

THE
COMPASSIONATE
BRAIN

—
HOW EMPATHY
CREATES
INTELLIGENCE
—

Gerald Hüther

Translated by Michael H. Kohn



TRUMPETER

Boston & London

2006

The more unfinished the brain still is at the time of birth and the slower it develops during the following period, and the longer it takes for all of its neuronal connections to be definitively worked out and established, the greater and richer the opportunities are for the individual's own experiences and the conditions it encounters in its own life to become anchored in the matrix of its brain.

Primates—we humans and our nearest relatives, the anthropoid apes—are distinguished by the fact that we come into the world with a particularly unfinished brain that remains susceptible to formation by experience for a long time, and by the fact that we live in groups that are really extended family units, big families. Every newborn that grows up in such a group is imprinted by factors it finds there that provide a sense of safety and security, just as ducklings are by whatever mother they encounter who offers them protection—without a genetic program having built any particular neuronal connections for this into the brain. But because with the primates this imprinting is significantly more complicated than with ducks, it is no longer called imprinting but bonding.

2.3 *Lifelong Programmable Structures: The Brains of People*

If you come into the world with a brain whose final wiring—the neuronal circuitry that will determine your later behavior—is only going to be connected up, consolidated, and smoothly established in accordance with how you use it in the course of your subsequent

development, you have a big advantage. In order to preserve your inner balance and the inner order you need for your survival, you can no longer rely exclusively on the genetically anchored programs that have arisen over the previous millions of years. Everything you need most critically to survive in the world you are born into—things that are of crucial importance in the place and time in which you live—can be anchored in your brain in the form of specific neuronal connections by the concrete use you make of your brain after you are born. You can benefit from the experiences you yourself acquire with such a brain not only in dealing with your own life later on, but also in creating the conditions in which you will raise your offspring. In this way it actually becomes possible to pass on qualities you yourself have acquired to the next generation. This is indeed an incredibly great advantage, a completely new possibility: passing on the abilities and achievements gained by one generation to the next. This is the beginning of what is known as cultural evolution.

An interesting thing about this is that it does not require a human brain. As can be easily shown by experiments, rats can do this too. If you keep rats in a laboratory, you can always find some mother rats who take care of their young in a very painstaking manner, and others who are rather sloppy in this regard, who hardly build a proper nest, repeatedly leave their young alone, and in some cases even devour them. If you redistribute the female offspring immediately after birth in such a way that half the young raised by a "good" mother are her own and half are those of a "bad" mother, all of them will later turn out to be mothers who take scrupulously good care of their young. Conversely, all the female offspring raised

by a negligent mother, even if they are biologically from a "good" mother, will grow up to be "bad" mothers. We would normally presume that free-living mother rats who care for their offspring inadequately would not end up having a chance to pass on this particular quality to their offspring over several generations. But this is not necessarily the case. Rats raised by bad mothers, even if some of their siblings are devoured as babies, turn out as adult animals to be more simply structured and more strongly instinct driven than those raised by good mothers. They are more belligerent and brutal and for that reason, primarily in the case of male animals, more successful sexually. The circuitry in their brain is more "primitive," less complex, and not so densely networked. When the need is for fast, unequivocal, and uncompromising reactions, a rat with such a simply constructed brain has the advantage. Since this is frequently enough the case in a free-living rat colony, rats whose main ability is to develop a somewhat more complex, more densely networked brain ultimately really cannot accomplish much. Such rats remain the prisoners of the circumstances they live in, which they are not capable of changing. Even under laboratory conditions, the more primitive conditions cannot be kept from setting in over the long run. As soon as the lab colony gets big enough, the rats with the more simply structured brains again begin to dominate and reproduce more than the others. To give the more circumspect rats a long-term chance, the rules that govern the life of such a colony have to change in such a way that these particularly prudent, learning-capable, and sensitive rats can, like the others, find enough food, ward off dangers, acquire a mate, and raise offspring. Such changes in the life conditions of rats have never occurred

in their entire developmental history. As with the ancestors of other mammals, their ancestors succeeded quite early on in occupying and defending a habitat in which refined brain capacities were not of primary importance and in which they could succeed pretty much just by remaining the way they already were.

