be predicted and prognosticated. Fortunately, because of the genetic feedback in such a case, self preservation will be activated and enforced by the genes and will become stronger and stronger. It will manifest itself in our societies and will show up in our social consciousness sooner or later. Then it is high time to understand the message before it is too late.

Certainly, the evolution of the mammalian limbic system triggered our higher feelings, sympathy, compassion and the evolution of our neocortex human intelligence and free choice. Coevolution again evolved guilt, responsibility and justice, the first ethical concepts. This is a step in the evolution of intelligence and culture which the genes - according to Dawkins - should never have started, because it lead - as already mentioned - to a breakdown of their absolute power and to an emancipation of our intelligent brain, mainly because of the evolution of higher feelings and of the human Promethean foresight, i.e., the ability to predict and explain the past and the future. The emergence of conscience started and this looks like a new biological interpretation of the old myth of the original sin.

Only our species reached, by realizations of artifacts and mentifacts, by language communications etc., a "linguistic" cooperation of our brains which is the basis of our eucultural level, the highest form of culture. Hand in hand with this, education of the young favored the evolution of the higher feelings of sympathy, love amongst ingroups (relatives), socialization and finally the most precious ethical and religious concept of "AGAPE" or love between all humans . Cultural coevolution will not likely end, provided we follow the optimization of our survival and don't commit genocide. The coevolution-thesis is supported by the fact, that even nonhuman animals - about 10.000 species - possess certain forms of culture, called "protocultures".

The coevolution, that is, genes competing or cooperating with culture or reacting against it, can also be explained theoretically, as Leinfellner described it, by the theory of

dynamic games where the genes are interpreted as participants and act (play) against, or cooperate with, the culturally established customs, traits, vice versa.

Actually evolutionary ethicists are split into three fractions.

1) The suppression or bioethical fraction, (Wuketits 1984,Lorenz 1983, Riedl 1982, Vollmer 1983), who are convinced that our mind, practical philosophy and ethics are superior to genetic influences and are able to superimpose ethical rules on genetic ones. They assume that studying biological evolutionary processes and their rationale, the life preserving tendency will help us to correct perilous, cultural derivations. They believe that our mind and culture is able to consciously inhibit by a suppressing mechanism any ethically inferior genetic impulses. An "enlightened bioethics" has to approximate and adapt legal and ethical principles to the biological maximization of survival of life on our planet earth. It has to reform old ethical norms and values for the sake of suppressing our egotistic, genetic impulses in favor of life preserving, altruistic developments.

2) The second group (Dawkins, Darwin) is split up into two fractions: one part stresses the dependence of ethics on genes, albeit its members do not insist on the view that genes are fixed and unmodifiable. The other part regards the influence of the mammalian limbic system and the neocortex as decisive for the evolution of culture and ethics.

3) Finally the coevolutionary view (Lumsden, Wilson) regards both the genes and the culture as two interrelated and interacting evolutionary processes, which jointly have built up our cultures.

5. THE FIRST EXAMPLE: FROM FAIRNESS TO "THOU SHALT NOT KILL THY NEIGHBOR".

Evolutionary ethics assumes that there exist different genetic factors which regulate 1.interspecific killing of animals of different species, for instance for food between predator and prey, 2.intraspecific killing of animals of the same species and 3.killing in self-defense. The latter is certainly one of the strongest survival mechanisms, if we are put into a situation of life or dead.

Solutions for intraspecific fighting are regulated by genetically fixed rules and means to settle a conflict between animals or humans for territory rights, possession of the females, ranking order within the group, etc. (Lorenz 1963). Interestingly this conflict is a contest between animals, which has been explained very well by game theoretical models (Maynard Smith 1982). The solution is always a quick termination of such a conflict and is softly determined by many genetic factors. Its outcome is winning or loosing, without killing the other animal or self inflicting heavy wounds. In such a fair contest no animal is brought into the situation to kill the other out of self defense. (Notorious exceptions are the rats and the humans). Intraspecific fighting is therefore not a Darwinian struggle for survival, but rather a fair contest with the purpose to terminate social conflicts between animals. Long before the Decalogue's famous commandment,"not to kill your neighbor", there existed inherited, instinctive rules of a quasi-moral character, deeply encoded in the genes and enforced by the mammalian limbic

system, how to solve such a conflict without killing the rival. Thus inherited rules exist which weaken aggression and avoided the extermination of fellow members. These rules achieved quick termination of social conflicts, optimized societal survival,stability and finally minimized unnecessary pain.

