THE DESIGN OF MAN:
THE HUMAN SCIENCES IN PAST AND PRESENT

Syllabus course History of the Human Sciences

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Contents

INTRODUCTION

Modern Western man is a constantly dissatisfied being who persistently strives for more and better. The way things and human beings are, has become the way they can become and can be made, largely through science and technology.

Twenty-first-century human beings consciously and actively seek to mold or improve both their natural and social world but increasingly also themselves through all kinds of interventions based on a combination of knowing, predicting, controlling, (re)shaping, and enhancing. The accomplishments of the life and human sciences are impressive. We are no longer amazed by open heart surgery, organ transplantations, devices in and on our body and medical technologies which perform vital functions when specific organs fail. Molecular biologists claim that by deciphering the DNA sequence of our chromosomes they have uncovered the secret of life, while biotechnologists have made the first strides in fabricating life outside 'natural' procreation. Techniques such as artificial insemination, in vitro fertilization, surrogate motherhood and embryo transplantation seem mere child's play compared to what biomedical engineers have in store for us: living tissues cultivated in test tubes, laboratory-produced organs, xenotransplantation, cell therapy, biobanking, genetic screening and (prenatal) gene therapy to prevent and cure diseases and, as ultimate feat, the possibility of cloning human beings. Human life can be regulated and manipulated in test tubes and with a pair of tweezers. Plastic surgery provides options for fixing esthetic shortcomings of our body and enhance it. It seems as if man himself has turned into a machine indeed, one that you can take apart, tinker with and repair and put together again.

The ambitions of scientists involved in brain research, neuroscience, psychopharmaceuticals, cognitive psychology and artificial intelligence are matched by those of biotechnologists. Over the last decades, the use of psychopharmaceuticals has expanded enormously, not only to treat behavioral problems and mental disorders, but increasingly also to improve moods, performance, and personality. The comparison of mental powers with computer software nurtured the notion that the human brain is functioning as a computer and that thinking machines can be constructed. Building on a longer tradition of psycho-technique, some psychologists have firmly resolved to become engineers of the mind. We appear increasingly capable of not only repairing defects in our physical and mental make-up, but also increasingly of enhancing and perfecting ourselves.

Boundary-work

Science has come to play an authoritative role answering questions about what man is and should be, and how human beings can be changed and shaped. *The Design of Man* is about the history of the sciences which study the human body and mind as well as individual and social behavior since the late eighteenth century in all of its dimensions: cognitive contents, methods, organization; historical and philosophical origins and sociopolitical and cultural contexts; the practical application of scientific knowledge about human beings in modern society and its relation to varying philosophical and more general sociocultural images of man. Apart from theology, which in traditional society set the tone for understanding the essence of man and his/her position in the world, the human being had been topics of (moral) philosophical reflection and intellectual concern in fields as medicine and natural

history earlier. But only since the Enlightenment, when the study of man was inspired by the example of rational-empirical physics and chemistry and thus dissociated itself from what was considered as metaphysical speculation, man has turned himself into an object of systematic scientific study. Such investigation, which was designated as rational, objective, empirical and methodological, was differentiated from knowledge which was labelled as irrational, religious, metaphysical, speculative, and subjective common-sense belief.

Also, scientific knowledge was increasingly organized in separate disciplines. Apart from medicine, none of the various sciences which we are now familiar with, such as biology, physiology, psychology, pedagogy, sociology, and cultural anthropology existed before the nineteenth century as such. The formation of separate disciplines and the associated processes of academization and professionalization, evolved between the early nineteenth and early twentieth century. Scientific knowledge about man became the domain of specialized professionals who claimed exclusive expertise in the scientific world as well as in society at large. They established themselves with academic chairs, faculties and departments, educational institutions, curriculums, research facilities, laboratories, clinics, professional organizations, textbooks. specialized scholarly journals, and national and international conferences. As a result, academically trained specialists, who practiced their profession exclusively with their scientific learning and research, began to take the place of the amateurs and universal scholars who felt at home at the same time in philosophy, natural science, as well as literature.

Science became 'disciplined', that is subdivided into various fields and specializations which derived their identity from a demarcated and more or less systematically organized field of expertise with its own concepts, epistemological views, methods of research, styles of reasoning, explanatory models and analogies. Biology and physiology broke away from medicine and the broad field of natural history. Psychology and pedagogy evolved from philosophy and partly from physiology as well. Medicine turned into medical science, partly as a consequence of the rise of clinics and laboratories as research facilities. Psychiatry developed into the first medical specialization. Disciplines took on an identity of their own because their practitioners delineated a particular field of knowledge vis-à-vis that of philosophy as well as other sciences.

Disciplines within the human sciences are the more or less provisional outcome of the various ways in which scientists have demarcated their field of study on the basis of diverse criteria: different objects of research (the material body, the immaterial mind, 'normal', healthy bodies and minds versus 'abnormal' and pathological bodies and minds; the anatomic structure of the body versus its vital functions and processes; visible behaviors versus invisible consciousness; inborn features (*nature*) versus influences of the surrounding world (*nurture*); man as a natural or social and cultural being); different epistemological models; different research methods and locations; different styles of reasoning and explanatory models; and how and where expertise was applied in society.

The study of man became distributed across different scientific disciplines. The boundaries between them were not given by nature and self-evident. The disciplinary compartmentalization of man did not reflect a division of man that could be directly derived from the natural and social world: demarcated boundaries were constantly transgressed, or

they shifted; therefore, we can speak of more or less continuing boundary-work. Thus, the human body became the field of biology, physiology and medicine; mental life became an object not only of psychology and pedagogy, but also of biology, physiology and neuroscience; and individual and collective human behavior was claimed as an object by psychology, pedagogy, biology, (preventive) medicine as well as sociology and cultural anthropology. In the twentieth century we have witnessed efforts to reshuffle disciplinary boundaries through the creation of new interdisciplinary areas of knowledge, such as eugenics, genetics, sociobiology, bioengineering, Darwinist medicine, 'bio-psychosocial' psychiatry, criminology, sexology, physiological, bio- and neuropsychology, psychonomy, evolutionary psychology and cognitive and neuroscience. Both discipline formation and interdisciplinary boundary-crossing were related to varying epistemological assumptions, research methods and explanatory models as well as professional interests and strategies, scientists' claims of innovation, their workspace and the social role they aspired. The way knowledge of man is divided up in various disciplinary fields and specializations is therefore not fixed but contingent and changing, and therefore of a historical nature.

The human sciences and the human self-image

The position of the human sciences in the wider scientific landscape, between on the one hand the natural sciences and on the other the cultural sciences or humanities was (and is) ambivalent, contingent and disputed. A fundamental difference between the natural sciences and the human sciences concerns the relation between the subject and object of knowledge. Whereas in the natural sciences these are distinct entities – the thinking and acting scientist studies natural phenomena, either living or inanimate, which do not think and act, let alone talk back – in the human sciences such a neat division is impossible: man, as a thinking, explaining, acting and responding being, is simultaneously subject and object. The knowledge in the human sciences cannot be separated from man's continuing self-reflection and self-understanding in daily life, and the meanings they give to their existence. Neither can such knowledge be detached from people's responses to scientific knowledge about themselves. What is done in the human sciences, thinking about, commenting on and explaining what human beings are about, is something which is also continuously done in daily life. The difference is that in science it is done in a more rational, systematic and controlled way, but this does not guarantee that scientific knowledge of man can be disconnected from the notions about man that already circulate in society.

The human sciences are entangled with philosophical and broader cultural self-images, regardless of whether such images are confirmed or challenged. This entails that it is difficult to separate facts and values, to distinguish notions about what man supposedly 'really' *is* from what man *should be*, how humans wish to see themselves and what they consider as the significance, dignity or purpose of man. Whatever the strength of their empirical data and evidence, scientists ask questions and interpret their 'facts' from the perspective of not only scientific-theoretical considerations, but also moral, social, cultural and political notions about what it means to be human.

Again and again, the human sciences seem to vacillate between two opposing images: the naturalist versus the humanist or 'culturalist' one. The naturalist view holds that human beings are basically determined by their biological make-up and material conditions. As such

they are supposedly comparable to other natural phenomenon or technical artefacts and likewise subject to natural patterns and laws. The humanist 'culturalist' self-image of man stresses, without denying natural limitations, that being human implies self-consciousness, free will, self-motivation and the creation of meaning and values. These contradictory images are intrinsically related to the question whether the human sciences are (or should be) part of the natural sciences or of the humanities.

Historically, the Renaissance and the Enlightenment established the (optimistic) view of man as a superior being because of his – much less her – unique ability to reason, to act as a conscious and responsible agent, to explain and dominate the world, and to direct his own fate. In this voluntarist perspective man's history is one of liberation and emancipation from the constraints of nature. This implies that human beings, because of their mental and spiritual capacities, are exceptional in comparison with the rest of nature because they are not only physical, but also, and primarily cultural beings. However, as a consequence of the Scientific Revolution, which advanced natural science as the model for science in general, first the human body and later also the mind were compared with man-made technology (mechanical machines such as the clock and other automata, followed by the steam engine, the combustion engine, the switchboard, the radar system, the radio and the computer). The growing impact of the biomedical sciences since the late eighteenth century established the image of man as an organism which was organized in a different and more intricate way than an artificial machine. If static machines can be reduced to the individual parts from which they are made (machines can be disassembled and again re-assembled), organisms constitute dynamic growth-systems that as a whole are more than the sum total of the parts (and therefore they cannot be disassembled and re-assembled). Time and again, scientists faced the question how life and the human mind, which they increasingly considered as interrelated with the body, could and should be explained, either in an analytical and reductionist manner in terms of one-directional mechanical causes or rather in a holistic and cyclical way. Despite such different explanatory models which the analogies with machine versus organism entailed, they shared a materialist and determinist perspective on man. Such a view of man as a being who cannot escape the forces of a blind and indifferent nature questioned the rationalist and ethical image of man as an autonomous being that was endowed with an immaterial soul or mind and free will, as Christian teachings assumed and leading philosophers such as René Descartes and Immanuel Kant claimed.

In the course of the nineteenth century, the traditional Christian and also modern Cartesian and Kantian model of man was increasingly undermined, not only (often implicitly) by biomedical scientists and psychologists, but also explicitly by philosophers such as Arthur Schopenhauer and Friedrich Nietzsche as well as by the founder of psychoanalysis Sigmund Freud. Rational consciousness and free will were an illusion, they claimed; man was driven by irrational and unconscious forces. Freud asserted that human self-esteem – 'naïve self-love' and 'human megalomania' in his words – was hurt decisively at three moments in the history of science. The shift brought about in astronomy by Nicolaus Copernicus, Johannes Kepler and Galilei Galileo from a geocentric to a heliocentric universe removed man from the middle of the universe, the privileged place in God's creation. The biological theory of Darwin even more undermined the idea that man is unique and superior by showing that the human body and mind are the result of natural evolution and that man in this sense is neither different nor superior to other living beings. And Freud himself struck the third blow

by questioning the self-image of man as a self-conscious and self-controlled being. Psychoanalysis showed that the ego is not a master in his own house but driven by unconscious sexual and aggressive drives.

The continuing disenchantment of man's self-image and sense of worth did not go unanswered in the human sciences. Scholars who focused on the psychological, social and cultural dimension of man, pointed out that human beings were not only determined by nature like an automatic machine or an instinctive organism, but that they were also persons with awareness, thoughts, feelings, intentions and creativity; persons who communicate, act to achieve goals and constantly give meaning to the world in which they live.

Against the background of such contradictory views of man one can ask what scientific knowledge of man is about. Does it uncover the reality of an essential, given nature of man that is part of nature in general? Or is such knowledge not more than a reflection of how human beings have interpreted themselves and have given meaning to their existence, not only in the context of particular time-bound cultural, economic and sociopolitical conditions, but also as the result of the ways in which the human sciences themselves, their knowledge and their interventions, have (re)shaped human beings and their self-understanding? If so, then we cannot expect that the human sciences answer questions about man's essence or human nature. The notion of an underlying immutable human essence or nature should be put in perspective and historicized. The history of the human sciences can only show and elucidate the wide variety of socially and culturally molded interpretations and meanings of what man is about – including the way in which scientific knowledge and interventions are themselves engaged in the (re)shaping of such interpretations and meanings.

Knowledge and design

The striving for scientific knowledge and its legitimacy in modern society was not only about explaining of but also intervening in the physical, mental and behavioral make-up and functioning of human beings. The application of scientific knowledge in society is inextricably bound up with efforts to control, change and shape individual human beings and their social relations. The ethos of the Scientific Revolution and the Enlightenment broke with the view of human life as determined by mystery, fate, divine providence, inherited and taken-for-granted tradition or immutable nature. The traditional attitude was articulated by the seventieth-century Flemish philosopher Arnold Geulincx when he wrote a treatise in which he objected to the expression 'making a child.' Because people did not know what exactly went on in lovemaking and how it can result in the birth of a baby some nine months afterwards, Geulincx felt it was hasty and even blasphemous to assume that parents who beget a child are also its makers. More generally he depicted man as a being that was capable of understanding neither nature nor himself. Only God, the world's first and only genuine maker, possessed such knowledge. Geulincx voiced an age-old moral concern about human knowledge and the overconfidence associated with it.[1]

[1] C. Verhoeven (1973). *Het axioma van Geulincx*. Bilthoven: Ambo, 23. Geulincx had no faith whatsoever in science and he could impossibly have anticipated its great expansion, but, strikingly, he did unwittingly subscribe to one of the essential ideas of the seventeenth-century Scientific Revolution, notably expressed by its protagonist Francis Bacon, namely the assumption that being able to know and being able to make or design something are inextricably bound up with each other.

The acquisition of knowledge, marking a loss of innocence and purity, was often presented as dangerous and morally reprehensible. In the Western tradition the penalties for *hubris* were recounted again and again. In Greek mythology there is the figure of Prometheus, who stole the fire from Zeus to give it to man and who also went down for doing so. In the bible Christian believers were told how God punished Adam and Eve when they ate from the Tree of Knowledge: since their exile from Paradise human beings have to cope with suffering and shame. The legendary medieval figure of Faust, who hungered for knowledge and power, even if these were handed to him by the devil in exchange for his soul, died a painful death and would burn in hell eternally. Modern Western culture with its aspiration to use knowledge as an instrument for control and manipulation of and power over de world has been negatively characterized as Faustian. The downside of the strong and widespread association of science with progress is the feeling, even more pressing with regard to the human sciences than in relation to the natural sciences, that it is overly and one-side rationalistic, and as such cold and inhuman, and brings a loss of innocence, beauty and magic.

From the eighteenth century on, in the wake of the modernization of society, an ever more positive evaluation of scientific knowledge and material and social technologies as the means to make the world a better place and also to improve ourselves, set the tone. The Enlightenment, 'mankind's exit from its self-incurred immaturity' as Immanuel Kant defined it in 1784, put human beings in charge of their own destiny. The traditional fear of change gave way to fear of stagnation. Scientific knowledge would provide man with the possibility to control his own nature and living-environment and therefore to determine his own fate. In the nineteenth century the enlightened ethos of progress transpired in nineteenth-century Positivism and Utilitarianism, which assumed that in addition to physical nature also human life and society could be mastered and managed. Science and technology constituted the driving forces of the industrial mode of production and increasingly they also influenced the ways in which modern mass society became organized and governed. Since the French Revolution and the emergence of the politics of modernity, the quantity and quality of human life became a field of attention of the state as well as of social initiatives.

The optimistic belief in the blessings of science have not gone unchallenged. Since Romanticism the unconditional and unlimited faith in science has, again and again, also been put up for criticism and it has resulted in disillusions. Prototypical is Mary Shelley's novel *Frankenstein or The modern Prometheus* (1818), the story about the artificially created monster that escapes the control of its maker with unforeseen and disastrous consequences. To this day, culture critics point to the negative effects of our persistent striving for the design and enhancement of nature and man. The philosopher Bruno Latour has argued that the sense of being modern and enlightened rested on the illusion that with modern science, and its inherent distinction between society and nature or between subject and object, man was able to unveil the definite rational truth about the world and to control nature. The modern scientific ethos tends to deny that so-called modern man still gropes in the dark and faces all kinds of uncontrollable risks, which are partly resulting from scientific and technological interventions in nature as well as society. There is always a certain tension between the ideal and the practice of design, not only with respect to the degree in which the ambition to shape man can be and actually was achieved, but also because of political

and ethical objections against this ambition and its intended and unintended effects. Should what is possible also be permissible? The scientific aspiration to shape human beings as well as its real or desired limits are intwined with of views of how human life, mental functioning and individual and social behavior are best explained and with the associated images of man.

Contextualization and social constructivism

The questions scientists ask about human beings and their findings are at least partly conditioned and framed by wider social, cultural, political and economic factors. Important historical factors in the development of the human sciences are for example secularization; the rise of the modern state that started intervening in ever more areas of human life; and democratization, industrialization and urbanization, which gave rise to all sorts of social problems for which solutions had to be found and new forms of administration and management were required. The relationship between science and social context can be considered in two ways: on the one hand, how social relationships, cultural notions and ideologies determine the kind of questions scientists pose, their theories and methods and the resulting knowledge; on the other hand, how scientific activities, knowledge and interventions work their way through society.