Our own ancestors were less successful in this respect. They were not able to conquer a niche in which they could live with any degree of comfort. Their original habitat, the African rainforest, began to shrink rapidly, until only the best and toughest climbers among the primates could make a go of things there. The habitat available outside the forest, the savannah, had already long since been occupied by species that were considerably better adapted to the conditions there. These competitors had already taken over all the possible food sources, they were faster or stronger, and were better at defending themselves or attacking others. Newcomers hardly had a chance in this specialist-ruled world. In order to survive in it, newcomers had to build up and further develop an ability that none of the others possessed. They had to stay together and try to assert themselves as a group, a clan. Only in this way could they take advantage of the different abilities and talents of different individuals and thus achieve as a community what no single one of them could achieve on his own. That was their only chance. But this could only be done by groups whose members felt closely connected with each other and in which each knew the others' special abilities and weaknesses as precisely as possible. Under these conditions, unlike with rats or other species living in groups, it was an advantage to be highly capable of learning, highly circumspect, and highly sensitive—that is, to possess a brain whose definitive pat-

terns of neuronal interconnection remained shapeable for the longest possible time by these humans' own experiences,

In the course of our ancestors' further development, this capacity was quite pointedly favored by selection. However, the evolutionary selection process involved here was not the one that has been known since Darwin's time as the "survival of the fittest," but rather more particularly a second mechanism that Darwin also recognized but that has hitherto received insufficient attention. This second evolutionary selective mechanism is known as sexual selection. Among all socially organized animals with a relatively long developmental phase, the very definite choice of sexual partners who appear attractive on account of specific characteristics and are capable of assuring their own survival and that of their offspring is of great importance in the successful propagation of the species and thus also in the further transmission of the combination of genes that is responsible for those attractive characteristics. In the course of evolution, this selective process, known as partner or mate choice, became more and more important. Along with the selection of specific physical characteristics, it led to the selection of psychological characteristics that proved highly successful in raising offspring and at the same time to selection of the genetic configurations these psychological characteristics were based on. Now the greatest success in the propagation of their species no longer automatically went to those who produced the greatest possible number of offspring. It now went to those with offspring who were the most talented at learning and at bonding, were the most prudent and circumspect, and were the most competent in forming and consolidating social relations within the extended families of

these early humans. The more effective the parents were, especially the mothers, at creating conditions conducive for the development in their offspring of these social abilities, the greater the survival chances were for the whole clan.

Criteria for choosing an appropriate mate, in human beings much more than in other animals, were (and still are) determined by the experiences accumulated by individuals, especially in the early stages of their development. Choosing a mate who seems well suited to further these experiences has for an inevitable result that the corresponding genetic configurations of both parents will become stabilized at first in the gene pools of certain families and then, through sexual intermingling, will become established in the gene pools of extended family groups, clans, tribes, and finally the entire peoples that arise out of them.

Advancing socialization brings with it the formation of stable family groups. This is an essential prerequisite for the protection of offspring against all the influences from the external world that might disrupt the maturation of their brains. It also makes possible a high degree of social determination of the developmental conditions within particular family and clan groups. Close emotional bonding between the two parents is the prerequisite for the development of the family and thus for bonding between the parents and their children. As this kind of bonding took place, hand in hand with it there occurred a breathtaking increase in the mental, emotional, and social capacities of the clans that were able to develop this kind of bonding to the greatest extent.

Just how the neuronal circuits that were not yet fixed at the time of birth later actually hooked up with each other and with already

hardwired neuronal networks in the brain depended on the concrete experiences that newborns had in dealing with challenges and threats in the real world they lived in. It became essential to hold open and unfinished an ever-increasing proportion of the neuronal circuitry of the brain; but this could only happen if the parental generation could provide their offspring with a sufficient amount of protection from external threats during the period of brain maturation. And this was possible only where sufficiently close bonding had developed between the members of the family, the extended family, and the whole nomadic group. If the bonds among the adult members of a clan were strong enough to ward off the dangers to which the children, with their still immature brains, were vulnerable, then the genetic configurations that produced ever more learning-capable brains were able to persist down through the generations. If the self-assertive, egotistical interests of the adults were too strong for them to provide the needed protection to their young, only those offspring could survive whose brain development was more genetically controlled and whose behavior was more strongly directed by inborn instincts.