We want to analyze this agnate set of rules, encoded in a cluster of genes, for the purpose to demonstrate how morality may have evolved at a very early state of protocultures and how the interplay of rites and genetic factors gave birth to forerunners of moral rules, such as: "Thou shalt not kill thy neighbor"

A lion could kill his rival with one deadly stroke of his pawn, ravens can peck out the eyes of another raven with one thrust of their beak, but in reality this never occurs, with exception of accidental killing. Therefore we have to conclude, according to Loren z that there must exist some preventive, genetically fixed rules that the stronger the ferocious and dangerous animal's natural weapons are, the stronger the preventive instinct not to kill. This is actually enacted by a set of rules, encoded in the genes, which regulate fair contests. Here again the conflict-solution is optimal for the animals and the stability of the species. This means that genes control, even if it lasts through generations, an invariant, non-killing "protocultural "rite" for intraspecific fighting.

What are rites of fair contests then? Nothing else than optimal rules, encoded in the genes, which solve conflicts in an optimal, non-killing way. From an evolutionary point of view, this ritualization is a typical example, how protocultures may have started and optimization of societal stability began to

work. It is clear, as Maynard Smith convincingly has shown, that animals which have not learned to solve their intraspecific fights by such an optimal "ritualization", either will suffer from lethal terminations of their conflicts, or will be killed early and therefore will have few, if any, progeny. They can not contribute to the gene pool or to the socialization of the young. Too belligerent animals and warriors simply die out and with them sooner or later the species.

But how is the situation in highly socialized, human societies? Since humans have a harmless, omnivorous nature, they are lacking strong natural weapons and consequently are devoid of any strong, genetically inbuilt, killing-preventive rules for intraspecific fighting. But, when humanoids or humans invented powerful artificial weapons, a catastrophe occurred. Man was only accustomed to use his relative harmless natural weapons, his hands and teeth, and had no genetically fixed inhibitions to handle powerful weapons in contests with his conspecifics. His weak preventive, non-killing-genes "misinformed" him, since they "informed" him very well about his relative harmless hands, but not about the deadly weapons in his hands. Moreover, any fight to the death due to the powerful, lethal weapons could activate the archaic, genetically rooted self-defense mechanism, deeply rooted in the genes of all animals. Since all humans are guided by a very weak killing-preventive mechanism, encoded in their genes, they would have killed each other or would commit atomic genocide today, if not cultural coevolution had produced social and ethical rules, principles, expressed clearly in religious commandments such as, "Thou shalt not kill". They began to enforce the existing weak preventive rites by fair and ethical

rules. This may explain how Rawls' fairness, on which he founded his ethical principle of justice, gradually evolved. Humanity would have killed itself already by its first artificial weapons, one and a half millions of years ago, if not, at the same time, cultural and later religious rules would have prevented it. This is an example, how moral rules, ethical principles and genetically rooted drives interacted and created ritualizations of social behavior.

From an evolutionary point of view, the evolution of moral rules which forbid intraspecific killing are very young. The moral tragedy began with the inventor of pebble tools, the African Australopithecines, who promptly used his new weapon not only to kill for food, but fellow members of his own species and continues today with the pilot in an atom bomber. The pilot, who presses the button and releases the bombs is genetically and militarily completely screened against seeing and experiencing the consequences of his deadly action. His genetically encoded preventive mechanism is blocked and too weak, his self defense not enacted and the ethical cultural inhibition too young and too weak... In the other case of war, when infantrymen are brought into the situation of fighting to the death, eye in eye with the enemy, by their superiors and politicians the archaic self defence is activated and killing the final, bitter outcome.

On the one side, gene culture coevolution theory can show us one possible way out of this dilemma: we have to enforce by education and belief the religious and ethical commandments of fairness and not to kill. But that is not enough, we have to understand the scientific explanation and the genetic causes of the biblical "Thou shalt not kill", otherwise we will not cease

to kill our fellow man. On the other side, it is even questionable, if fairness can ever override and dominate genetically the stronger self-defense-genes. There seems no way out than understanding the religious commandment of "love your neighbor as you love yourself" and acquire a clear, scientific insight in these dangerous conflicts. We may hope that only then we will become aware of the dangerous military warfare, which tries again and again to misuse humans by putting then into the deadly situation of "innocuous", screened killing or of fighting for survival in the case of self defense. This shows very clearly why we need the dominant and enforcing role of cultural and moral factors over genetic ones, since it is unlikely that fundamental weakening of the genes which regulate self-defense will ever occur.

6. A SECOND EXAMPLE: THE EVOLUTION OF COOPERATIVE ETHICS

Another crucial problem of evolutionary ethics is: how can we explain the "conversion" of egoists to altruists, vice versa, before ethical principles or commandments existed? The question is: what is earlier the egg or the hen, the custom or the principle, the rule? For that purpose we have to replace philosophical moral terms by biological,for instance, "egoism "by "competitive behavior or competition", "altruism" by "cooperative behavior, cooperation and symbiosis". Since ethical conflicts are serial conflicts we have to explain the emergence of cooperation from non-cooperation or competition (Axelrod 1984).