Such a reciprocal contextual historical-sociological perspective on science differs from two other (older) approaches: the internalist and externalist ones. The more traditional internalist perspective depicts the development of science as a series of ingenious and path-breaking insights, methods and inventions, which progresses through a self-propelled and autonomous search for truthful and ever better knowledge. The scientist is seen (and sees himself) as an impartial truth-seeker using rational methods. The belief that science is the self-evident result of a preordained quest for objective, pure and useful knowledge, which does away with ignorance, myth, superstition and irrationality for once and for all, suggests that its history is self-explanatory.

Both the externalist and contextual perspectives, on the other hand, assume that science is made by people in the context of a certain time and place, and that as such, it is interrelated with other dimensions of human life: economic activities, social relations, cultural meanings, religious beliefs, political ideologies, ethical values and aesthetic preferences. So-called ‘hard’ scientific facts are not self-evident, but the product of choices and selections on the basis of chosen methods and of culturally embedded ways of looking at reality. The knowable is determined by those who have the capacity to set the terms of the debate. Until far into the twentieth century, the science of man was, like science in general, very much in the hands of Western, middle- and upper-class male intellectuals and academics. They were the supposedly independent, self-controlled and consistent subjects of the objective scientific gaze – as if they were disembodied free-floating minds which subjected other human beings to scrutiny. In doing so, they tacitly applied their own experiences, identity and norms and values as guideline for the definition of what human beings were or should be, and as the standard for the differentiation of what should count as normal and abnormal. It went without saying that deviant Others lacked the rational coherence which qualified the scientist.

The ‘externalist’ perspective emphasizes the economic, social and political interests that would determine scientific knowledge and its practical applications. The contextual perspective holds an intermediate or interactionist position: although insight into the sociopolitical and cultural context is indispensable for understanding science in all of it dimensions, scientific knowledge should not be fully reduced to its societal settings. Unlike the externalist approach, the contextual one avoids a reductionist explanation of science in economic, sociopolitical or cultural terms. The human sciences are influenced by such external influences, but at the same time scientific knowledge and its applications shape human beings and their social relations.

This contextual perspective on science is relativist in a historical-sociological sense and it therefore opposes ‘presentism’ and ‘finalism’ or what is often referred to as ‘Whig-history’. In such history of science, the (retrospective and selective) focus is on those elements in the past that have contributed to what in the present counts as valid and valuable scientific knowledge. The assumption is that the history of science is basically a continuing and progressive development. All what appears to deviate from the road leading to true scientific methods, theories and knowledge tends to be viewed (and denounced) as irrational barriers, misguided side paths, delusions, dead-ends, false tracks and failures that can and should be remedied. Such obstacles are considered as irrelevant for understanding what science is presumably really about. The basic assumption of the Whig-history of science is that there is only one correct and objective way to understand the world (the rationalist-empirical method of the scientific mind) and that true scientific knowledge is timeless and autonomous, apart from the society and culture in which it situated. Therefore, the assumption is that knowledge in the past can be evaluated according to the same standards as knowledge in the present.

By contrast, the relativist approach holds that current standards of scientific knowledge cannot be a guide for studying the history of science. What is considered as valid scientific knowledge is not mirroring reality as it really is, but it depends on contingent perspectives, on what Thomas Kuhn has described as paradigms: particular intellectual frameworks of presuppositions, definitions, hypotheses, postulates, theories and methods, which are shared by scientists in periods of ‘normal science’, but which may also change or be replaced by new paradigms. Such paradigms are not isolated from the broader sociocultural settings of science. The distinction between true scientific and false non-scientific knowledge is not self-evident and immutable, but of an historical nature.

The human sciences in modern society: historical-sociological perspectives

With regard to the interaction between scientific knowledge about man and its wider context, some sociological and historical perspectives on the nature of modern society are relevant and instructive.

The historian-philosopher Michel Foucault, who considered the birth of the human sciences around 1800 as an essential feature of modernity, argues that at that time the role of the state and how it exercised power over the population, changed in a fundamental way. While the state authority of the Ancien Régime was juridical and ‘negative’ – it ruled largely by means of physical suppression, punishment and violence – from the French Revolution

onward the emerging intervention state developed a form of power over life that was 'positive' and productive. This 'bio-power', the umbrella term for a host of policies and social interventions, was aimed at the enhancement of health and normalcy, especially to promote economic efficiency and productive labor. The strength of a nation was increasing measured by the quantity and quality (health and fitness) of the population. Government became geared to surveillance and the more or less planned interventions in social relationships and infrastructures: in public health and medical care, in working conditions and vocational training, in poor relief and social work, in penitentiary systems and re-education, in the treatment of madness and other 'abnormal' behavior, in pedagogy and education, and in family-life, child-raising and sexuality. Both the state and other social institutions called on the biomedical and psychological sciences – with regard to the twentieth century, the term 'psycho-power' could be added to bio-power – to gain more knowledge on and control over the population as a whole and the lives of individuals. The human sciences evolved, according to Foucault, because, from their beginning, they were involved in such regulatory and surveillance practices. The formation of scientific knowledge about human beings was interrelated with the systematic efforts to control and (re)shape them.

The development of scientific knowledge of man cannot be seen in isolation of the increasing systematic regulation, surveillance and disciplining of collective and individual life in modern society. Still, it would be one-sided to assume that the relation between on the one hand social policies and scientific expertise and on the other the individuals and populations which became the object of science-based interventions was unidirectional in the sense that such practices were imposed on people. They were not merely passive and powerless targets, but there was more or less room for responding in varying ways, the more so because scientific knowledge and its associated interventive practices was not monolithic but multifaceted. People might even use scientific information for their own purposes.

How could a disciplinary or surveillance regime emerge in modern society while at the same time it was, since the French Revolution, moving in a democratic direction? In this respect the adoption and internalization of normalization and discipline at the personal level is relevant. In a broader historical perspective than that of Foucault, the sociologist Norbert Elias has pointed out the development of changing regimes of social control and their effects on mentalities and behaviors. According to Elias the post-medieval civilizing process in the Western world shows an ongoing shift from external social control through force and violence in the context of hierarchical and inequal social constellations towards increasing internalized self-control of individuals against the background of more and more egalitarian social relations.

In a democratized modern society, the state cannot, as a rule, use violence and force to compel obedience and orderly conduct. An open, individualized and meritocratic society can only be stable when it relies on some sort of free consent and cooperation of individual citizens, who are supposedly autonomous and guided by self-determination. Therefore, they have to be self-responsible, in control of themselves and behave in a more or less regular, self-directed and predictable way. The need to normalize individuals and to make them internalize certain values and normalize behavior-patterns, became the more urgent the more a society was democratized. When hierarchy and external pressure or force are not

effective and legitimate any more, because in a democratic society individuals have rights and they are formally equal, inner motivation and self-regulation are all the more crucial to maintain the sociopolitical order. People are required to take responsibility over their personal and social existence, not only to realize liberal-democratic values, but also for the sake of social stability, cohesion and efficiency. In liberal-democratic and capitalist societies people are in general not so much governed through external and top-down force and coercion, but in more subtle self-regulatory ways which adhere to (enlightened) ideals such as self-transparency, self-development, self-improvement, and self-optimalization. People are expected to open up for supposedly neutral scientific knowledge and, if necessary, for impartial professional interventions in order to realize these ideals – in the name of progress, success and efficiency, 'for one's own best will' or to get 'the best out of oneself'.

Modern man also displays a strong self-motivated need for biomedical, psychological and pedagogical knowledge to manage and give shape to one's life and to find orientation in an increasingly complex, risky and 'liquid' society – partly as a consequence of processes of individualization, secularization and democratization. The sociologists Anthony Giddens and Ulrich Beck have defined (post)modern society as a risk society in which nothing is immune to perpetual revision and change, but which is at the same time preoccupied with controlling all kinds of uncertainties and endless possibilities. In such a society, individuals are continuously challenged to make choices about their lives and to shape it in an optimal way. They can (or should) do this with the help of scientific expertise, often in popularized form and provided by professional and/or commercial services, self-help guides and the media. The sociologists Niklas Rose and Zygmunt Bauman have introduced the concept 'life-politics' indicating that modern emancipated, enterprising and self-responsible individuals make themselves the center of their own making – or rather, they are supposed and required to do so in order to be successful. What is characteristic for modern social institutions and arrangements in general – that they are continuously scrutinized, re-examined, re-evaluated and re-shaped – also holds good for individual lives which are more and more considered as a designable project.

The Western world has witnessed a growing dependence of lay people on professional knowledge. According to Giddens, this is part of a broader 'reflexivity of modernity': the regularized use of expert knowledge about personal and social life as a way to deal with uncertainty and danger and as constitutive element in its organization, transformation and improvement. Against this background, the Dutch sociologist Abraham de Swaan has coined the term 'proto-professionalization' to specify the growing tendency among people to adopt scientific-professional vocabulary and modes of interpretation in their efforts to understand themselves. Rising levels of education, heightened communication and mobility, and the ambition for improvement, the drive for autonomy and to make the best of one's life, play an important role in this process. To a much lesser extent than in the past, people in Western societies are willing to accept individual shortcomings or unhappiness as an inevitable part of life, as God's will, or simply a matter of fate or bad luck. Rising expectations of people about their ability to treat and solve personal problems, to fashion their individual lives by free choice, and to create or recreate their self, have furthered the demand for scientific knowledge about man and its application in society.

1. THE 'PRE-HISTORY' OF THE HUMAN SCIENCES

In the course of the eighteenth century the overall idea of the science of man emerged – that man can be made into an object of scientific enquiry. However, the philosophical and broader cultural preconditions of this endeavor were laid out earlier in from the sixteenth century onwards. In the Renaissance, Humanism, the Reformation, the Scientific Revolution and in particular in the philosophy of René Descartes and John Locke, the traditional Christian and communitarian views of man were undermined and partly replaced by a more secular and individualist understanding of man.

The traditional image of man

In traditional agrarian society, in which human beings dependent on land, they were hardly individuals in the modern sense. Socially they were embedded in a small-scale, close-knit and hierarchical entities, such as families, kinship groups, clans, village communities, parishes, feudal estates, and corporative organizations such as guilds. Most people largely submerged in prescribed bonds and chains of rights, duties, obligations, loyalties and dependencies which structured such collectives. Social positions were by and large conditioned by rather rigid ranks and orders based on status distinctions. Except for some among the upper classes or intellectual elite, for the majority of people a more or less independent existence and an individualist self-image were unconceivable. They identified themselves not so much a separate individual, but rather as a representative of the group in which they were immersed and with which their existence and interests overlapped.

The social order was vindicated by the Christian mandate of God's will. Also, until the Renaissance the self-image of man was determined by Christian doctrines, which were infused with philosophical notions borrowed from ancient thinkers, in particular Aristotle. Christianity provided a clear model for the place of man in a God-given, eternal moral order. This image of man was intrinsically connected to moral judgment in terms of virtue and sin. Being a good Christian, living according to God's commands, was the crucial requirement. The destiny of man and the meaning of life were not situated in this life on earth, but in one's fate after death, which was heaven or hell. The individual life of human beings on this corrupted earth – which for most people was indeed rather miserable according to our standards – was of minor importance in the light of eternal life in heaven or damnation in hell. There was, however, some ambiguity in the Christian image of man. Since God had banned Adam and Eve man from paradise, man was a fallen and sinful creature, burdened by original sin and therefore imperfect. But man was also endowed with an immortal soul and gifted with reason and free will, which provided the ground for a hopeful perspective – that man was not totally at the mercy of blind fate or God's inscrutable will.

The soul was considered as the essence of man, which determined his purpose. The understanding of the soul built on Aristotelian philosophy. In his teleological worldview every natural thing/being can be explained by identifying its inherent, essential natural purpose or final cause. Everything has a natural function and place in a well-ordered universe. This implied that living beings were imbued with soul-like qualities. According to Aristotle the soul was the form or organizing principle of the body and could not exist independently of matter. This understanding of the soul differed from the Plato's strict

distinction between the transcendental realm of pure and perfect ideas, the source of true knowledge, and the messy material shadow world, and neither was the Aristotelean view the same as the more modern Cartesian dualism of mind or spirit and body.

The Aristotelean soul was three-layered: it had a vegetative, sensitive and spiritual dimension. Plants were only vegetative, animals vegetative and sensitive, whereas the human soul combined all three dimensions. The vegetative and sensual parts of the soul were situated in the body: together they operated as the self-organizing *anima* which infused organic matter with life and sensation. The spiritual dimension, the faculties of reason, judgement and free will, which made man superior to the rest of nature and, in the Christian view, also immortal, was seen as related to the body. There was no absolute separation between the organic and spiritual dimensions of the soul. The soul was discussed in theology as well as in philosophy and medicine. Physicians left questions about the divine and immortal part largely to philosophers and theologians and focused on the soul as an organic life force. Christian philosophers such as Thomas Aquinas, however, shifted the emphasis to the view that the intellectual soul as an imperishable immortal force was a special kind of form which was distinct from matter and could escape the terrestrial dungeon of the body.

Renaissance and Reformation

In the course of the sixteenth, seventeenth and eighteenth centuries, as a consequence of new intellectual and also religious movements as well as of social and economic developments, the self-image of man began to change in two ways. Firstly, more or less secular intellectual perspectives on the world, although not rejecting Christianity, advanced the idea of man as a rational being who can, to a certain extent, control his own destiny on earth and who can improve himself. The epistemological consequence of this idea was that man could be studied through rational analysis and empirical investigation and that such knowledge could be separated from metaphysical and theological notions and values. Secondly, the traditional and Christian view of man as intrinsic part of an all-embracing social and religious scheme of things was gradually undermined by the emerging individualist notion of the self, the idea that one's inner self is distinct from the external world which makes possible subjective self-consciousness and later also the experience of being a unique and authentic 'personality'.

The first steps towards a secular and individualist view of man were taken in the Renaissance and the Reformation. In the Renaissance the rediscovery of Greek and Latin philosophy advanced intellectual reflection about man and his qualities and capacities. Humanist learning shifted the emphasis from a divine supernatural order and the imperfection of fallen man to the recognition of the secular dignity of man. Humanism implied that man should be considered as the measure of at least worldly things and the belief in man's ability to take his earthly fate in his own hands. Closely related to this new attitude was civic humanism which harbored the ambition that man can improve himself by education, rhetoric, art and culture, and civilized manners. This served the political, commercial and learned elite's aspiration to gather self-knowledge, to fashion their personalities and to promote self-reflection, self-control and self-responsibility – the qualities which were needed to control erratic instincts and emotions, to calculate economic benefits, and to rule

the common people. A more or less secularized and practical moral philosophy was an important component of this humanistic ideal, which was reflected in the publication of numerous didactical guides in order to advice members of the elite how to lead a good, successful and elegant life.

Self-knowledge and self-mastery did not only refer to the mind, but also to the body and its health. Therefore, medicine played a role, not only in order to treat illness, but also as a practical guidance for leading a good life through keeping a good balance between the organic and spiritual part of the soul. Morality and health were understood in the same conceptual framework, that of maintaining harmony between actions and passions of all kinds, which was understood as a reflection of harmony in the external world. The Renaissance worldview was still that of the timeless Great Chain of Being or *scala naturae* (ladder of being) : the idea that all matter and life was structured according to a hierarchical and harmonious design in which the macro- and microcosm paralleled and reflected each other.

Protestantism (Lutheranism, Calvinism and a lesser extent Anglicanism) implied an internalisation and individualisation or personalisation of faith. Rejecting church rituals and hierarchies and the belief in miracles, protestantism centres on personal conscience, inner motivation, self-reflection and self-responsibility. Being a good Christian should come from within, from inner conviction, and not from outside authority, in particular from the clergy or from the suggested hope or fear of being rewarded or punished by the church. Also, believers should read the Bible for themselves: they should get in touch with God's word directly. This was the so-called 'priesthood of all believers' and therefore the bible was translated into the vernacular. With regard to his or her faith, the individual Protestant believer was largely thrown back upon him- or herself. This stirred inner self-reflection; Protestant theologians and philosophers began to use the term *psychologica* for the such activities of the human mind.

The Scientific Revolution: empiricism and rationalism

After the Renaissance and the Reformation, the third crucial episode in preparing the ground for studying man in rational and secular terms was the Scientific Revolution and the associated innovative philosophies of Francis Bacon, Thomas Hobbes, René Descartes, Hugo Grotius, Baruch Spinoza and John Locke. These philosophers lived in a time of confusion and turmoil: political and religious wars within and among states ravaged large parts of Europe and uncertainty about what was true fostered an attitude of skepticism. At the same time, however, they searched for a new source of certainty, which they found in the methodological study of nature and the notion of natural laws. The Scientific Revolution between the mid-sixteenth until into the eighteenth century established 'natural philosophy' as the groundwork for modern natural science on the basis of rational and empirical methods, the epistemological ideal types in science until today. The philosophers Bacon and Descartes critically rejected the traditional sources of wisdom: divine revelation, classical philosophy and authoritative texts, passed down through the ages. Solid knowledge was no longer the same as age-old knowledge, was the message of Bacon and Descartes.