At this point during the early phase of human development, a fundamental split occurred. The clans that were unable to develop the kind of emotional bonding we have been talking about could not provide the basic conditions needed for the formation of these brains, which on account of the fact that they were maturing ever more slowly also were becoming ever more adept at learning. Offspring without these kinds of brains were incapable of learning to bond closely with large numbers of their group. Creatures with limited learning ability who were still largely controlled by instinct

were unable to make the transition to humanity. There were also those who did make the leap, but when the bonding that had held them together up to that point was destroyed—in most cases by external disruptive factors—either they died out or were able to continue to survive only through the brain development of their offspring being accelerated once again and their behavior again being directed by less complex, more instinct-controlled reactions.

Our own ancestors must have succeeded in maintaining and strengthening the bond between parents and children. They must also have figured out how to make a second and much more important bond stronger and more enduring—they must have succeeded in imprinting on the brains of their offspring the sense of a close bond among the members of the family, the extended family, the tribe, and the entire community, which was continually growing in size. The better able they were to develop a sense of togetherness, the better they became at taking advantage of the mental and physical capabilities and skills of their individual members to strengthen their communities, to uncover new resources, and to fend off enemies. Thus the basic attitudes and shared convictions as well as the goals and motives for action of these early extended families and clans were transmitted from generation to generation along with the knowledge of their circumstances they had acquired and the abilities and skills they had attained. Identification of new generations with the goals, desires, and outlooks of these early human communities was reinforced by handing down traditions concerning the history and development of their ancestors. In ways such as these, human groups became progressively better at exploiting and defending the resources found in their area of settlement, at build-

ing stable social structures, at developing historical narratives and traditions that reached further and further into the past, and thus altogether in strengthening the inner bond that held them together and was the basis and motivating factor for all their common achievements.

On the long road of development through the stages of transition from apes to humans, continual small changes in the gene pool took place and were favored by the processes of natural selection, but even more so by the process of intentional partner choice. Among the genetic changes are to be counted the gradual reduction of hair covering, the constant slowing of the speed of brain development, as well as a number of anatomical changes primarily connected with the formation of the pelvis and the development of the extremities and the larynx. These changes made possible the birth of children with larger brains who could walk upright, whose hands were free for manipulative use, and who were able to develop speech. Reduction in the amount of bodily hair strengthened erotic bonding between partners. Naked skin and the frontal sexual union that became possible with the upright positioning of the pelvis were crucial conditions for more emotional and also tenderer sensual encounters between men and women. The fact that partners could now look into each other's eyes while mating and recognize each other personally gave additional strength to the bond between potential parents. Prolongation of women's readiness for mating from originally limited time periods to the entire year in addition to the new emphasis on attractive secondary gender characteristics facilitated the arising of not only intensified but also more enduring sexual and erotic bonds between men and women.

How + for what purpose do humans use their brains?

OPTIONS FOR ASSEMBLY

These conditions were not only important for sheer survival. They were also important for the development of densely networked brains capable of lifelong learning. They were also key for the strengthening of the social relations in these early communities that were the indispensable basis for that development. The genetic modifications needed for the anatomical changes that took place—according to the data of molecular biologists concerning the genetic differences between present-day humans and our closest relatives in the animal kingdom, dwarf chimpanzees—involved at most two percent of the entire genetic base. And this process of genetic change was completed around one hundred thousand years ago. The aspect of the genetic base responsible for brain development in humans also has not changed since that time. What have, however, changed a great deal over those thousands of years are the factors that determine how and for what purposes human beings use their brains. These factors are notably: social relations; the knowledge that the acquisition of speech, writing, and data-recording capabilities made it possible to accumulate and transmit; the great growth in communication, which opened up new avenues for transmitting knowledge, abilities, and skills from culture to culture as well as from generation to generation.

Thus the world of human experience determined by cultural development and tradition became more and more complex, multifaceted, and richer. In this world, human beings had the opportunity in the course of their individual development to deal with a great number and variety of challenges. During their lives, they could acquire an ever-greater number of new experiences and anchor these in their brains as patterns of neuronal connections. In

this way the thoughts, feelings, and behavior controlled by these neuronal circuits became susceptible of undergoing change into advanced old age.