In a simplified version of se rial conflicts, the dealer's game, two individuals want to exchange some amounts of goods, which one individual possesses and the other badly needs.

Each agrees to leave a bag full of the desired goods for the other at a designated, secret place. If this is only one single exchange,it is, beside randomly occurring cooperative exchanges, always optimal to choose the noncooperative, egotistic strategy, cheat the other individual and get a full bag for an empty one. But iteration makes both dependent on the other partner and builds up a "minisociety". If the game in this minisociety is iterated, a social learning process starts, because the other bargainer has the possibility to retaliate and teach the noncooperator a lesson. Much depends, of course, in the iterated game, on the socio-environmental situation (3), i.e. on wether both really need the exchange of rare goods to live. The dealer's game explains game theoretically and socially, just as the Prisoner's Dilemma, why the partners change from egotistic, noncooperative behavior to cooperative, altruistic behavior and why, if from time to time inveterate egoists may try their luck and insist on egoistic cheating, will loose.

The question is now, how can we test the emergence of a stable cooperation, which in nature will take often hundreds or thousands of generations? Today the evolution of cooperation can be done by a computer simulation, which tests this specific evolutionary model by letting it run on a computer, simulating easily thousands of conflicts of thousands of generations. Thus we can test under which conditions and strategies cooperative customs evolve.

In Axelrod's famous computer-run- test (Axelrod 1984,206--216) the computer had been fed by all sorts of strategies, submitted by the invited 2oo decision- and game-theorists. In this computer run test of a tournament each strategy represents

a generation and we can see when the proportion of cooperative solutions begins to increase.

Now the test showed that, if both cooperated and each adopted and maintained invariantly, in the long run, a cooperative strategy, then both were be better off in terms of survival, stability of their minisociety and both stayed alive. The symbionts and altruists survived and the noncooperative, egoistic organisms lost or disappeared from the scene.

In terms of game theory, there are two conditions and explanations for the emergence of cooperative behavior: superadditivity (1) and the socio-environmental condition (3). Cooperation leads, as we have seen, to the evolution of strong holistic, societal systems (minisocieties, families, hordes, groups, societies) and this emergence can be expressed mathematically by the superadditivity (1). According to this condition, the sum of the rewards or survival values sv, for both symbionts, or members of the newly formed holistic minisociety, the group, shortly their union: $sv(SM \cup SR)$, is always greater than the sum of the rewards or the survival values of the single individuals, acting out of pure egoism $v(M)$ and $v(R)$. Therefore the whole: $vs(SM \cup SR)$ is greater than the sum of the parts $v(M) + v(R)$, as expressed by the inequality or superadditivity formulation (2):

(2) $$vs(SM \cup SR) > sv(M) + sv(R),$$

It is clear, why superadditivity increases the stability of symbionts, groups, societies and why it is deeply rooted in the genes. It explains why minisocieties, families, hordes and clans have evolved. It has an empirical and a methodological aspect. Empirically it expresses the fact that within holistic systems

the parts acquire better rewards and a better survival power than in isolation. Methodologically it introduces indeterminism in the theory. Superadditivity looks like a scientific commentary to the old Aristotelean principle: "the whole is more than the sum of the parts".

Axelrod's tournament was a computer run, nevertheless experimental test, where each of the participants had to feed the computer with his strategy. A strategy is a prescription how to counter the moves of the other players. The question was: who will win, the egoists or the altruists? The following matrix (2) describes the rewards (winnings or losses: R,T,S,P) and the inequalities (3) express the socio-environmental condition. The winnings and losses for the iterated conflicts were: if both behave altruistically and cooperate they would get the reward R; If both behave egoistically and would not cooperate, they would receive the reward P. If only one cooperates and the other not, the first would get a minimal reward of S, and the other the value T for being tempted, as expressed by a usual game theoretical matrix:

(2)

	C	D
C	R,R	S,T
D	T,S	P,P

The "socio-environmental condition" which always triggered the start of cooperation simply was:

(3) $T > R > P > S$ and $R > (R + S)/2$

The astonishing result of the tournament was that from the

about 100 submitted strategies of the participants only one won - against all the other strategies.-It was A.Rapoport's TIT FOR TAT- strategy, an outspoken cooperative strategy:

TIT FOR TAT = Cooperate always on move 1, thereafter do whatever the other player did in the previous move!