Obtaining reliable knowledge about the world, Bacon argued, required the exclusion of 'idols' (all kinds of distortive beliefs, assumptions, biases, prejudices and common-sense notions which are rooted in cultural and daily experience) and systematic, rationally monitored and controlled observation, hypothesizing and experimentation with the help of tools. Natural philosophy should be a rationally and collectively organized, controlled and supervised endeavor. Bacon separated metaphysical speculation about (the Aristotelean) formal and final causes from natural philosophy dealing only with efficient and material causes and their regular laws. For Bacon knowledge of the natural world was connected to the ability to make useful instruments and devices because such technical know-how required comprehension of the laws of nature. His comparison of nature with a machine implied that man could dissect, manipulate and control nature by putting it 'on the rack. In his *The New Atlantis* (1626) Bacon painted an imaginary world made through science and technology for the benefit of mankind. This remained a utopia for the next two centuries, but in the nineteenth and twentieth centuries Bacon's ideal became a reality to a large extent.

Like Bacon, René Descartes rejected the authority of Christian revelation and the intellectual tradition of the Ancients. His ambition was to offer a new cognitive method for obtaining certain knowledge about the world. In his *Discours de la Méthode* (1637), Descartes started by radically doubting everything, all existing knowledge as well as sensual observations which he considered arbitrary and unstable and therefore possibly deceiving. His starting point for building solid knowledge was his inner self, his rational reflection on his thoughts and the immediate certainty of his own mental states. The first state was doubt, but no matter what may be doubted, the fact that he doubted at all, and therefore was thinking, was itself irrefutable and Descartes's first certainty: *Cogito ergo sum*, 'I think, therefore I am'. Descartes started from the certainty that he was doubting, and being certain that he doubted, he was certain that he thought and therefore that he existed. (His banning of doubt was solipsistic, as if pure thinking occurs and should occur in individualistic isolation. This assumption is in contrast with daily experience in which we communicate with other people in a social world of shared meanings and expectations, and absorb impressions of the external world.) Descartes' next step was his proof of God's existence. His doubt indicated that he was imperfect, and the idea of imperfectness implied that something must be perfect which could only be God. Descartes believed that he could be certain that this was true because his insights were undeniably clear and distinct (*clarus et distinctus*) and, like mathematical axioms, unambiguous and irrefutable.

After arriving at the certainty that his own and God's existence was certain, Descartes, who was a mathematician, obtained unshakable knowledge about the outside world through rigorous rational thinking, the method of deductive, analytical reasoning on the basis of rigorous classification and mathematical logic. The result was a picture of the material world in which all phenomena can be reduced to the essence of matter: particles with extension moving mechanically in space. Only the properties of matter that can be quantified and measured (size, shape, speed and their regular mechanical interactions) were relevant for rational knowledge, according to Descartes; other qualities were not inherent in matter, but the result of sensual impressions, which were by definition subjective and mere contingent, and therefore uncertain. Descartes bold claim that what was in his mind, that is a reductionist and mathematical picture of the world as matter in motion, as if it was a

predictable mechanical machine, corresponded to the real world as God had created it. Since he had established that God was perfect and that God had given human beings reason, he could also be certain that God would not deceive him and that the rational picture of the world in his mind mirrored the essential structure of the universe.

Whereas Bacon's epistemological approach was pragmatic and followed a middle course between complete skepticism and absolute certainty – knowledge was acquired through step-by-step probing while being aware of its limits – Descartes claimed that his logical-mathematical method resulted in complete and absolutely certain knowledge about the world; otherwise, his analytical method would not be valid in its own rational terms. Bacon's empiricism and Descartes's rationalism were, however, even with basic disparities, not completely incompatible. Bacon stipulated that systematic and controlled sensual observations should be guided and tested by reason. And the Cartesian method was not without observation; empirical examples were used in support of the rationalist epistemological building.

Both epistemologies underpinned the Scientific Revolution by undermining the teleological Aristotelean-Scholastic worldview which was full of essential natural purposes. Both conceptualized nature basically as matter in motion without inherent direction or goal, but uniform and regular according to the mechanical operation of cause and effect, which could be measured and calculated in a quantitative, mathematical way. That nature appeared to be working in a regular and predictable fashion, could be taken as proof that God, as a great watchmaker, had created the world as a harmonious and predictable order, which did not require further continuous miraculous divine interference.

Empiricism and rationalism introduced a view on knowledge in terms of the opposition of subject and object. In both classic Platonic and Aristotelian and Christian traditions, knowledge is guaranteed by the assumed correspondence between rational human consciousness and the order of the universe. Understanding is awareness of and insight in these parallel orders. In the traditional Great-Chain-of-Being worldview, the order of things is present on the macro as well as the micro level, and in the external world as well as on inside in the thinking part of the soul. So, there was no clear-cut distinction between human thought and its external object. The new epistemologies, on the other hand, emphasized the distinction between human thought as part of the inner self and the reality of the external world. Nature was a reality apart from man as an autonomous subject, which cannot be known from the outside. Once the inner realm of man is distinguished from the outer realm of nature (and also society), then subject and object become distinct entities. Descartes' immediate certainty of his inner consciousness and therefore existence, is in contrast to his uncertainty about his knowledge of the external world including his own body. Thought and knowledge are not located in the overlap of inner and outer world but are confined to the inner subjective world of the mind. Rationality is no longer seen as a quality of both the external world and internal human consciousness but becomes the mind's purified method for penetrating in the opaque external world and extracting objective knowledge through the reduction of its complicated multiplicity to regular patterns and laws. Locke's empiricism epitomizes this epistemological shift even more than Descartes's rationalism. For Locke reason is not given in the mind, as it appears to be in Descartes' rationalism, but the product of the operation of the mind. The mind processes sensual perceptions through cognitive and

self-reflective methods, and these are also mediated by feelings and personal history. The result is not absolute, but rather a tentative and correctable truth.

The opposition between the rational mind as the subject of thought and analysis versus the material world, including the human body, as the object also entailed an image of philosophers and scientists as disembodied, as free-floating minds, in the sense that their body and its condition would not be relevant for their intellectual activity.

A new image of man: body and mind

Against the background of the Scientific Revolution, the question arose to what extent the mechanical laws that determined external nature could also be applied to living beings in general and to man in particular. Philosophers who rejected the older teleological and religious-magical view of nature developed a new perspective in which the notion of the soul as a purposeful multilayered spiritual and life force was more and more pushed to the background. Replacing Aristotle's notion of the *anima* part of the soul, the furtive life spirits, the structure and functioning of living bodies was now compared to the down-to-earth operation of machines and explained through regular mechanical laws. Descartes used the machine metaphor, introduced by Bacon in the field of natural philosophy (physics and chemistry), also as a model for explaining living nature. Not only inorganic nature, but also animal and human bodies were supposedly subject to mechanical laws. William Harvey posited that the heart is a pump, Giovanni Borelli demonstrated that the built of the skeleton and bodily movements display a mechanical structure, and Thomas Hobbes and Julien Offray de La Mettrie claimed that living bodies were like automata.

With regard to the spiritual life of human beings, these thinkers increasingly referred to the 'mind' rather than the 'soul'. The mind was about mental activities such as thinking, remembering, perceiving, feeling and imagining, and it was considered apart from the immortal soul, the divine part of human beings. A large part of what was formerly understood in terms of the supernatural part of the soul was now increasingly described in terms of the faculties of the mind. In this way, what was left of the spiritual soul, the immortal, divine part of man, was left to theology, while natural philosophers could develop a purely secular philosophy of the mind (and later also science of the mind: psychology and neuroscience). In order to prevent a clash with the Church, natural philosophers who reflected on human nature took the position that what they said about the human body and mind did not touch on Christian teachings and theological knowledge.

In the seventeenth century, Thomas Hobbes, well-known as a political thinker, was one of the first to formulate a radical view of man in materialist terms while ignoring religious doctrines. Man in the state of nature, says Hobbes, is mechanically driven and motivated by natural, bodily feelings of pleasure and pain. On the basis of the pursuit of pleasures and the avoidance of pain, he argued, every man has an absolute natural right to preserve his body and to use his powers to secure his life. In this way Hobbes took a first step to secularize and naturalize the moral categories of good and evil by linking them to concrete physical sensations instead of a divine, supernatural purpose. Hobbes put human nature as a secular phenomenon center stage in his moral and also political philosophy, and he was one of the predecessors of utilitarianism and selfish individualism, which would become influential in

the late eighteenth and early nineteenth century. Hobbes, however, was exceptional in his bold claim that the human mind was ultimately determined by physical needs. Until into the late eighteenth century, Descartes' and John Locke's views about the human body and mind set the tone.

The essence of Descartes' view of man was characterized his postulation of an independent, inner-directed thinking self which was strictly differentiated from the material and machine-like body. According to Descartes, rational thinking and the use of language distinguished man from the rest of material nature and made him superior to it. He argued that the mind (*res cogitans*, that is thinking, immaterial substance) and matter (*res extensa*, that is physical/material substance) are radically different. Matter exists in space and time, can move, is extended, divisible, measurable and quantifiable and it can be analyzed as a machine in mechanistic terms. The mind is immaterial and indivisible, operating in time, but without extension and location and it can therefore not be analyzed and quantified in a natural-scientific way. The mind, which is conscious of itself by introspection, and which can explain external reality in materialist and mechanical terms, can itself not be known from the outside and therefore not be scientifically explained. This position would imply that psychology as a science is not possible. (Later psychologists would claim that the mind *is* accessible from the outside, although only in indirect ways.) Descartes' dualism gave rise to the mind-body problem: the question how these two different substances were connected and how they influence each other. Descartes' ad hoc answer, that the mind interacted with the body in the pineal gland, a small organ at the base of the brain, was not very convincing. Ever since the mind-body-problem has been a much-debated issue in philosophy.

Descartes's dualism, the separation of the mind from the rest of nature, could be viewed as an attempt to safeguard the dignity of mankind from naturalization, to reconcile the new naturalist philosophy of the Scientific Revolution with the traditional status of man as an exceptional being. In that way Christian beliefs such as the existence of God and the immortality of the soul could also be saved. It is true that there was still a prominent place for a Christian God in Descartes' view of man, but at the same time it was very different from the traditional Aristotelian and Christian view of the soul as a combination of an organic life force and the spiritual, supernatural part of man. Descartes tried to explain as much of human life as possible in bodily, that is materialist-mechanist terms: perception, imagination, dreaming, passions, reflexes, automatic and routine activity, all that we would now consider as the object of study of biology, physiology and psychology. He purged the explanation of physical as well as psychosomatic functions of all spiritualistic, animistic and teleological features. What was defined as the organic soul by Aristotle and Christian thinkers, was now fully drawn into the body and explained in mechanistic-materialist terms. Descartes excluded only reason and free will from natural scientific explanations. And his association of reason and free will with an individualized and independent mind was different from the Christian soul as an ensemble of God-given qualities.

Possessive individualism: John Locke

Next to Cartesian philosophy, the adoption of the notion of natural laws for the understanding, not only of the physical universe, but also of the human world contributed to a new view of man. In enlightened legal and political discourse, Natural Law was

conceptualized as a set of fixed, universal and rational moral principles which should be the foundation for legislation, the organization of the state and society, and human conduct. Natural law, accessible through rational thought and providing guidance for society, was considered as a direct reflection of what was assumed to be the core of human nature. This implied that human beings were considered as autonomous creatures with free will, responsibilities, obligations, possessions, and also, increasingly certain inherent, inalienable rights – qualities that are at least shared by all individual subjects who are capable of using their reason in an independent way.

This kind of legal thinking articulated the concept of the rights-bearing person, the individual who is in possession, not only of his – but much less her – body and the products of his labor and other material possessions, but also of his actions, capacities, thoughts, remembrances, feelings, experiences, desires and opinions – in other words the individual is the proprietor of all his personal qualities, without owing to society anything for them. By appropriating these qualities, which in Natural Law thinking is a basic individual right, human beings can constitute themselves as self-owning persons. This is the idea of possessive individualism, formulated by thinkers such as Hugo Grotius, Thomas Hobbes and John Locke, and which was a basic principle of early liberalism.[2] The underlying presupposition of possessive individualism is that self-preservation, self-determination and self-development are man's most basic interests and rights – at least as far as the vital interests of others are not harmed – and that these rights had universal validity because they were inherent in human nature.

Next to Descartes it was in particular John Locke who articulated the secularized notion of the modern individual as a self-contained, self-sufficient and self-responsible agent of choice and initiative. His basic assumption was that the essence of man can be found in his inner mental life apart from social bonds and contexts. Like Descartes, Locke pictured man as a thinking being who reasons and reflects and who can experience himself as the same being in different places and times – in other words who can have a personal identity – because of the psychological continuity of his consciousness and memory. This psychological continuity is the precondition for being able to recognize all one's thoughts and actions over time as one's own and take responsibility for them.

The broader socioeconomic context of the emergence of modern individualism was the rise of commerce and capitalism, which entailed more geographic and social mobility and a weakening of the dense web of traditional social bonds. This enabled people to disengage themselves from collective and hierarchical social structures, a development which was also advanced by the gradual dissolution of feudal rights and obligations and the rise of the modern state. The spread of market relations through the sixteenth and seventeenth centuries and the emergence of a commercially enterprising bourgeoisie advanced the sense of the individual as an agent of worldly change and improvement. In the Protestant nations of North-West Europe in particular, there was a sense that the newfound wealth and technical knowhow was, not simply some sort of divine gift, but the product of individual activities, talents, abilities and opportunities. Protestantism, which postulated the believer as a self-responsible moral agent with an individual conscience, advanced the notion of the

[2] The Roman concept *individuum* originally referred to indivisible entity, the smallest building block of nature, like the Greek *a-tomos*. In the nineteenth century the term individual became current in the sense of the notion that every person should, at least in principle, be attributed moral worth and self-determination.

self as a self-reflective, acting being who could influence his fate during life on this world, although his ultimate fate after death was still in the hands of God. The individual became a practical agent whose self-worth resided in his ability to act upon both nature and society, and to achieve self-chosen ends.

Enlightened individualism was based on the idea that each human being was a more or less similar representative of mankind on the basis of a shared rational human nature. The more versatile and emotionally expressive individualism which was articulated by Jean-Jacques Rousseau, and which would come to full development in Romanticism, stressed human diversity and uniqueness, and it postulated an inner consciousness of thoughts and feelings which is separated and shielded from the external environment. The consequence was a dichotomy and increasing tension between the experience of what came to be considered as the invisible deep and true self and the more superficial outward public person. The artificial social role enacted in modern mass society imply that an authentic self is dissociated from public appearance (which may then be viewed as a theatre and judged as insincere). This modern individualism, a sense of subjectivity and privacy as opposed to the performative requirements of the public world, is reflected in the emergence of autobiographical writings such as diaries and letters and portrait painting from the seventeenth century on. This new sense of self would become one of the social underpinnings of the rising interest in the human sciences, depth psychology in particular.

2. THE BIRTH OF 'HUMAN SCIENCE' IN THE ENLIGHTENMENT

In *Gulliver's Travels* (1726) Jonathan Swift narrates how on one of his travels the protagonist ended up in *Brobdingnag*, the land of giants. Gulliver is brought before the king, who is educated in natural philosophy. The king carefully observes him and, so Gulliver tells the reader, 'seeing me walk erect, before I began to speak, conceived I might be a piece of Clock-work … contrived by some ingenious Artist.' Yet much to the king's amazement Gulliver proves capable of speech and answering questions. The king drums up several scholars to do a closer study. After they 'had a while examined my Shape with much Nicety', as Gulliver goes on,

> *They were of different Opinions concerning me. They all agreed that I could not be produced according to the regular Laws of Nature; because I was not framed with a Capacity of preserving my Life, either by Swiftness, or climbing of Trees, or digging Holes in the Earth. They observed by my Teeth, which they viewed with great Exactness, that I was a carnivorous Animal; yet … they could not imagine how I should be able to support my self, …. which they offered by many learned Arguments to evince that I could not possibly do. One of them seemed to think that I might be an Embrio, or abortive Birth. But his Opinion was rejected by the other two, who observed my Limbs to be perfect and finished; and that I had lived several years, as it was manifested from my Beard; the stumps whereof they plainly discovered through a Magnifying Glass. They would not allow me to be a Dwarf, because my Littleness was beyond all Degrees of Comparison; for the Queen's favourite Dwarf, the smallest ever known in that Kingdom, was nearly thirty Foot high.*

The scholars debate quite some time before arriving at the conclusion that Gulliver has to be a 'Lusus Naturae', a freak of nature.

Fifteen years after the appearance of *Gulliver's Travels*, Swift, together with his friends John Arbuthnot and Alexander Pope, published the fictitious *Memoirs of the Extraordinary Life, Works, and Discoveries of Martinus Scriblerus* (1741) in which a 'great Virtuoso' from Nuremberg appears. This inventor works on designing

> *a sort of an Hydraulic Engine, in which a chemical liquor resembling Blood, is driven through elastic channels resembling arteries and veins, by the force of an Embolus like the heart, and wrought by a pneumatic Machine of the nature of the lungs, with ropes and pullies, like the nerves, tendons and muscles: And we are persuaded that this our artificial Man will not only walk, and speak, and perform most of the outward actions of the animal life, but (being wound up once a week) will perhaps reason as well as most of your Country Parsons.*

Swift's and Arbuthnot's depiction of man as a designable machine mirrored the belief of the proponents of the Scientific Revolution, notably Francis Bacon and Descartes, that scientific knowledge and technical design were intrinsically related, and that this also applied to man himself as a possible object of science.