2.4 Structures for Open-Ended Programs: *The Human Brain*

It is now already eight hundred years since the Staufer emperor, Friedrich II, showed experimentally what happens to the human brain if its development is left entirely to genetic programming. In order to find out which primordial language the brain would produce entirely on its own, he had two children raised by nurses who were forbidden to speak even a single word to them. For the emperor, the result of this inhumane experiment was quite unexpected. The children did not begin speaking Aramaic or even Greek or Latin. Instead, they became retarded in their overall development and ended up dying. How their brains had developed under these circumstances was not further investigated at the time. Their brains must have been a pitiful version of what they could have become.

Nowadays still, most people on our earth grow up in conditions that lead to their not being able to take advantage of their latent potential to develop a highly complex, densely networked brain capable of lifelong learning. Nowadays still, most people on our earth are forced to use their brains throughout their lives in a very one-sided way for very particular purposes.

This applies not only to those who are occupied, day in and day out, with satisfying their most essential basic needs—getting enough food; defending against life-imperiling encroachments, threats, and illnesses; finding a peaceful place to sleep; and maybe even finding a sexual partner with whom to start a family. It also applies to all those who at one time or another in their lives have found a specific strategy for coping with their fears and maintaining their inner order, and have ever after compulsively used this same strategy in the same way, because they believed it would solve all their other problems too. The neuronal circuitry activated in their brains by this strategy thus becomes progressively better connected and more smoothly facilitated. Initially small neuronal pathways gradually turn into something like solid roads and finally even major freeways. The original coping strategy becomes a well-established program that determines the subsequent thinking, feeling, and behavior of the people in question. They compulsively try to create and maintain the conditions that will allow them to keep proving the effectiveness of this particular set of skills they have acquired. As long as they manage to do this, they get better and better, more efficient and more successful, at coping with certain definite tasks. However, they fail quite pathetically as soon as circumstances change and they are confronted with new challenges that cannot be dealt with by using the same old, well-broken-in neuronal circuit patterns in their brains. Such a lopsidedly programmed brain, used again and again in the same way for the same purposes, also remains a pitiful version of what it could have become.

For example, there are computer addicts who from childhood on have been so intensely involved with their keyboards and their own

computer worlds that later on as adults they are hardly capable of carrying on direct conversations or are unable to attract the opposite sex through any other means than the computer. There are mathematical geniuses who cannot tell a seagull from a goose, football virtuosi who can neither swim nor ride a bicycle, and chess masters who can neither sing nor dance.

As these examples indicate, it is not always an advantage to have a brain whose final wiring is determined by how a person uses it, or is forced to use it. What becomes of such a flexible, learning-capable brain and whether or not its inherent potential to form complex neuronal circuitry can be utilized depend on the conditions into which people are born and in which they have to lead their lives. In places where there is not enough to eat, where one's life and family are in constant danger, exchanges with other human beings are reduced to whatever might help to overcome these problems. Where jealousy and mistrust rule and everybody is everybody else's enemy, it is impossible to develop a sense of solidarity. Under such circumstances, exchanges with other human beings are determined purely by the need to assert and promote oneself.

No one is able to choose the circumstances in which he grows up. And no one can control the early experiences that determine how and for what purposes his brain is used—and thus what neuronal circuit patterns get built up and stabilized in it. A hundred thousand years ago, sophisticated speech such as we have now did not exist. The people of those early times had no words for many things about which we now effortlessly communicate, not only in our mother tongues but also in other languages we learn later in life. Their possibilities for expressing themselves about their own

individual or general cultural experiences and transmitting knowledge about them were still very limited. There was also no written language that could be used for passing down experience and knowledge from one generation to the next. If, however, one of these early ancestors of ours were to come into the world now, he would be able to speak fluent English the way we do. He could read the things we ourselves read these days. He could even perhaps exchange ideas in German or some other foreign language with people of other cultures—all just as well as we ourselves do today. As we have said, the physiological basis for all this was already present a hundred thousand years ago; only in those days the conditions were lacking for making use of this physiological basis the way we do today.