TIT FOR TAT won not only against all the other strategies in the first tournament, but won a second time, when the tournament was repeated. The practical result of these experimental games was: if we let all kinds of participants (egoists and altruists) solve such an ethical conflict, the altruistic TIT FOR TAT strategy will always win. Why we may ask? Simply because cooperation is triggered by the socio-environmental condition (3) and by the second condition: the superadditivity (inequality (1). Therefore the evolution of the historically first, cooperative behavior needs not to be based on rationality or on ethical principles. It explains how altruism evolves in a societies of meanies or how ethical, altruistic principles in form of customs or societal-use originated. Once the first cooperation evolved, it became an optimal, societal custom, which finally became encoded (see chapter 2 and 3) into the genetic heritage and in the course of coevolution had been enforced by ethical and religious conscious principles, such as "AGAPE".

Axelrod and Hamilton (Axelrod 1984: 55-69) have drawn a variety of social, evolutionary and ethical consequences from Rapoport's successful TIT FOR TAT - strategy. In a socioethical context, Rapoport's strategy means: "Be nice and forgiving". "Nice" means here "don't be the first to act egoistically" or noncooperative. "Forgiving" means in socio-ethical contexts "retaliate only once ". It is interesting to compare the TIT FOR

TAT-strategy with other moral obligations, such as the two biblical: "an eye for an eye" or " if someone hits you on one cheek, offer him the other cheek". Apparently the Old Testament's advice is too strong and the New Testament too soft, to achieve altruistic behavior at an early stage of coevolution. Therefore, Rapoports TIT FOR TAT -strategy lies somewhere between the Old and the New Testament's morality.

Axelrod's theory and its tests explained the evolution of cooperation from noncooperation or of altruism from egoism, it corroborated the view that evolution of a "protoethical customs and rules" started with cooperative phases of evolution.

Axelrod's model , under the influence of Rapoport's victorious social strategy, explained not only convincingly the transition from noncooperative, egotistic to cooperative, altruistic behavior in human societies, but could be used successfully for explanation of the evolution of cooperation and symbioses (Leinfellner 1986a: 141-143, Leinfellner 1986b:23-25).

Therefore Axelrod's model can be extended to all kinds of evolutions of cooperation. In fact, Axelrod and Hamilton have proven the following (Axelrod 1984:55-69):

An invasion of small clusters of cooperating, altruistic organisms is already sufficient to start gradually a successful increase of cooperation in the whole population, given the conditions 1 and 3. Any strategy which possesses Rapoport's "protoethical", social key strategy of niceness, forgiveness, recognizability and provocability will lead to cooperation and altruism. "Recognizability" means "a strategy easy to notice or to understand" and "provocability" means "a strategy of a quick, but only single retaliation for the noncooperator". Finally

Axelrod's theory explained how and why a population may become "cooperatively or altruistically" stable. A population of cooperative, altruistic individuals (or organisms) can no longer be invaded or destroyed by noncooperative, egoistic "meanies". Of course, it can be overwhelmed by occupying external invaders in great number. But, if once internal cooperation, the cradle of culture, has evolved, ethical customs can become automatically stable. This kind of stability is similar to the evolutionary stability of Maynard Smith and entails the consequence that such a cooperative population becomes "collectively and ethically stable". Cooperative populations are able to defend their cooperative behavior against any invasion of noncooperative behavior - a really astonishing result! There is no help against the fact that egoists appear from time to time in our society, but a collectively stable society can always protect itself from randomly appearing or invading egoists.

7. THE POSTEVOLUTIONARY PERIOD OR THE END OF EVOLUTION

Under the post-evolutionary period we understand the present, manipulated and chaotic phase of our history, very often called civilization. It is a phase, where the guidelines of cultural coevolution don't work any longer automatically, but are partly put out of action, partly hindered by chaotic developments which occur in complicated dynamic systems with feedback, according to the chaos theory. Post-evolutionary developments are partly influenced by new trends of our mass-civilization, such as media, technical engineering and by political manipulations, and finally, by our free will. Shortly, in the post-evolutionary

period evolution is not any longer a self regulating and self organizing process, but, as the expression "manipulated" means, given into our hands. We are not any longer onlookers of the drama "evolution", but became actors. Therefore we may or may not use ethical standards and principles, we may or may not optimize worldwide stability and survival.

This last question simply amounts to: what did we learn from the evolution of culture and ethics? Is it true that we learn from evolution that we have not learned anything? Or are we willing to learn the lesson from the evolution of ethics and culture ? Do we posses the patience to understand that innumerable small steps of trials and errors (gradualism) as well as sudden changes (punctualism) are necessary to achieve a relatively better society. Each step may yield either a better (altruistic) or a worse (egotistic) ethical society. If we have learned our lesson, if we don't forget to optimize stability and cooperation and let us guide by our highest, altruistic, religious values, then we will end up with an ethically better society, if not unforseen and devastating global or cosmic random events hinder us.

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