What Swift and Arbuthnot presented as satire, other eighteenth-century thinkers dealt with in more earnest ways. For example, the philosopher David Hume claimed in his *A Treatise of Human Nature* (1739-1740) that there was a need for a science of man, and that such a science would even constitute the basis of all other sciences. Partly in response to the seventeenth-century Scientific Revolution, but also partly in opposition to it, the contours of a science of man emerged in various European countries during the second half of the eighteenth century.

In Germany scholars wrote thick volumes on 'anthropology', the science that examined both the body and the soul of humans – 'die Harmonie von beyden', as Ernst Platner put it in his *Anthropologie für Aerzte und Weltweise* (1771-1772). In the 1790s a group of French physicians and philosophers came forward who became known as *Ideologues*. They conceived of man as a psychosomatic being, and they saw a major social role for the science of man. The *Ideologues* embraced certain attainments of the French Revolution, but they also expressed their worry about its excesses. In England the philosopher of Utilitarianism, Jeremy Bentham, argued for the development of an empirical science of man which could provide useful knowledge about the possibilities to improve human beings and society. In 1791 he published *Panopticon: or, the Inspection House*. It involved an architectonic model he deemed very appropriate for the building of prisons, reformatories, poor and workhouses, factories, schools, hospitals and asylums.

Nearly two centuries later, the French philosopher and historian of science Michel Foucault put forward that the panopticon was a striking representation of the disciplinary function of scientific knowledge of man in modern society.

The impact of the Scientific Revolution

The Scientific Revolution sought to explain the world in a rational and empirical way. The Christian-Aristotelean concept of the soul was replaced by the secularized view of man as a being with a (rational) mind and a machine-like body. The seventeenth century also saw, notably in de work of Thomas Hobbes, the first attempts to position man in nature and understand man in physical terms. The eighteenth century showed a continuation and intensification of the shift towards a secular and a more or less naturalist and materialist view of human beings. After external nature had become the object of scientific research, now, according to enlightened philosophes and medical thinkers, *human nature* should be explained in a rational way. Modern man should not let himself be guided by divine providence and handed-down tradition, but by rational knowledge of his nature.

It would be possible to gain scientific knowledge of man because human nature is conditioned by patterns and regularities, just like material nature operates according to natural laws. Also, they assumed that such knowledge was practically relevant in everyday life with respect to health, social conduct, civil society, political relations and ethical standards. The ambition to develop a science of man was part of the emancipatory ethos of the Enlightenment – defined by Kant as 'mankind's exit from its self-incurred immaturity' (1784) – and the enlightened politics of knowledge exemplified by the *Encyclopédie* of Diderot and d'Alembert, which was not only a reference work for spreading knowledge, but

also a political weapon against the authoritarian state and dogmatic church of the *Ancien regime*.

Thus, enlightened thinkers laid the foundation for the human sciences, which would come to full flowering in the nineteenth and twentieth centuries. In his *Treatise of Human Nature* (1739) the Scottish philosopher David Hume underlined the need for the 'moral sciences'. His argument was inspired by Newton's endeavor to explain nature as well as by John Locke's empirical approach. Hume argued that our experience of the world as orderly and to a large extent as familiar and predictable, is not an inherent quality of external reality itself, but the result of how the human mind processes our experiences and how these processes involve the formation of habits and routines, which guarantee a perception and experience of reality as if it is stable and self-evident. In order to understand human nature, says Hume, it is crucial to investigate and map in a systematic way man's practical ways and habits, routines and conditioned responses to external influences as well as his/her passions in relation to physical stimuli and movements. Such knowledge, he added could be used as a practical and moral guide for man how to conduct his life in an optimal way.

The assumption that natural-scientific methods should be used to investigate man and that the human world was, like physical nature, determined by underlying basic laws, pattern and regularities, resonated among several enlightened thinkers. Charles Louis de Montesquieu, who considered the influence of climate on human temperament, social organisation and laws, carried out experiments on the nerves of a sheep's tongue in order to find out how sensitive they were to temperature. The results would indicate how political regimes in the human world should be geared to various climates. Also in France, the so-called physiocrats Anne-Robert-Jacques Turgot and Francois Quesnay argued that the organization of the economy should follow natural laws as they ruled in external nature as well as in organic bodies. Quesnay, who was trained as a doctor, underpinned his plea an unhampered exchange of surplus agricultural products and money by suggesting a comparison with the smooth circulation of blood in a healthy body. Productivity and trade could be boosted through rational reform, that is removing all artificial impediments, obstacles and inefficiencies, and allowing economic actors to follow their own self-interest. In that way the economy would run smoothly by itself according to its own inbuilt natural regularities; the meaning of physiocracy was rule by nature.

Adam Smith, the founder of classical political economy who was influenced by the French physiocrats, believed that a Newtonian approach would help him understand social and economic relations. If gravitational attraction was the essential force in nature, the driving forces in the human world were, according to Smith in his *Moral Sentiments* (1759) and *The Wealth of Nations* (1776), two human mental forces: 'sympathy' (relational fellow-feeling based on empathy, the capacity to recognize other human beings as similar to himself and to put oneself in another's place) and 'self-interest'. These apparently antagonistic human drives (like attracting and repelling forces in nature) would be harmonized as an unintended consequence of the 'invisible hand' and thus result in a peaceful, cooperative and orderly market economy. Like the physiocrats, Smith argued that this invisible hand could only do its natural work if government set optimal conditions by dismantling irrational customs and

obstacles as well as introducing legislation to guarantee an equal and fair playground.[3] Whereas the physiocrats and Smith drew their inspiration from biomedical knowledge and physics, others looked to mathematics as a model for the human sciences. Marie Jean Antoine Condorcet referred to 'social mathematics' and others to 'political arithmetic' as methods for gathering systematic information about the health, morals and productivity of the population and in general for creating transparency about society. This quantitative approach foreshadowed statistics and probability theory.

From rationalism to empiricism

The endeavor to establish a scientific study of man in the eighteenth century built on the ambitions of the seventeenth-century Scientific Revolution. Apart from Bacon's empiricism, the model of science in the Scientific Revolution centered on formal, abstract, deductive reasoning, quantification and mathematical logic, as it had been elaborated by Descartes in his *Discours de la Méthode* (1637). At the same time, however, the Cartesian and Newtonian natural scientific model was put in perspective. Crucial for the emergence of the enlightened science of man was an epistemological turn from abstract and reductionist rationalism to empiricism, which involved a new image of man. Also, the quest for general, universal truths was joined by an increasing interest in the particular and therefore human diversity. The rationalist Cartesian mind-body dualism was put up for discussion by a psychosomatic view of man as a sensuous being. Empiricism with its emphasis on the importance of the senses for gaining knowledge, entailed that the mind was increasingly associated with and even drawn into the body.

In the eighteenth century, there was a shift away from Cartesian rationalism towards empiricist approaches, which relied on observation, perception, sensual experience, accurate description, and systematic comparison. The growing importance of empiricist approaches did not rule out the Cartesian rational method completely, but apart from reason with all its capacities, the senses were considered as the crucial means for acquiring knowledge. Without experience of the outside world, reason was considered as being empty of contents and helpless. Locke's empiricist view of man, elaborated in his *Essay Concerning Human Understanding* (1689-90), became very influential in the Enlightenment. Empiricism held that the mind of every newborn child was like a *tabula rasa*, a blank sheet of paper that was filled as a result of sensual experience and learning-processes. Locke argued that human beings were born with a mind including inherent rational capacities to process sensual experiences, but that the substantive contents, the building, blocks of the mind, the so-called ideas and associations between different ideas, were the result of the experiences of the outside world.

Lockean empiricism was radicalized in the epistemological theory of sensualism, which was articulated by French Enlightened materialist philosophers such as Étienne Bonnet de Condillac, Denis Diderot, Claude Adrièn Helvétius and Paul Henri Thiry d'Holbach. Whereas

[3] The idea of the economy as an autonomous and prime sphere of activity, separated from other (social, political, cultural and moral) dimensions of human life, which would follow laws of its own and which could therefore be rationally analysed, was related to the demand of the trading middle classes for freedom from state intervention and removal of traditional impediments in their commercial activities. The study of political economy transformed this capitalist aspiration in the suggestion that such a situation mirrored the natural condition of the economy.

the human mind as immaterial thinking substance was excluded explicitly from the world of matter and mechanical analysis by Descartes, they included it in the naturalist explanatory framework. French materialist philosophers argued that the operation of the mind as a mechanical registration device linked to the senses did not fundamentally differ from that of physical phenomena. Just as the material world consisted of particles moved by pulling and pushing forces, the mind was composed of mental elements (ideas) triggered by sensory perceptions and these ideas would interact (associate) in a mechanical way. They also asserted that not only the contents of the mind (impressions, ideas, thoughts, and also feelings), but also the working of our mental faculties such as perception, understanding, judgement and memory, and self-consciousness in general were the products of experience and depended on the senses (seeing, hearing, touching feeling, smelling, tasting). Sensualism held that the mind was closely related to and even dependent on the body. The physical senses were the crucial mediators between what is in our mind and the external world. Without sensual experience there would nothing in the mind at all. The assumption that the material and sociocultural environment influences and shapes man, his body as well as his mental and moral make-up, was the opposite of Descartes' claim that self-consciousness was a matter of autonomous self-reflection; that the inner, immaterial self, which is supposedly strictly separated from the rest of the material world, gains certain knowledge on the basis on pure logical reasoning in and for itself.

Empiricism in general and sensualism in particular implied the belief that man was shaped by his natural and cultural environment and also that human beings were plastic, that they could be designed and improved by enlightenment, instruction, upbringing, education, conditioning, habit formation, and the (re)organizing and manipulation of the environment. Human attributes were not fixed, and the mind was not confined by original sin as in Christianity or by innate rational or logical principles, as Descartes believed. Empiricism and sensualism emphasized flexible 'nurture' rather than determinist 'nature' and postulated a view of human nature as malleable and improvable.

All of this touched on the notion of man as a moral actor. Following Hobbes to a certain extent, Locke and the sensualist philosophers tended towards a secular, utilitarian ethics. Feelings and ideas about what was right or wrong could be reduced in the last instance to experiences of pleasure and pain. Thus, right and wrong were associated with mental experiences instead of divine or metaphysical imperatives. Locke added, however, that the relation between the experience of pain and pleasure and moral behavior was not direct, but mediated by rational thinking which guaranteed that feelings of pain and pleasure were controlled and regulated, so that possibly egoistic behavior would be channeled into social behavior. Therefore, it was crucial for socialization that rational faculties were developed by education and a stimulating environment. This perspective was based on a notion of human nature which assumed a common rational mind and capacity to develop that mind. This view fostered an optimistic belief in a basic underlying human equality and in the possibility to promote social harmony.

The Cartesian body-mind dualism had placed man as rational being outside and above the rest of nature and at the same time considered the body as some sort of intricate mechanical machine. This double (rationalist and mechanical) explanation of man was gradually replaced by a 'holistic' and 'psychosomatic' one. The physical body as a sensitive

organism, and what was called the 'moral' part of man (including thinking, feeling and the social-cultural dimension of man) were considered as interrelated. As a consequence of the empirical turn and medical-physiological investigations (for example into the nervous system as the connecting physical organ between mind and body), the mind, as the seat of thought and consciousness, experience and feelings, was increasingly associated with the working of the body and even, in some biomedical explanations, more and more drawn into the body. The influential French medical thinker and leading Ideologue Pierre Cabanis, for example, considered thinking and behavior as vital functions which were comparable with other physical processes.

This rejection of the Cartesian idea of the mind as completely distinct and separated from the material body, was an important step towards the naturalization of the mind, which had been taken earlier by, among others, Thomas Hobbes. This was continued by empiricist philosophers as well as physicians who carried out physiological research and who considered health and illness in broad terms: not only with regard to the body in itself, but also to conduct, ways of life and the living environment which were or should be in line with the human physical make-up. These medical researchers increasingly distanced themselves from the model of the body as a machine and proposed explanations of life in terms of dynamic and spontaneous self-organizing vital forces. Such explanations would be elaborated in the new discipline of biology which developed from around 1800. Apart from self-regulated life processes like respiration, digestion, blood circulation, regeneration and healing, growth and aging, procreation and the spontaneous reflex activity of muscles and their irritability, they were especially interested in the working of the senses, and the nervous system, which seemed the link between the body and mental processes. Locke already suggested that consciousness was located in the brain: sensory perceptions were transmitted by the nerve-system from the outside world to 'their Audience in the Brain, the mind's Presence-room'.

All of this undermined the separate and privileged status of the mind as a metaphysical and unified entity. Whereas Descartes had desacralized the body as a mechanical machine (in that way human beings and animals were not different) and elevated the rational mind as the essence of human beings, sensualism, defining man as a unified psychosomatic being, rather 'decentralized' the mind' as dependent on physical processes. Since mental processes could be traced back to several parts of the body, the boundary between what was mental and what was physical was not so strict any more as Descartes had suggested and, as a consequence, neither was what distinguished humans from animals. The nervous system came to be seen as the crucial connection between body and mind and this suggested that human beings could be compared to animals – although at the same time the superiority of man was upheld with the claim that the human nervous system was far more complex than that of animals.

The association of empiricist philosophical thinking and this kind of medical-physiological research, and the discussions between philosophers and medical thinkers gave rise to the notion of 'anthropology', especially in France and Germany. Anthropology was a broad intellectual endeavor to view human nature in a holistic manner: to study man's physical existence as well as what was referred to as the 'moral' (including mental, behavioral, social and cultural) dimension of human life, and to understand the connections and mutual

influences between the physical and the moral. Anthropology claimed intellectual authority about all these diverse aspects of human life and experience. In the course of the nineteenth century, the broad field of anthropology would more and more differentiate into separate disciplines: biology, experimental physiology, natural scientific medicine, psychology, psychiatry, neurology, criminology, ethnology/cultural anthropology and sociology.

From the general to the particular

The second epistemological shift was the changing emphasis from general, universal truths to the interest in the particular and in human diversity. Whereas natural science as established by the Scientific Revolution focused on general, abstract, law-like universal truths, in the eighteenth century there was growing empirical interest in the description of the concrete and the particular, which implied that with respect to mankind there was a fascination for human diversity. Drawing attention to differences between individuals as well as groups of people and comparing them, advanced interest in other, non-Western and 'primitive' cultures and in 'the Other' in the Western world: people who were different, in particular those who appeared to be irrational, such as the insane. They became the object of a new medical field, 'alienism' (later known as psychiatry) which treated insanity as illness instead of moral failure.

The late eighteenth and early nineteenth century also witnessed the emergence of new scientific fields such as physical anthropology, comparative anatomy, craniometry, physiognomy, phrenology, and racial ethnography. Their method was systematic measurement, description and comparison of physical differences among individuals and between groups of people. The shared belief was that such investigation of the body also threw light on mental and behavioral features, and therefore was the groundwork for scientific knowledge about human nature. The increasing interest in differences between people, between the sexes, 'races' and the 'normal' and 'abnormal' in particular, advanced biological and physiological explanations focusing on supposedly inborn and fixed natural characteristics and evaluating these in terms of superiority and inferiority.

Enlightened notions of human nature

Anthropology embodied the ambition of enlightened thinkers to understand mankind primarily not in relation to God, divine revelation, the scriptures or inherited tradition, but in terms of human nature, and also of society and history as its cultural expression. As a consequence of the revolutionary era of the American and French Revolutions and the Napoleonic wars, all of which crushed the traditional social and moral order, there was a broadly felt need for a new view of man. The search for knowledge about human nature was a response to social and political turmoil and uncertainty and served the (rational and supposedly non-political) underpinning of a broadly shared groundwork for a stable modern moral and social order. Knowledge about human nature would also provide 'neutral' answers to disputed sociopolitical issues such as equality versus inequality. The new anthropological image of man was found in the secularized notion of human nature that was one of the central concepts of Enlightened thinking: a human nature which can be investigated and known, not only by introspection in the Cartesian way, but even more by empirical observation, description and comparison. The assumption was that scientific

knowledge of human nature, of the essence of man, would provide an objective and neutral guideline for individual and social life. The science of man would make clear in which direction human beings should develop themselves and their society.

The meaning of human nature, however, was not clear and fixed. It was an ambiguous, essentially contested concept, disputable and open to numerous definitions and value-judgments. The concept referred simultaneously to supposedly scientific and empirical facts about 'what man is' and ethical, political or ideological values and claims with regard to 'what man should be'. Discourses about human nature, whether scientific or not, often blended the factual-empirical and the normative. Just like people of different religious creeds tend to believe that God is on their side, proponents of different views of what man is and should be, like to think that nature is on their side. Anti-slavery abolitionists as well as those defending slavery of black Africans referred to nature to underpin their views about man and his moral status. Referring to 'nature' as a basis for moral and political claims (and social interventions) was (and is) so attractive and compelling because of the suggestion that they are supported by objective and therefore indisputable scientific conclusions. This is the background of the so-called naturalist fallacy: the confusion between and conflation of empirical facts of nature and moral imperatives or political and ideological values, and the related projection of what is considered morally, socially and politically desirable to an assumed essence, potential or destiny of human nature.