What drastically changed in the last stage of evolution was not the genetic base needed for developing a highly complex, densely networked brain capable of lifelong learning. What changed were the fundamental conditions necessary for the realization of this potential. These had to be gradually created and maintained over our developmental history from generation to generation. Every step in our development, every discovery, and every invention made by the people of a particular culture helped to expand and extend the way they used their brains. The more use they made of the neuronal connectivity existing in their brains, the more complexity it was capable of developing.

Even today the process of optimizing our conditions for development has not come to an end. In different cultures it has moved with different speeds and advanced to different levels. Historically, the possibilities the people of a given culture had for creating the

conditions for their life and development were very strongly determined by the realities they faced in their natural habitat. An increasingly important role came to be played by individual and collective strategies for dealing with life adopted from previous generations—by the knowledge that had been accumulated, the skills and abilities that had evolved, as well as by outlooks and basic convictions that were handed down. Division of labor and specialization led to communities being increasingly subdivided into smaller groups and becoming more hierarchically organized. This is the point at which the quality of brain use began to vary in accordance with social stratum.

At all times during this developmental process, individual members of the community as well as particular strata or groups in society—even entire cultures—ran the risk of overdeveloping and rigidifying already evolved coping strategies that were regarded as especially successful, along with the abilities and skills and basic convictions and values connected with them. When this occurred, it led to a canalization of developmental conditions of the offspring that became more and more pronounced from generation to generation. The limitation of the potential for the offspring's brain use that this entailed favored building up and smoothly establishing particularly intensively used neuronal pathways at the expense of other less frequently activated nerve-cell connections. The better this worked, the more thoroughly the next generation became programmed for the achievement of certain specific goals (of the family, of the clan, of the social stratum, of the society, of the whole culture). Extreme examples of this are still to be found today among many native peoples, for instance, the various tribal groups of

Papua New Guinea who, in fairly complete isolation from each other, passed through a number of very original, in some cases even bizarre-seeming, culture-specific canalization processes. Family-specific canalization processes can lead to highly specialized attainments and abilities in particular occupations (dynasties of artisans, merchants, and public officials), particular arts (artistic families, musical families), or in very questionable fields of endeavor (the Mafia).

However, the advantage gained over a number of generations of increasing specialization always transforms into a fatal disadvantage when external conditions begin to change and other abilities, skills, and ideas become essential. Unavoidably, conditions have always changed and will always continue to do so. On the individual level, they change just because a person gets older, has exchanges with other people, has new experiences, but also because she loses certain skills and has to look for alternative ways of dealing with things. On the level of the family, conditions change through influences on the children coming from outside, and in the case of a marriage, from the influence of the partner's family. On the level of particular social strata and social groupings, change happens through the development of new technologies, the use of new resources, and the changes in the structure of society that these bring. And finally on the level of whole cultures, it comes from increased mixing, contact, commerce, and general exchange with other cultures.

Throughout our history, individual families, social strata and groups, and whole cultures have tried again and again to stave off this process of opening and mixing. But in the long run, it has never been possible anywhere on earth to hold back or reverse this

process. Everywhere people, with their learning-vulnerable brains, tend to broaden their store of knowledge, to acquire new abilities and skills, and to have new experiences. And everywhere this knowledge, these abilities, and these ideas are transmitted to other people, adopted by other people, and exchanged with other people. In the past this mostly happened involuntarily and unconsciously (through commerce, wars, migrations, etc.). Today this process of transfer and exchange of information between people of different families, social strata, groups, countries, and cultures can be consciously and purposively arranged. Thus for the first time we can intentionally expand the conditions of life and development that until now have always had a canalizing effect on the final formation of the brain, and in this way we can prevent the facilitation of one-sided neuronal connective patterns in our brains. Only after these one-sided programs that we ourselves have created have been sprung open and undone step-by-step can we take advantage of our genetic potential to develop a complex, densely networked brain capable of lifelong learning. Through this process, we can attain greater subtlety in perceiving and processing changes in our world, an ever greater and more meaningful level of exchange with other human beings, greater efficiency in the maintenance of our inner world, and last but not least, ever better developmental conditions for our children. In the course of human history, prototypes of the ideal kind of brain resulting from this opening process have already frequently appeared on the level of individuals (perhaps when you have finished reading this book, a few examples will occur to you). But this model has yet to be produced successfully on a mass scale.