In the eighteenth century we find at least three meanings of human nature:

1. the 'primitive' condition of man apart from society, culture and history;
2. the concrete empirical human body and its psychosomatic operation;
3. the essential reasonableness which all of humanity supposedly share.

Ad 1. The idea of a natural 'primitive' condition of man apart from society, culture and history served to compare and contrast modern Western man with man in other parts of the world (which might imply cultural relativism) as well as with his own barbarous prehistory before the Western world had become civilized. The association of human nature with Western man's own prehistory was prominent in political thinking about the idea of the social contract as the political transformation of man's wild existence into an orderly and peaceful society. Thomas Hobbes, for example, pictured the natural state as one of brute anarchy, violent struggle for life and the right of the strongest. He argued that a peaceful social order could only be established in a politically organized society under a strict ruler who monopolized the use of violence. Hobbes' message was that rough human nature had to subdued for the sake of a secure and peaceful co-existence of people. Another influential social contract thinker, Rousseau, however, introduced the contrast between an unspoiled, pure natural state of mankind and of an artificial and corrupt civilization. In his social thinking, for example in his political *Du Contract Social* (1762), Rousseau used naturalist analogies: he described his ideal sociopolitical community as an organized body politic which was like an organic unity: separate individuals and the collective as a whole depended on each other and would interact in a balanced and harmonious way.

The idea of a transformation from primitiveness towards civilization resonated in speculative developmental histories of mankind, in particular among Scottish enlightened thinkers such as Adam Ferguson and Adam Smith who focused on changing economic modes of existence as the

underlying civilizing dynamic. Human development had progressed through specific stages towards a growing division of labor and increasingly sophisticated productive activities: hunting and gathering; pastoral and nomadic; agricultural and feudal; and commercial and manufactural. Such an economic perspective was rooted in the belief that man had a natural right, not only of material self-preservation but also of self-interested improvement of his living-conditions. Starting from the assumption of individual human nature (in terms of self-interest), economic thinking played a prominent role in the search for a science of man.

The notion of nature as 'uncivilized' (more in a negative than in a positive Rousseau-like sense) was also used to refer to irrationality and 'wildness' within contemporary Western society, characterized by the German writer Jean Paul as 'our inner Africa': insanity, criminality, violence, uncontrolled sexuality, pauperism, lack of education, the erratic nature of children, of so-called feral or wild children in particular. The association of human nature with the irrationality of the primitive and the Other was a way to confirm one's own orderly rationality (usually defined on the basis of the values of the rising middle class). The question was to what extent these deficiencies could be remedied by education and civilizing efforts in order to turn such deviant and backward people into rational and responsible members of society. Optimistic enlightened thinkers tended to answer this question with yes: the potential for reasonableness and moral improvement was considered as part of human nature, even though this potential was still latent among the masses and had to stirred and developed. There was, however also a more troubling and pessimistic view of the irrational passions and instincts as the essence of human nature, for example in the work of Dennis Diderot and Donatien Alphonse Francois de Sade among others, who questioned human rationality and reasonable morality. In De Sade's work, which echoed Thomas Hobbes' natural man, human beings appear as totally egoist, egocentric, hedonistic, sexually perverted and power-hungry without sympathy or pity whatsoever for their fellowmen. Also in civilization, he claimed, man was still the natural man of Hobbes. Civilization was only a thin veneer and control of human nature by civilization was an illusion.

Ad 2. The second meaning of human nature referred to in a more neutral way to the human body and its functioning, the processes of life including instincts, passions and reflexes. This notion was prominent in philosophical as well as medical-physiological theories which postulated that the operation of the human mind depended largely on the senses and therefore the body. This implied a view of the inner life of human beings as dynamic and under tension of antagonistic feelings and drives – a view that raised doubt about the power of reason to control them. This meaning of human nature was also central in the new science of biology which emerged around 1800. In the anthropological model of the emergent biomedical sciences, objective knowledge about individuals was derived from their body: anatomy, physiology and its appearance. The associated sociopolitical message was, firstly, that standards of individual and social human behavior should be based on knowledge about the natural workings of the normal or healthy human body and its influence on the mind; and secondly, that social, cultural, ethnic and gender differences could be explained in terms of natural characteristics.

Ad 3. The third meaning of human nature is the more abstract assumption about what all men have in common: reason and the potential capacity to develop and use this faculty. This notion was the basis of the emancipatory imperative of the Enlightenment and was central in the

discourse about Natural Law, the argument that all people share basic and universal rights based on the general human capacity to reason, which is either manifest or latent. In the latter case, it was a potential that could (and should) be awakened and developed by upbringing, education and civilizing. Natural right postulated that rational human nature should be the basis of justice and morality, an enlightened society and a transparent and rightful political order. This meaning of human nature refers to an ethical, social and political ideal about what man should be, an ideal that dovetailed with the Enlightenment project of liberation from ignorance, prejudice, dogma and superstition; 'mankind's exit from its self-incurred immaturity' as Immanuel Kant phrased it. Although Christian religion was pushed to the background, moral issues, were prominent in enlightened discourse about human nature. Enlightened social thinkers were more interested in the rational way man and society should function than in the ways man and society really worked in the context of prevailing traditions, vested interests, power relations, and inherited habits, customs and beliefs.

What was to be considered as the good life, was supposedly given in the nature of man; in this sense human nature was a moral imperative, in particular to realize the rational potential. In Scottish enlightened moral philosophy, for example, knowledge about the nature of man was closely related to the question about how human beings should relate to each other and how society should be organized. Following John Locke, Scottish moral philosophers such as Thomas Reid, Adam Smith and David Hume assumed that egoistic as well as moral and social feelings were engrained in human nature and that therefore individual strivings and the public good could be harmonized.[4] This optimistic reliance on the inherent *bienfaisance* of nature, that it was benevolently serving the needs of man, was the very opposite of Hobbes' and De Sade's view of human nature as totally egoistic and violent, and also, on the other hand, of Rousseau's idea of the inevitable disharmony between unspoilt, virtuous human nature and artificial and corrupted society.

These three meanings of human nature show some fundamental ambivalences and contradictions. Within the first meaning there is the contradiction between the widely held view that civilization requires a subduing of a primitive (evil and harmful) human nature and the Rousseau-like view that civilized society is corrupted and should be healed through a return to some sort of pure and good human nature. Whereas the first and second meaning are supposedly about what man really *is*, the third one mixes the factual with claims about what man also *should be*.

The second and third meaning in particular are at odds: the abstract and idealistic Natural Law view of man as essentially rational, free and improvable set against the naturalist view of man as a psychosomatic being who was determined by anatomy, physiology, instincts, reflexes, impulses and drives. This contrast is connected to another one: on the one hand the assumption of a fundamental human equality because of a common reasonable human nature, and, on the other, the association of human nature with inborn physical and mental

[4] A more down to earth or even cynical view of the coincidence of individual and collective interests had been presented in the early eighteenth century by the Dutch-British physician and moralist Bernard Mandeville. In his *The Fable of the Bees; Or, Private Vices, Publick Benefits* (1714) he argued that naked self-interest was the natural basis for collective wealth. Human nature was characterized by passions such as egoism, greed, envy, vanity and hypocrisy, but at the same time such vices stimulated profitable economic activity which would, as an unintended consequence, not only benefit the individuals involved but the commonwealth as a whole.

characteristics which differ between individuals and between the sexes, 'races' or ethnic groups, social classes, and between 'normal' and 'abnormal' people, and which imply 'natural' inequalities. Such inequalities were understood in terms of more or less rational versus irrational, civilized versus primitive, developed versus undeveloped, modern versus backward, educated versus uneducated, European versus non-Western – all of which were subsumed under the evaluation of superior versus inferior inherent qualities of people.

Different degrees of rationality and irrationality, developed and undeveloped, primitive and civilized, educated and uneducated, normality and abnormality were generally judged in terms of superiority and inferiority, but explanations diverged, in particular from the late eighteenth century on, when the ambivalence of enlightened understandings of human nature became increasingly clear. Either differences between individuals and groups of people were seen in terms of environmental and sociocultural variation and change or such differences were believed to be inherent and fixed in physical nature. The first explanation upheld the abstract, idealistic principle of Natural Law that mankind was defined by an underlying sameness and equality because of its shared rationality, if not yet realized, then at least as potential which could be developed.[5]

The second explanation, which gained influence in the late eighteenth and early nineteenth century, not only tended toward a reductionist and determinist view of man – unchanging nature as inherent destiny – but would also involve implicit or explicit evaluations along the lines of superior versus inferior, and equal versus unequal. Democratic revolutions and enlightened social reform might advance human improvement and equality, but underneath, at a more basic level, nature, as inevitable destiny, did not equalize and would limit melioristic and democratic ambitions. As political democratization as well as the industrial revolutions infringed on traditional status hierarchies, advancing the prospect of a more egalitarian society, scientific explanations of fixed natural disparities began to play an ever-greater role in justifying social inequalities. The enlightened science of man, which placed humankind firmly in the natural world, marked an epistemological as well as moral turning-point: next to its emancipatory potential, the increasing focus on fixed natural characteristics and the associated natural inequalities revealed an objectifying, othering and dehumanizing trend. The science of man and its basic concept, human nature, could be mobilized for very different sociopolitical ends. Clear examples of the naturalization of inequality were new scientific explanations by natural historians, physical anthropologists, anatomists and doctors, of the differences between the sexes and between 'races'.

Different social roles and life-worlds for men and women had been common in traditional society as an intrinsic part of sociocultural and moral-religious norms rather than as an inevitable consequence of physical differences. The male and female body, the reproductive organs in particular, were not so much seen as opposed but as comparable and positioned on a hierarchical continuum which implied that female body was an imperfect version of the male one. From the late eighteenth century on, however, the female anatomy, physiology and temperament were increasingly defined not only in contrast to the male body and mind, but also as inferior. In particular because of her role in procreation, woman was supposedly closer

[5] This was in in line with the Christian idea that all humans were created in God's image as well as with the egalitarian consequences of Descartes' body-mind dualism which implied that thinking does not depend on the body.

to nature, and therefore more instinctive and emotional than man, whose qualities were associated with rationality, self-control and the achievements of civilization. The notion of a fixed natural dichotomy between masculinity and femininity began to serve as a legitimation for the disparate social destinations of the sexes and the exclusion of women from public life (including science); their natural role was that of nurturing mother and housewife in the idealized private sphere of the middle-class nuclear family.

If Europeans used to consider the inhabitants in other parts of the world as inferior, they did so mainly because these people were (not yet) Christian or (still) lacked civilization, and not so much because they were of a different natural species. Eighteenth-century racial classifications by natural historians such as Carl Linnaeus, Georges-Louis de Buffon and Johann Friedrich Blumenbach, started mainly as a new method for looking at human diversity rather than an understanding of race as a fixed natural category. The monogenetic view of 'race' – a term which was used in very loose way to refer to people, nation, ethnicity, kind, variety or species – held that all human beings, irrespective of their physical make-up and cultural background, shared a common origin and that differences between races were caused by physical (geography, climate, nutrition, health) and cultural (socialization, customs, education) environmental factors. Linnaeus, the leading taxonomist of natural history, categorized all human beings under the label *Homo sapiens* as one species which belonged, together with apes and monkeys, to the primates, and he classified varieties of humans mainly on the basis of geography and climate.

Monogenism negated absolute and fixed boundaries between races, yet it often assumed a hierarchical racial order on the basis of the assumption that non-Western peoples had degenerated, that they had moved away from the common origin, as God had created mankind. At the end of the eighteenth century, however, a more naturalist perspective on race gained ground. The shift from the monogenetic perspective to polygenic view that human races descended from different ancestors encouraged biological explanations of racial differences. The scientific evidence of distinctive races was increasingly located in anatomy and physiology as well as outward aesthetic characteristics of the body, in particular the form of the skull and skin color. Such a perspective was encouraged by the emergence and growing popularity of sciences such as physiological anthropology, anthropometry, craniometry, physiognomy and phrenology, which deduced people's mental and behavioral characteristics from outward physical appearances. The next step was a reductionist explanation of cultural and mental differences as innate and immutable characteristics, which were evaluated in terms of superiority and inferiority. The presumed stagnation and backwardness of non-white races was now explained in terms of their inherent primitive nature. Such reification of race as an objective natural reality and a growing preoccupation with racial purity paved the way for the development of scientific (biological) racism in the nineteenth century. It was especially in the aftermath of the democratic American and French revolutions, when the abstract ideal of equality had real political consequences and the antislavery movement gained ground, that naturalized justifications for the fundamental racial inequalities were stressed. If politics could equalize, nature at least did not.

German anthropology

In Germany scientific knowledge of man was advanced by bourgeois intellectuals as part of their reflection on their inner self in relation to their adoption of rationality and individual self-responsibility as a guide for life, which epitomized their middle-class identity. To be enlightened implied being knowledgeable and informed, not only about the external world, but also about the self, in particular the interaction between body and mind in order to be able to control and direct oneself and to deal with passions and instincts. Against this background physicians, theologians, educators and philosophers published popular and learned expositions about anthropology. Immanuel Kant for example engaged himself with this field as a practical guide for life in civil society: he lectured about it and in 1798 published *Anthropologie in pragmatischer Hinsicht* (Anthropology from a pragmatic perspective), in which he argued than every man had two main tasks to fulfill in live: to learn how to know oneself and to develop oneself in his or her individual way as an autonomous moral agent in order to contribute to the well-being of society. This purpose required willpower and rational control over unruly passions and drives, and broad intellectual and cultural shaping of the self. Kant's ideal resonated in the educational model of *Bildung*, as elaborated by Wilhelm von Humbold, the initiator of the University of Berlin.

The increasing attention for the usefulness of self-knowledge was also reflected in popular-scientific journals, which focused on personal mental life, often on the basis of life-stories, such as *Magazin zur Erfahrungsseelenkunde* (1783-1793). Here we see the emergence of a discourse about individual inner life and its discontents: character, feelings, intuitions and the 'inner voice' of conscience. Against this background, ways of discovering one's personality and capacities became popular. Johann Caspar Lavater introduced physiognomy, analyzing personality types on the basis of facial features. Franz Josep Gall and Johann Caspar Spurzheim developed phrenology to uncover the mental faculties of individuals by investigating the shape of and the bumps on the skull. This practice was related to craniometry, the systematic and comparative measuring of the skull of different groups of people. These new 'scientific' fields reflected secular, middle class and more or less meritocratic values. At the same time autobiographical writings and novels which pictured the inner life and character development, became popular. Self-knowledge required that one looked at oneself from a distance, as an object and this required sincerity and honesty. The middle-class ethos stipulated that man should be a master of his passions and instincts, that he was not overwhelmed with emotions, drives, phantasies or religious delusions. If such a thing happened it showed that one had not yet realized the rational values of the Enlightenment. Insanity was the prototypical counter-image of the enlightened bourgeois norm for good, that is self-controlled, behavior. When the fear of ending up in hell subsided, becoming insane became the new nightmare.

French 'Ideology'

In France a group of influential Enlightened philosophes and physicians, known as the *Ideologues* who were active during the French Revolution and the early Napoleontic era, formulated a program for a comprehensive empirical science of man. The philosopher Antoine-Louis-Claude Destutt de Tracy (*Eléments d'Idéologie*, 1804) and the physician Pierre Jean Georges Cabanis (*Rapports du physique et du moral de l'homme*, 1815) were the

leading figures of *Idéologie*, and also the prominent physicians Philippe Pinel, Xavier Bichat and Francois Joseph Victor Broussais belonged to this circle. Their promotion of *la science de l'homme* as the comprehensive study of man built on sensualism as well as broad medical knowledge on the interrelated physical, mental and 'moral' (socio-cultural) existence of man. Health and well-being, they argued, depend on the interplay between individual nature, habits and living conditions. Empirical knowledge about patterns of human behavior and the influence of the physical and cultural environments on man should offer guidance for personal as well as social life. The ideologues claimed authority for physicians in many dimensions of human life and they strongly believed in the possibility to transform and improve both individual citizens and society as a whole through social hygienic policies and educating people in order to gear their behavior to rational and moral principles. Thus, the science of man would replace traditional customs and habits and religious values, and provide models for good citizenship and the rational organization of modern society. The ideal citizen was the healthy, balanced and well-tempered individual, who, through responsible and well-adjusted behavior, contributed to the harmony and the progress of society as a whole.

The *Idéologues* were inspired by social and political concerns and their ideas were shaped by enlightened ideals as well as the French Revolution. They rejected traditional society and the Ancien Régime, and they supported the revolutionary principles of liberty, equality and fraternity. They also welcomed the new republican order because its anticlericalism encouraged free and unbiased scientific inquiry into the nature of man and society. Many of them were involved in revolutionary politics, but at the same time they feared the dangers of anarchy, ideological discord, violence and state terror, which were also part of the French Revolution. Therefore, in order to safeguard social stability and integration, and economic productivity, politics had to be balanced by the neutral instrument of scientific and technological expertise, which could provide direction and social control. (This approach was later continued by social thinkers such as Henri de Saint-Simon, August Comte and Emile Durkheim.) The *Ideologues* were involved in numerous reform projects in education, medicine, the administration of justice, poor relief, the care of the insane and social hygiene, which were launched during the French Revolution and Napoleon's regime, although most of them were not realized. Cabanis and Bichat in particular also influenced sociopolitical thinking. They compared society and the nation with living bodies and species; their suggestion was that harmonious social cohesion and national integration could be realized if the organization of society followed the organic pattern of nature. And they also suggested that good citizenship depended on a healthy condition of people, in particular on their nervous system and brain. Cabanis emphasized the significance of physiological and mental variations, 'different turn of mind and soul' as he phrased it, among people and how their make-up was affected by natural factors such as sex, age, temperament, climate, nutrition and illnesses. Bichat in suggested that modern society, with its increasing division of labor, should organized along physiological lines. In his *Recherches physiologiques sur la vie et la mort* (1800) he divided people in three basic physiological categories which were associated with dissimilar inborn qualities, and which fitted basic socioeconomic roles and functions. So-called brain man possesses the intellect for science and reflection; sensory man was qualified for art and religion; and engine man was fit for material production. A well-organized society guaranteed that each individual would be placed in his or her naturally appropriate social position.

British utilitarianism

In Great Britain the science of man emerged as a response to socioeconomic modernization and worries about sustaining social order. The transformation of a small-scale agricultural society into a large-scale industrial and urban society required new forms of government, social administration, and guidance of human life. This triggered attempts to social reforms which were oriented towards economic values such as productivity and utility, and a more efficient and rational organization of society. Such reform movements, which advocated responsible government in the interest of the people, relied on an enlightened belief in scientific knowledge as an instrument to improve individuals and society as a whole.

The leading thinker was Jeremy Bentham (1748-1832). He and his followers, the so-called Philosophic Radicals including James and John Stuart Mill, the economist David Ricardo and the sanitarian reformer Edwin Chadwick, argued that technical progress and industrialization inevitably required social reform along the lines of rational scientific insights in man and society. Inspired by an empiricist-sensualist view of man and French enlightened thinkers, Bentham formulated his philosophy of utilitarianism as a rational, secular and practical guideline for personal ethics and social policies. Bentham assumed that the principal human drive was hedonistic and egoistic: the avoidance of pain and discomfort and the striving after pleasure and happiness. The basically hedonistic and egoistic nature of man could be turned into a beneficent and moral direction by establishing not individual but collective happiness, the happiness of as many people as possible as a moral standard. According to Bentham it was 'the greatest happiness of the greatest number' that should be the measure of right and wrong. The moral quality of a human act would depend on the amount of happiness which it added to the total amount of happiness of as many people as possible. In this way individual self-interest and the common good could be harmonized; the promotion of the public interest would eventually benefit all individuals. According to Bentham's hedonistic calculus the greatest happiness of the greatest number could be realized by making utility into the dominant measure for right and wrong, and by introducing social engineering and planning along the lines of rationality and practical efficiency. Like other empiricists Bentham believed that man was malleable and could be shaped through upbringing, education, legislation, the organization of the environment and social reform. Whereas economic thinkers such as Adam Smith and Ricardo believed that the invisible hand of the free market (provided that fair play was guaranteed by man-made laws) would automatically provide a sound balance between individual self-interest and the collective good, Bentham thought that social harmony could not be realized without legislation and active social intervention.

Bentham proposed many practical reform projects in the field of law, health care, poverty relief, education and the fight against crime. Like the French *Idéologues*, he was opposed to tradition and religion. He strongly believed in the possibility to bring about progress by regulating human behavior through scientific knowledge and technological expertise. Bentham pointed to the usefulness of statistical registration of the population and of their social and economic activities. Statistics was the scientific way of making society transparent, which was the precondition for efficient surveillance and social policy. In 1791 he published *Panopticon: or, the Inspection* House in which he described a model architectural structure for prisons, reformatories, houses of correction, poor and work houses, factories, mental

asylums, hospitals, barracks and schools. The Panopticon served the goal of systematic and efficient observation, classification, experimentation, inspection and surveillance for different purposes: confining the suspects, correcting criminals, guarding and treating the insane, reforming the vicious, employing the idle, treating the sick or preventing the spread of epidemic diseases, educating children, instructing and disciplining laborers in any branch of industry or soldiers in the army. The panopticon regime was the more effective, according to Bentham, the more so because those who were subjected to it for a considerable duration would internalize the surveying gaze of watchmen and thus eventually regulate themselves.

Bentham's panopticon reflected the historical reality of increasing institutional segregation of several groups who were increasingly considered as a burden in modern industrial, urban and individualizing society: people who could not meet the new requirements of productivity, rationality and efficiency such as paupers and the unemployed, the chronically ill, the insane and the physically and mentally handicapped, tramps and criminals. Several new institutions were founded in the late eighteenth and early nineteenth century, such as poor- and workhouses (to put the poor and the unemployed to work); new types of prisons (to detain and re-educate criminals), hospitals and asylums (to treat the ill and insane). What these institutions shared was the claim that surveillance, treatment and re-socialization would restore and advance health, reasonableness, productivity and normalcy.

The science of man and disciplinary power

Bentham's historical reputation as the protagonist of the panopticon has been colored to a large extent by Michel Foucault's depiction of him as the architect of modern surveillance society. The panopticon has become infamous as the quintessential machinery for the modern sociopolitical regime of knowledge and power, resulting in the disciplining of bodies and minds and a chilling economic efficiency. This is what Foucault argues in his book *Discipline and Punish* (1975) about the working of the prison system as it emerged in the early nineteenth century.

The historical background of Foucault's analysis is the rational and supposedly humanitarian reform of penal justice in the late eighteenth and early nineteenth century. The traditional penal regime was characterized by ruthless retaliation: cruel corporal punishments in public to set an example. Crime was seen as a direct and personal attack on divine order and political authority. Guilt had to be confessed (just like sin in the church), if necessary, under force of torture. Confession proved the guilt of the perpetrator and provided the authorities with legitimacy to punish. Physical punishments, executed in public, were harsh, also to deter others from committing crimes. Enlightened philosophers and legal thinkers such as Montesquieu, Voltaire, Cesare Beccaria and Ludwig Feuerbach, however, criticized such punishments as arbitrary and needlessly cruel. They argued that it did not solve the problem of crime, which they conceptualized not as an attack on the authority of rulers and of God's order, but as a breach of the social contract, as a strike against society as a whole. A more uniformly rational penal system, which was in fact realized in Napoleon's *Code Pénal* (1810), would be more transparent, humane and fair, because it geared punishments in proportion to the seriousness of the offence and took into account the defendant's motives and background. It would also be more effective because its purpose was re-educating,

rehabilitating and reintegrating the criminal in society. This reflected the enlightened meliorist approach, the idea that man can be reshaped and improved. In the first half of the nineteenth century physical punishments, including the death penalty were more and more abolished or restricted and replaced by detention in prisons in which prisoners were subjected to a disciplinary regime in order to reform them, to bring about their moral transformation.

Foucault's book is not only a history of legal and prison systems but at the deeper level he provides an interpretation of the birth of the human sciences and their role in modern society. The arrangements, strategies and techniques which were used to shape the prison-regime, he points out, also throw light on the way the human sciences originated and how they contributed to the disciplining and normalization of modern man in a formally democratized society. Foucault claims that the rise of the human sciences is of crucial significance for Western modernity, but at the same time he rejects three basic assumptions which have underpinned the self-presentation of these sciences as well as historical interpretations of their development in terms of enlightened progress. The first supposition is that knowledge produced by the human sciences was neutral and that the language in which this knowledge was expressed was mirroring some sort of underlying reality and truth about man. The second is that scientists first 'discovered' facts about man and that knowledge of such facts was then applied in society. And the third assumption is that this knowledge served enlightened purposes such as progress, humanitarian treatment, emancipation, liberation, democracy and human rights.

According to Foucault the knowledge generated by the human sciences and the discourses in which it was formulated, was embedded in certain social practices that involved power relationships. Scientific knowledge of human beings was developed, Foucault argues, in panoptic institutions, which were founded in order to segregate certain groups of people who were considered as a social problem and therefore had to be controlled by particular strategies and interventions: registration and verification; continuous observation and surveillance; categorization and comparison between several individuals on the basis of their degree of 'deviance' and abnormality or the degree to which they could still be improved; and systematic control and manipulation of behavior through an educative and corrective regime. Such strategies were inspired by on older religious practices such as confession and the methods of the Catholic Inquisition.

The main effect of such panoptic strategies and interventions was, according to Foucault, the demarcation and segregation of what was to be considered as the abnormal and thereby the establishment of standards for what is to be viewed as normal (that is healthy, sane, rational, virtuous etc.) for the general population. The highlighting of the abnormal instilled anxiety in society for being labelled (stigmatized) as such and kept the majority in line. Moreover, similar surveillance techniques would also be used in other institutions for the general population such as schools, factories and the army, and later in the agencies of social work and therapeutic institutions. In the welfare state this approach would spread all over society. According to Foucault, modern society is a disciplinary and surveillance society in which scientific knowledge of man is developed and used in order to control individuals and populations.

Foucault emphasizes that scientific knowledge did not so much precede but resulted from such practices. Such knowledge, presented as true facts about individuals or certain groups, was produced through the material conditions of panoptic institutions, the social techniques used and the associated discursive practices, that is the way the information about the subjects in these institutions was communicated and registered. Next, such knowledge could then be used to improve and refine the disciplinary techniques and practices in order to make them even more efficient and effective, and then to gain even more detailed knowledge about individual subjects. In this way there was an accumulation of knowledge, power and discipline which mutually reinforced each other. Knowledge of the nature of individuals labelled as abnormal enabled control over people in general and such control facilitated the objectivation of human beings and the continuous expansion of such systematic investigation. In this way, says Foucault, truths about man are produced in panoptic institutions which are constituted by power-relationships and by the application of a plethora of material, social and discursive techniques and strategies, all of which he describes in detail in his *Discipline and Punish*.

How could such a disciplinary and surveillance constellation emerge while at the same time modern society, since the American and French Revolutions, was, step by step, also democratized? Jeremy Bentham, the inventor of the panopticon, was a liberal advocate of democratic reform and government which served the interests of the people. He strongly believed in freedom of information and debate as well as a considerable extension of suffrage and representative democracy. The greatest happiness for the greatest number could only be realized in a democracy, in which citizens were represented in politics, the government ruled in their interest, and they controlled and – if necessary – changed government. The state should not limit itself to keeping law and order but should also guarantee equality of opportunity and a decent subsistence level for as many citizens as possible.

In this respect it is relevant what Foucault argues about the internalization of normalization and discipline. A democracy, in which the state cannot, as a rule, use violence and force to compel obedience and orderly conduct, can only be stable when it relies on some sort of free consent and cooperation of individual citizens, citizens who are supposedly autonomous and guided by self-determination. Therefore, they have to be self-responsible, in control of themselves and behave in a more or less regular, self-directed and predictable way. The need to normalize individuals and to make them internalize certain values and normalize behavior-patterns, became the more urgent the more a society was democratized. When hierarchy and external pressure or force are not effective and legitimate any more, because in a democratic society individuals have rights and are formally equal, inner motivation, self-control and self-regulation are all the more crucial to maintain a stable social order. This dovetails with the enlightened Kantian ideal of emancipation on the basis of responsible and transparent self-determination along rational lines.

3. ORGANIZING LIFE AND THE LIFE SCIENCES

> *An organism is [...] not simply a machine, for machines only have power to move. An organism has in it a formative force that it brings to bear on matter that fails to have such force: it organizes. It thus involves a reproducing formative force that cannot be explained by mechanical motion alone.* (Immanuel Kant, *Critique of Judgment*, 1790)

> *Human nature is not a machine to be built after a model, and set to do exactly the work prescribed for it, but a tree, which requires to grow and develop itself on all sides, according to the tendency of the inward forces which made it a living thing.* (John Stuart Mill, *On Liberty*, 1859)

It is often believed that the spiritual climate of Romanticism did not encourage the development of science. Yet around 1800 a new science of life emerged that was different from the older physics and natural history. The term *biology* began to make inroads. The German naturalist Gottfried Treviranus and the French botanist and zoologist Jean-Baptiste de Lamarck defined biology as the science that searched for the conditions, causes and laws of the phenomena of life. In the introduction of his six-volume *Biologie oder Philosophie der lebenden Natur* (1802-1822) Treviranus formulated the central question of the new science: 'What is life?' This was followed immediately by the consideration that precisely this question 'is the hardest of all to answer.'

In the new science of life, a major yet also contested role was played by such concepts as *anima sensitiva, organization*, *organism, organic forces*, *Bildungstrieb*, *vis essentials, nisus formativus, Gestaltungskraft*, *pouvoir de la vie, force vitale, moule intérieur* and *molecules organiques*. This vitalist terminology gave rise to discussions among life scientists in both France and Germany about the relationship of biology with physics and chemistry. Notably a number of young Berlin scientists, who identified themselves not as biologist but as physiologist, held pronounced views on this. In the 1840s they fiercely renounced what they saw as a 'speculative' and 'romantic' science of life which was rooted in vitalism. They presented themselves as radical reformers and stressed that they performed their research in laboratories. For example, the physicist and physiologist Hermann von Helmholtz, who in 1847 formulated the law of conservation of force, tried to demonstrate with experiments that it was possible to consider whole organisms and separate organs as chemical factories in which one form of energy was converted into another. In 1848 his colleague Emil Du Bois-Reymond published his study *Untersuchungen über thierische Elektrizität*. In the introduction he wrote:

> *I am quite convinced that precisely the physical-mathematic method … is capable of doing physiology a major service. […] Once this insight becomes second nature, one will hardly find fertile soil anymore for the detested weeds of specific physiological modes of explanation, which unfortunately have halted the progress of science.*
> *If one considers the infinite complexity of life processes and has experienced the difficulties that automatically occur in each attempt at strict definition of what is organic, one cannot get round the view that for many branches of physiology the*

above recommended application of mathematics is the ultimate and only ladder of knowledge we are permitted to climb.
This conviction rests on the insight … that there are no other changes in the material world but motions. Such processes, then, cannot be anything else but motions. However, eventually all motions can be analyzed as following the interconnecting straight line of the two assumed particles, either in one direction or the other. Thus also the processes in organic beings must ultimately be reducible to such simple motions.
One usually considers the forces as the cause of motions. … Because of course they occur in the direction of the forces, it is implied in the above already that neither in inorganic nature nor in organic nature there are forces of which the ultimate components are not simply either attracting or repelling, so-called central forces.
… the theory of life force indeed appears as such a web of the most random claims; it combines so many impossible attributes and unthinkable activities in a single delusion that it is hard to take it seriously anymore … The so-called life force as it is commonly thought to be present throughout the living body is an absurdity.

In the middle of the nineteenth century, physiology established itself as a separate, fundamental science of life apart from biology, anatomy and medicine, in Germany as well as in France.

The rise of biology

Around 1800 a new science of life emerged for which the German naturalist Gottfried Reinhold Treviranus and the French botanist and zoologist Jean-Baptiste Lamarck coined the term biology. (The term became current after August Comte had assigned biology a prominent position in his positivistic hierarchy of the sciences.) By introducing this new term, they wanted to make clear that biology was different from the older field of knowledge that was known as 'natural history'. Natural history was the study of nature (minerals, plants, animals and man) that was assumed to be static, and its focus was on description, comparison and classification of forms of life on the basis of their outward appearance and geographical distribution. The underlying assumption was that all living beings fitted in a hierarchical order, the so called *scala natura* which was part of the broader idea of *the Great Chain of Being*.

Natural history had emerged in the early modern period when the discovery of the non-Western world brought European explorers into contact with unknown animals and plants. Collecting various kinds of natural and ethnographic objects in curiosity cabinets and keeping living plants and animals in botanical gardens and zoos, became a fashionable activity for princes and other elites who could afford this leisure activity. Displaying the 'new' wonders of nature was part of humanistic culture, art and learning, and not only motivated by a search for knowledge, but also by more mundane ambitions: interest in the extraordinary and sensational; entertainment and the creation of sites of sociability and debate; displaying erudition and aesthetic taste as well as status, wealth, and power. The enormous variety of specimens raised the question of how to manage and order collections, which brought in learned men who were sponsored by wealthy collectors and who also might occupy or obtain positions at universities, mostly in medical faculties.

In the eighteenth century, when natural history spread also to salons and academies, the field developed into a branch of natural science and became more methodical and organized. The Swedish botanist Carl Linnaeus, author of *Systema Naturae* (1735), and Georges-Louis du Buffon, who was in charge of the royal gardens, natural collections and zoo, took up the challenge to devise a complete and coherent taxonomy of living nature through systematic labelling and classification. Linnaeus strongly believed that nature, as God had designed it, was ordered in a balanced and harmonious way, and also that nature was to be used for the (economic) benefit of humankind. Linnaeus taxonomy was accessible and his efforts to make it into a standard in the scientific world was successful. Buffon's approach, elaborated in his *Histoire Naturelle* (1785-1787), was more empirical and secular: he criticized Linnaeus system as too rigid and instead of seeing God's handiwork everywhere in nature, he rather suggested the generative power of nature itself, which implied the notion of natural laws and of nature as an end in itself. He also emphasized the endless diversity of nature and noticed irregularities rather than seeing, like Linnaeus, all phenomena as part of a uniform and clearly delineated order. De Buffon realized that various orderings on the basis of different criteria – Linnaeus system centered on the reproductive organs – were possible. Taxonomy should be put in perspective; classifications were to some extent hypothetical human creations rather than mirrors of the natural order and providing definite knowledge. Moreover, Buffon showed doubts about immutability of nature by referring to its dynamism and 'progression' propelled by an inherent life force which he referred to as *moule intérieur*. Such a perspective foreshadowed the approach of the new science of biology as well as early evolutionary theories, although Buffon did not believe that changes within a species went so far as to give rise to a new species.

Biology was not just about description, comparison and classification (taxonomy) but it was, as Treviranus and Lamarck indicated, the science that searched for the conditions, causes and internal workings of life. Life was not seen as something static, but it was defined in terms of continuous energetic activity, dynamic forces and self-sustaining functions, of movement, change, growth and development. In that sense biology differed not only from natural history, but also from the older field of medical anatomy, the dissection of dead bodies in order to investigate the static structure of the body. What is even of greater consequence was that biology distinguished itself from the other already established natural sciences: physics and chemistry. This disciplinary divergence implied a fundamental epistemological and methodological disparity between de study of 'dead' inanimate nature and the study of living nature. During the Scientific Revolution such a differentiation had not been made. Whether matter was dead or living did not make any difference with respect to the way it should be explained: that is analyzing its smallest parts on the basis of the mechanical laws of physics and chemistry. The living body was compared to a machine and thinkers such as Descartes defined animals as *bête machines*, as elaborate, automatic clocklike mechanisms without consciousness and feeling. The medical school which followed this reductionist approach was known as *iatromechanicism*.

In the course of the eighteenth century, however, more and more researchers in the medical world began to doubt whether this was the proper approach for the study of living creatures. Many phenomena of life could not be explained on the basis of the laws of physics and chemistry: the sensibility and irritability of nerves, the reflex activity of muscles,

respiration, digestion and metabolism, blood circulation, healing and regeneration, procreation, growth and aging, flexible adaptation to the environment, and the power of the body to assimilate substances from external nature and transform them in organic matter. These processes of life, which could not be separated from organic matter, but for which it was difficult to find mechanical causes, appeared to be spontaneous, dynamic, self-generating and self-regulating. At the same medical researchers rejected the age-old idea that such phenomena were caused and controlled by life spirits or the *anima* part of the soul (as suggested by Aristotle), which would inspire dead matter with life. They believed that these processes of life were inherent in the body, and they tried to explain them in material terms by assuming that organic matter revealed particular vital properties or that it was organized in a particular configuration which was different from the structure of dead nature.

The outcome of these new insights was the postulation of two kinds of matter, dead and living, which could not be explained according to the same principles. Apart from the laws of physics and chemistry the assumption of a separate bio-causality was made. This assumption gave rise to various explanations of life that can be labeled as vitalist, teleomechanicist or vital materialist: the idea that vital forces are not as regular and predictable as mechanical forces in dead nature. Such explanations of life, which were further refined in the first decades of the nineteenth century, should be distinguished not only from mechanical-reductionist explanations of life, but also from older understandings of life in terms of an organic soul or *anima*. Vitalism in biology should not be confused with older animistic thinking, which assumed that life is the effect of immaterial, soul-like spiritual forces.

Descartes' dualism in terms of two fundamentally different substances (mind and matter regardless of whether it is inorganic or organic matter) was now replaced by a tripartite division of reality: mind, dead matter and living matter. The new science of biology was about the study of living matter, on the one hand without linking life to spiritual causes and, on the other, without reducing the explanation of life to the laws of physics and chemistry. Biologists considered life as fundamentally different from dead material nature that is determined by mechanistic laws as well as from mental processes. Their focus was on the phenomenon of organic life and most of them did not elaborate on the human mind and the mind-body problem in their scientific research, although they tacitly related more and more mental phenomena to physical processes. To a large extent the mind was not relevant to them because the spontaneous dynamics of life they studied showed an independent, 'unconscious' dynamics. Questions about the nature of the human mind were beyond the relevance of their disciplinary research-field.

Biology also implied a new image of man in relation to animals. The strict Cartesian dualism of mind and body implied that man was unique and superior to the rest of nature because the immaterial mind distinguished man from animals, which supposedly had no mind and were comparable to machines. In the newer biological perspective man was much closer to animals: both were part of the world of living creatures and as sensuous beings they shared many properties, such as reflex movements, irritability, and sensibility that had previously been explained in spiritual terms, but which were now more and more drawn into the body. The view of the human body as a machine was replaced by the notion of man as a sensuous organism (*l'homme sensible*).

Romantic analogies and metaphors

As the world of living bodies was distinguished from man as a mental being as well as from the inorganic material world, also a new scientific discourse emerged to describe this dimension of reality in terms that were neither mechanical nor spiritual. The Romantic worldview provided biologists with concepts for interpreting their empirical findings in a different way. Many of their key-concepts, metaphors and analogies were derived from Romantic discourse about 'movement', 'transformation', 'generation', 'gestation', 'growth', 'unfolding' and 'development' of natural (and also cultural) phenomenon. These terms suggested that the living organisms are dynamic and evolve in ongoing cumulative and transformative processes, that they spontaneously grow and move, constantly triggered by inner driving forces that press ahead in order to unfold and develop in space and time. This is different from Newton's conceptualization of matter in motion which was static in the sense that movement was not development towards a goal and that it is not changing the nature of dead matter, but that it is an endless repetition or variation of certain basic regular and deterministic patterns without inner direction.

Another outlook which biologists derived from Romantic thinking was that explaining life is about understanding how the wide variety of organisms, from simple to more developed ones, are related to each other, that life can be seen in terms of a continuum of increasing complexity. Also, the Romantic explanatory perspective was not analytic (that is understanding wholes by explaining the smaller parts), but holistic and synthetic on the basis of the principle that the whole is more than the sum of the parts. This approach was reflected in the biological notion of the living organism which is 'organized'.

Organic organization was the key Romantic metaphor used in biology. The meaning of this concept can be summarized as follows:

- Organic matter, although in its most basic parts composed of the same elements as inorganic matter, is organized in a specific and much more complicated way than in 'dead' nature.
- Organic life cannot be analytically reduced to the explanation of its smallest parts; the functioning of the parts also depends on the dynamic self-regulatory operation of the system as a whole. The organization of living beings as a whole has priority over the parts (which may in themselves be explained according to the laws of physics and chemistry).

- Whereas explanation in physics and chemistry follows a linear causal model (a chain of succeeding causes and effects), in the biological explanation of the organization of living matter (in particular regarding the interaction between the whole and the parts) a circular or interactive causality or feedback processes are assumed. Effects can also be causes and the other way around. (Example: the functioning of the vital organs in our body, the heart and of the brain, depend on each other; both are cause and consequence of each other at the same time.)
- Organic organization is goal-oriented: keeping a dynamic and adaptive balance between all the partial physical and chemical processes in a body in order to resist all

hampering and decaying influences und thus to preserve its life. Death is the collapse of the dynamic balance of the organism as a whole.

These are the basic principles of the various vitalist perspectives on life, the shared framework of the discussion among biologists about what life was in materialist terms without reducing it to either the laws of physics and chemistry or older animistic theories about life spirits and soul-like qualities. Vitalism implied a materialistic explanation of life (therefore the term vital materialism is also used), but without reducing organic matter to inorganic matter. The question about the precise relation between life and matter was open for debate and a variety of interpretations. In this way the radical implications of materialism were toned down and moderated, so that vitalist explanations were also more or less acceptable to a broader audience of (enlightened) Christian believers who continued to reject more blatant materialistic explanations.

Biologists borrowed several metaphors and analogies from Romanticism, but most of them did not adopt the broader Romantic worldview and the associated intuitive, speculative and metaphysical philosophy of nature (*Naturphilosophie*), which was closely related to German Idealism. Articulated by philosophical and literary thinkers such as Friedrich Wilhelm Joseph von Schelling, Carl Gustav Carus, Lorenz Oken, and Johan Wolfgang von Goethe this philosophy presented a holistic view of the universe as a super-organism, based on a fundamental underlying (spiritual) unity, a continuity between external nature and the human spirit. Gaining knowledge of nature would be possible through identification, imagination and personification, which implied that science, philosophy and the arts were at the same epistemological level. The proponents of *Naturphilosophie* tried in a way to re-enchant nature. They sought this re-enchantment in a holistic synergy between art and science. (A recent version of this Romantic perspective is the so-called Gaia theory formulated by James Lovelock, the claim that the world is a superorganism.)

Vitalist biologists, on the other hand, were engaged in scientific, empirical research and did not believe in an intuitive and imaginative contemplation of nature and the blurring of the differences between science on the one hand and arts and philosophy on the other. Biologists used romantic styles of reasoning, but they did not adopt all of their speculative and metaphysical contents. Instead, the epistemological philosophy of Kant, his particular view of organic nature and his argument about the limits of scientific knowledge, was their guideline.

In his *Kritik der reinen Vernunft* (1781) Kant discussed the question to what extent valid knowledge can be established and which was basically about combining basic elements of empiricism and rationalism/idealism. Kant argued that:

- Scientific knowledge depends on empirical information about the external world as well as the inherent characteristics of human reason.
- Empirical observations in themselves are chaotic, unstructured, meaningless and incomprehensible; knowledge depends on the way how the mind processes perceptions.
- The mind is not a passive registration mechanism, as assumed in pure empiricism, but, as supposed in idealism, an active and synthetic force that organizes and shapes the way how we perceive and understand reality through (1) the inherent a-priori

forms of experience: space and time and (2) the twelf a-priori categories of rational thought, such as substance, property, cause and effect, movement, whole and part, and quantity.

Knowledge, according to Kant, is the result of perception as well as rational organizing and shaping of what the mind perceives. All of this implies that Kant postulates two realities:

- *an sich* (by itself): the external world which is the source of empirical observations, but the essence of which cannot be known by the human mind.
- *für sich* (for itself): the world as it is known by the human mind, filtered and interpreted through the a-priori forms of experience and categories of rational thinking.

Knowledge is not an objective reflection of reality as it is (*an sich*), but the result of the (inter-subjective) way in which the human mind organizes sensual perception according to it's a-priori patterns of thought and projects these onto reality (*für sich*).[6] Metaphysical questions about God, the essence and purpose of human existence and the world, morals and esthetics are beyond scientific knowledge and are a matter of judgement, belief, religion, and practical, intuitive knowledge. Scientific facts about nature (what *is*) should not be confused with human values (what *ought to be*).

In his *Kritik der reinen Vernunft* Kant took Newtonian physics as the model for natural science in general, but in a later work, *Kritik der Urteilskraft* (1790) he included a separate discussion about the biological explanation of life. Kant argued that the epistemological groundwork for biology was different from that of physics and chemistry. His approach has become known as 'teleomechanicism', which in the first half of the nineteenth century was adopted by several German biologists. The Aristotelean idea of the telos was back in a more sophisticated and refined way. According to Kant, many partial processes in living bodies can be investigated with the methods of physics and chemistry, but these cannot provide an understanding of how all these processes relate to, interact and depend on each other and together sustain the life of the organism as a whole. Organic matter appears to be functionally organized in a dynamic and purposeful way and it cannot be understood through the linear mechanistic causal model that applies in physics and chemistry. The linear causality which explains (and predicts) the operation of the non-organic material phenomena (A→B→C→D etc.) does not apply in living nature. Bio-causality is circular or interactive (A→B→C→A), operates through feedback processes, in which effects can also be causes and causes can be effects.

According to Kant biologists cannot but assume that there is a goal-oriented, dynamic, organizing and formative force operating in living creatures. They need a postulated *Bildungstrieb* as an inherent potency which sustains and regulates all the physical and chemical processes in relation to each other. The question what this vital force exactly is, however, cannot be answered. A biologist cannot do without the presupposition that such a vital force must exist and that in living organisms it has logical priority over partial physical and chemical processes, although the essence of the underlying force is not accessible to scientific scrutiny. The assumed telos of this formative vital force is not part of the reality of nature (*Ding an sich*), but exists only of human thinking about living organisms; it is an

[6] With regard to rational knowledge and morality, Kant referred to the transcendental subject, the abstract representative of mankind that shared a common mental structure which he distinguished from the more concretely embodied self as experienced in daily life.

indispensable logical a-priori category (*Ding für sich*). As far as the essence of life is concerned, human scientific reason encounters limits. All of this also implied that Kant distinguished between machines, the technical dimension which can be made and engineered, and living bodies, the biological dimension, which is given, self-creative and self-shaping, and therefore beyond artificial design.

Teleomechanical biology in Germany

The difference between Kant's teleomechanical perspective and older teleological and animistic explanations of life is that Kant explicitly rejected the notion that the life force is a spiritual entity that works upon the material body from the outside. In Kant's argument the vital force is more a regulative principle which is intrinsically linked with the way organic matter is organized. Again, late eighteenth and nineteenth-century vitalism (or teleomechanicism and vital materialism) should not be confused with animistic explanations of life in terms of the qualities of the 'soul' or some sort of life spirits. Teleomechanically oriented biologists were working in an empirical-scientific way, they used the methods of physics and chemistry, and they studied life as a material phenomenon. Their rejection of reductionism did not imply that biology could do without the methods and insights of physics and chemistry. The point was that physical and chemical laws could not fully grasp the essence of life which had to be understood in terms of a specific bio-causality.

On the basis of Kant's argument that the idea of a vital force was indispensable but at the same time such a force could not be grasped by science, biologists came up with various (partly overlapping) speculations about the vital force and the related organic causality:

- as an overarching self-regulating system of physical and chemical processes in organisms;
- as an organizational system of conditions and processes, which work together to a common end;
- as a constitutive precondition of the well-adjusted organization of processes of life;
- as the emergent property of the functional self-organization of life;
- as a dynamic system of checks and balances in order to maintain the functional equilibrium and stability of the organism in order to resist destructive decay;
- as the specific way in which organic chemical elements (which are not found in 'dead' nature) are produced by and interact in bodies.

Again, these biologists developed these notions about life on the basis of their empirical scientific research and their teleomechanical explanations were advanced in particular in some of their key research fields: morphology and vital function; the discovery of the cell and its working; organic chemistry, and, in particular, procreation, embryology and evolution.

The living body was conceptualized as a functionally interconnected system of organs, tissues, controls, feedback processes, reflexes, rhythms and circulations. This suggested a dynamic interaction between organic forms (morphology) and life-functions, the idea that the structures and organs of the body do not precede function, but that material form and vital processes depend on each other. The understanding of life in terms of development and adaptive change entailed the insight that there is not, as suggested in medical anatomy,

a fixed one to one relationship between the material form of body parts, organs and organ systems on the one hand and particular life functions on the other. Instead, this relation was understood as overlapping, flexible, mutually accommodating and reciprocal: many life functions seem to involve more organs working together, similar functions can be fulfilled by different organic forms, whereas similar organs can perform different functions. It appeared that life functions do not depend on the form, structure and operation of separate body parts or organs and neither do organic forms depend on distinct functions of life, but the organization of the organism as a whole appears to be the determining factor.

Another research field was the cell as the smallest unit, building-block of life, discovered as a result of more refined microscopes in the 1830s by Theodor Schwann and Matthias Jacob Schleiden. Previously, medical researchers had looked at organs and organ-systems as the basic structural units of life and around 1800 the French medical researcher Xavier Bichat had investigated the structure of organic tissue as the smallest level of life processes. Schwann and Schleiden demonstrating that the basic processes of life (chemical reactions, metabolic processes and transformation of energy) took place at the level of the cell as a self-regulating system of physical and chemical activities which underlay all the life of plants and animals. The cell could be considered as the smallest unit of life because cells produce proteins by themselves. Each cell seemed to be an organized whole which could not be reduced to the elements they are made of. The cell was the point of unity in diversity, and it was the carrier of the fundamental continuity of life: a self-perpetuating structural and functional unit common to all living things. The self-organizing life forces of the cell can only be reproduced by the cell itself through partitioning itself and giving birth to new cells continuously, and not by some sort of physical or chemical engineering. New life can only come into existence out of living beings and thus research into the functioning of cells confirmed the teleomechanistic conception of living creatures as the result of self-generating formative forces.

Organic chemistry developed as a separate subfield of chemistry in biology and later also physiology as a result of research into chemical processes in bodies as these are related to metabolism, the functioning of cells, respiration, oxidation, the production of body-temperature. This also fitted in with vitalism and teleomechanicism because the assumption was that the body produces its own organic chemical elements, which are more complex and less predictable than those in dead nature: what these chemical composites do in the body cannot be reduced to what its constitutive parts can do, and neither can these chemical configurations be produced outside the body. This was the metaphor of the living body as a self-sustaining chemical factory.

Research in procreation and embryology undermined the old preformation theory with the idea of epigenesis. The pre-formation theory held that the sperm or the egg contained a complete tiny replica of the offspring embryo complete with all the structures and functions of a living creature and that this micro-being only had to grow through a process of quantitative change. The notion of epigenesis focused on growth or development as a dynamic and adaptive cumulative transformation course, which was driven by an inherent organizing and shaping drive. The growth of an embryo showed that the organic parts of the body change in the process with respect to their appearance as well as their function.

Evolutionary thinking

The study of the embryo was the study of organic development in time par excellence and the same held for the emergent idea that species had evolved gradually in time. The notion of evolution, which began to be articulated in the late eighteenth century and which centered on the idea of dynamic (and progressive) adaption of organisms in their interaction with possible changing habitat as an integral part of what life is. This was a fundamental break with the static scala natura, the notion that all living species were created once and for all and did not change. Comparative embryology (the investigation of the similarities and differences in the development of various species) and evolution theories were connected to each other by the concept of recapitulation which implied that the development of the embryo is an accelerated recurrence on the individual micro-level of the long-term evolution of the species to which it belongs.

The idea of evolution, that life forms were dynamic and changing, was voiced more strongly by some French and English than by German vitalist biologists. The most, also long-term influential evolutionary thinker was Jean-Baptiste Lamarck who, in his *Philosophie zoologique* (1809), explained evolution in terms of the interaction between changing environments that challenged organisms in new ways and their behavioral adaptive capacity through which they could develop, because of greater or lesser use of particular parts of the body, new functional physical traits. Such acquired traits could be passed on to their progeny which would continue the same adaptive behavior so that the species would gradually change into a new species. The inheritance of acquired traits would remain an influential assumption in evolutionary thinking until into the twentieth century, although Darwin's theory was basically not following this argument. Lamarck's explanation of functional adaptation in terms of an internal behavioral drive responding to environmental challenges, assumed that natural processes were purposeful and part of an essential harmonious and advancing natural order.

Other evolutionary thinkers, such as Erasmus Darwin (*Zoonamia*, 1794-1796), William Paley, (*Natural Theology, or Evidence of the Existence and Attributes of the Deity collected from the Appearances of Nature*, 1802) Robert Chambers (*Vestiges of the Natural History of Creation*, 1844) disagreed with Lamarck about how evolution happened, but in general they shared the belief that evolution was linear and as such showed design and direction. Evolutionary development was presented as the purposeful realization of a preordained or potential design. In this way evolution could be compatible with Christian belief and natural theology: evolution was, as it were, built in nature by God and showed the wonderful unfolding of His plan.

Darwin formulated a much more sophisticated and radical theory of evolution. He drew on various sources of information about and interpretations of natural as well as social phenomena:

- The experiences of animal breeders, in particular the similarities between artificial and natural selection.
- Geological research by among others Charles Lyell showing that the earth's history was one of continuous and gradual change.

- The demographic theory of the economist Thomas Malthus who pictured a causal relation between on the one hand rising and declining population size, and, on the other, the availability or scarcity of food. His message, which contradicted enlightened optimism, was that a growing population will inevitably reach natural boundaries because there were limits to the agricultural production of food. As long as reproduction was unchecked, there would be a struggle for existence and overpopulation would result in famine, disease, war and death (the so-called Malthusian catastrophe) which would hit the lower classes in particular.
- Political economy emphasizing functional differentiation, division of labor, and the benefits of free competition.
- The all-encompassing evolutionary thinking of Herbert Spencer about nature, the human mind and society in terms of differentiation, specialization, competition, interdependency, adaptation, 'survival of the fittest', and integration at increasing levels of complexity.

The essence of Darwin's theory, as elaborated in his *The Origin of Species by Means of Natural Selection: or the Preservation of Favoured Races in the Struggle for Life* (1859), can be summarized as follows:

- Darwin's view of nature in terms of 'tooth and claw' (eat or be eaten) and 'struggle for life': life is superabundant whereas natural resources are limited – nature is wasteful: there is always more life than its resources can support – and therefore life is continuous struggle and competition.
- Darwin's view of life in terms of spontaneous and accidental 'natural variation': individual organisms of the same species show differences.
- Darwin's explanation of the development of populations and species in terms of 'natural selection' and 'survival of the fittest': differences between individuals within a species, combined with population pressure and competition for scarce resources in nature entail that organisms which are best adapted to their environment survive, reproduce and pass on their hereditary traits to their progeny whereas less adapted organisms perish. The struggle for life depends on natural selection of random differences which are either more or less advantageous or disadvantageous. (Later Darwin added the mechanism of sexual selection.) New species emerge through adaptations in existing species under the influence of environmental change and through specialization, which makes a particular environment suitable for various forms of life. With his view that differences between species are not absolute, but relative and fluctuating, Darwin undermined essentialist thinking about nature, the belief in fixed types.

The revolutionary and controversial aspect of Darwinism, its 'corrosive acid' in the words of the philosopher of the mind Daniel Dennett, was not so much the idea of evolution in itself, but rather the inescapable insight that man and all other organisms shared a common origin. Moreover, Darwin's explanation of evolution in terms of randomness and chance contradicted the teleological framework of design and perfectibility. Evolution is neither purposeful nor linear and progressive, but rather contingent, aimless, haphazard and unpredictable. Evolutionary change is triggered by accidental variation and seems to occur through trial and error. He pictured the evolutionary process as a tree with numerous branches but no main trunk, an image that was at odds with the dominant view of changing

nature in terms of orderly and progressive development. Most nineteenth-century followers of Darwin oversaw or ignored the anti-teleological gist of his explanation, which was difficult to digest. His theory was generally understood through the filter of the more accessible and acceptable Lamarckian perspective of purposeful adaptation, which in general continued to be influential until into the early twenty century.[7] It was only in the course of the twentieth century, under the influence of developments in genetics and statistical population biology (the modern synthesis), that the full implications of Darwin's explanation in terms of blind natural selection were fully recognized.

Darwin himself, an English bourgeois and Christian with an enlightened and liberal background implying a belief in progress, was uneasy and ambivalent about the non-teleological dimension of his theory, in particular with regard to the evolution of humankind. He was well aware that his work would be controversial. For a long time, he was reluctant to publish his theory, fearing hostile public reactions, but also taking time to underpin his theory with evidence and concrete empirical examples. The premature publication of *The Origin of Species* (1859) was prompted by the coming publication of a paper by Alfred Russel Wallace whose explanation of evolution was similar to that of Darwin.

Whereas Wallace asserted that natural evolution did not apply to human beings because the early development of their intelligence was exceptional and could not be explained in purely natural terms, Darwin, in his *The Descent of Man and Selection in Relation to Sex* (1871), pointed out the continuity between animal and human life. Not only physical traits, but also human reason, language, emotions and 'social instincts' (altruism, compassion and cooperation), he argued, have emerged as a result of the evolutionary mechanisms of the struggle for life and natural selection. Darwin demonstrated, also in his *Expression of the Emotions in Man and the Animals* (1872), that supposedly unique human traits such as intelligence, emotions and morality, were also found in animals. Morality, according to Darwin, had evolutionary roots: altruism, solidarity and cooperation in social groups had been favored by natural selection because such moral qualities contributed to the survival of a group, which also benefited its individual members.

In Darwin's day it was not clear how heredity worked and how exactly individual variation came about. In discussing human evolution, he also used explanations that were similar to the Lamarckian principle of the inheritance of acquired traits. With regard to the relation between nature and human culture, he was cautious and wavering. On the one hand, he appeared to see human culture and morality as the extension of blind natural evolution. On

[7] The difference between Lamarck's and Darwin's explanation can be exemplified on the basis of their (hypothesized) answers to the question why giraffes have such unusual long necks. According to Lamarck, giraffes have long necks because during the ancestors of these animals, which were during their lives challenged by changing climatological conditions, again and again stretched their necks in order to reach the scarcer green leaves in trees. Therefore, during their individual lives their necks got a little bit longer. Next, they would pass on this acquired physical feature to their offspring, which in turn would stretch their necks further during their lives and pass again their somewhat longer necks to their offspring, which continued the same behavior. According to Darwin some individuals of the giraffe's ancestors, just because of coincidental genetic variation, had slightly longer necks than others and therefore had an advantage in the struggle of life over the ones with the shorter necks, because in difficult periods of water and food shortage, the animals with the longer necks could reach the green leaves high up in the trees. Therefore, giraffes with somewhat longer necks had an advantage, survived and procreated in greater numbers, whereas the ones with the shorter necks perished in greater numbers and did not succeed in producing offspring.

the other hand, he suggested that natural evolution was mitigated through the inherent dynamics of culture, the de-naturalizing impact of morality, religion, science and technology. Civilization allowed the survival of individuals who would have perished in natural circumstances. Unlike his cousin Francis Galton, the pioneer of eugenics (the endeavor to improve human beings or prevent their degeneration), and his followers, Darwin did not present such survival of the 'unfit' as a problem that should be tackled through sociopolitical intervention in order to restore natural selection in human society. Although Darwin himself was not a 'Social-Darwinist', his emphasis on the continuity of animals and human beings – which he construed through anthropomorphic descriptions of nature (referring to natural phenomenon in terms of human characteristics) and, next, his projection of what he found in nature to the human world – served as an incentive and legitimation for others (scientists as well as social and political thinkers) to explain human existence in all its dimensions (physical, mental, social and cultural) in reductionist biological terms.

Hebert Spencer, who applied evolutionary explanations – although in a Lamarckian rather than Darwinian explanatory framework and not in a biological-reductionist way – to society, inspired various forms of what would later, in the early twentieth century, labelled as Social Darwinism. Together with degeneration theory, which was articulated by the French psychiatrist, Benedict Auguste Morel his *Treatise on the physical, mental, and moral degeneration of the human species* (1857), the various forms of Social Darwinism focused on heredity and the possible biological decline of mankind in general and the 'white race' in particular. The risk was the passing on of bad traits during succeeding generations, going hand in hand with increasing defects and pathologies.

In degeneration theory and Social Darwinism loosely defined biological and evolutionary notions (organism, struggle for life, natural variation and selection, survival of the fittest) were applied to society in order to throw light on social relations and differences between human beings on the basis of their acquired and inherited physical, behavioral and mental features. Both schools of thought typically provided a comprehensive sociobiological perspective on man and tended more or less to naturalist, in particular evolutionary (Lamarckian rather than Darwinist) explanations of individuals and social relations. Ethnic and 'racial' groups, peoples, nations and societies were compared to organisms which are born and subsequently grow, age, and die, and which are either healthy and fit or diseased and weak . Also, such thinking emphasized that man is fundamentally driven by erratic natural instincts. If Darwin showed that man, like all animals, was a product of the whims of nature, Social Darwinism and degeneration theory suggested that human beings were essentially irrational and had no or little control over themselves. Man was conditioned by forces beyond rational awareness and self-control, by heredity, and instincts.

A crucial feature of Social Darwinism and degeneration theory was the combination of developmental (progressive as well as regressive) and hierarchical thinking. The identification of the various stages of developmental processes were intrinsically related to particular binary and at the same time hierarchical classifications. The basic one was *developed* (or progressed) versus *un(der)developed* (or regressed). This general evolutionary dichotomy was translated in various other, either similarly indefinite or more concrete, contrasts: normal versus abnormal, health versus disease, natural versus unnatural, rational versus irrational, sane versus insane, primitive versus civilized, white versus black or colored, masculine versus feminine, grown-up versus

childish, upper versus lower class, social versus a-social. These divisions in terms of superior and inferior natural qualities shaped the conceptual groundwork for scientific racism, sexism and classism as well as eugenics.

Experimental physiology in Germany and France

In the 1840s a group of young researchers (Emil DuBois-Reymond, Hermann Helmholtz, Ernst Brücke, Matthias Schleiden and Carl Ludwig) who had been trained in the laboratory of one of the most prominent representatives of the teleomechanistic school in biology, Johannes Müller, criticized the dominant vitalist approach in biology as speculative and unscientific. They advocated a new course for the investigation of life. In his introduction to his *Untersuchungen über thierische Elektrizität* (1848) about the electric impulses in the nerve system, Dubois-Reymond launched a fierce attack against the assumption of a distinct causality of life in terms of an inherent purpose, which he associated with Romantic natural philosophy. The only forces which were real, he argued, were of a mechanical and atomic nature. Carl Ludwig questioned that the organism as a whole was more than the sum of its parts: summing up the explanations of the functioning of each part of the body would sooner or later be sufficient for understanding the life of the complete organism. In his *Über die Erhaltung der Kraft* (1847), Helmholtz asserted that the physical law of conservation of energy, which held that energy never gets lost when used because it is always transformed into another form of energy, would also apply for living organisms. If life was sustained by the intake and processing of energy, the idea of a vital force, he argued, was disproved.

The attack on vitalism affected the epistemology as well as the methods of the life sciences. Vitalism made way for a reductionist perspective: organic matter was viewed as being of the same nature as inorganic matter, that is essentially made up of mechanically moving particles. The causal-deterministic laws of physics and chemistry could and should therefore be applied to explain life. The assumption of a distinct life force in addition to physicochemical forces would be superfluous and unscientific. The methodological point was made clear with experiments in laboratories which would show that life can be grasped by applying the techniques of physics and chemistry (testing a hypothesis by constructing experiments, measuring, quantification, analyzing – reducing the whole to the smallest parts – and repeating and verifying experiments) and by intervening in, manipulating, controlling and predicting life processes (through vivisection and chemical analysis), which required technical devices and know-how. The pursuit of a reductionist-materialist explanation of life was underpinned by ever more sophisticated experimental research methods. Although some teleomechanical biologists were also doing research in laboratories, their methods were rather observational, comparative and descriptive. In their view, experimental intervention in life was problematical because it interfered with life as a spontaneous, self-regulating process and distorted its natural course.

The epistemological claim of these reductionists was part of a worldview and an image of man which differed from the tripartite division of reality in which the separation of biology from the other natural sciences was grounded. The reductionist model implied that there were no absolute boundaries between the three dimensions of inorganic nature, organic life and the human mind. All were subject to similar natural laws and could be investigated through the natural scientific principles and methods of analysis, divisibility, causality,

determinism, calculation and predictability. The functioning of the mind and the body would be not fundamentally different from the mechanical workings of inorganic nature. Psychology, biology and physiology could and should follow the scientific model of physics and chemistry.

The reductionist physiologists were very influential and successful as far as their research methods and techniques in the laboratory were concerned, and they expanded the boundaries of what could be explained about life with the help of physics and chemistry. But they did not succeed in delivering definite proof that life can indeed be fully explained by reducing it to the laws of physics and chemistry. The broader epistemological claim that living matter essentially was not different from inorganic mater, was not made true. Vitalist explanations were pushed back, to be true, but not completely undermined once and for all. Many phenomena of life could still not be explained in a reductionist way. On the epistemological level the discussion between vitalists and reductionists remained undecided; in the late nineteenth century and beyond there were revivals of different brands of vitalist thinking in biology.

Moreover, the German physiologists, although advocating natural scientific reductionism, were not materialists in the sense that they believed that the term 'matter' reflected a reality of nature as nothing but hard substance – the ontological materialism which was propagated by some radical thinkers such as Jacobus Moleschott, famous for his slogan 'Keine Gedanken ohne Fosfor' (no thought without phosphor). Following Kant's epistemology, the materialism of the physiologists was methodological**:** nature was investigated *as if* it is composed of moving particles and physical forces. These hypothesized basic phenomena were not viewed as real 'things', but rather as measuring-units for movement. Methodological materialism was, in Kantian terms, only about reality for itself (*für sich*), the reality as far as the human intellect has the capacity to analyze it. This implied that matter in movement and its physical causes in living organisms could be measured through experiments – life technically controlled and manipulated in a laboratory setting – but that the essence of (dead and living) matter and its physical forces, their reality in itself (*an sich*) are beyond scientific explanation.

Moreover, the reductionist approach of the nineteenth-century physiologists was not a return to the mechanist scientific model of the Scientific Revolution and Newtonian physics. Their view of life partly showed features of the romantic worldview with its emphasis on inherent driving forces that continually push towards development and fulfillment, while at the same time their perspective was also infused with notions which came from new industrial technologies. Their explanation of life focused on life in terms of metabolism and energy-transformation as well as on driving or pushing forces. They compared living organisms with machines, but their model was not the clock or the mechanical automaton, but the steam-engine. The mechanical movements of this industrial energy-machine were not the result of the winding and the tension of a static spring, but of a source of energy, the burning of coal causing steam-pressure, a pushing force, which consequently could be transformed in mechanical movement. In a similar way living organisms were viewed and investigated as fuel-consuming, metabolic and energy-producing creatures. Against the background of industrialization, this dovetailed with the associated image of man as a being who realizes himself through labor: the energy of the human body was transformed into

industrial productivity. This would entail a new research field of physiology in industry: the science of work focusing on the question how the energy of the body can be used in the most optimal and efficient way.

Apart from industrialization, other (institutional, sociopolitical and nationalist) contexts help to understand the rise of physiology as an experimental science in Western-Europe. In Germany the fierce criticism and bold claims of the reductionist physiologists were stirred by rivalry between an older and younger generation of scientists which coincided with a confrontation conservative and liberal outlooks. The younger generation, which felt hampered by the romantic philosophy of nature and vitalist biology, opposed the established biologists by forging a new disciplinary field on the basis of an epistemological claim, new experimental research methods and techniques, and the laboratory as fundamental research institution. Through innovation they acquired a position at the German research university. Their mechanistic-atomistic perspective on life was politically paralleled by the rising tide of liberalism with its ideal of a freer and more individualized society, whereas they associated the vitalist perspective of the older generation with metaphysical Romanticism and a conservative view of society as an over-cohesive, closed and hierarchical organic system.

In France physiological research developed after the French Revolution in the context of medical reforms which ended, earlier than in other countries, the distinction between learned doctors and practical healers, and which advanced clinical medicine on the basis of systematic empirical observation.[8] Next to practical surgery, the commitment to basic research in medicine, in which Xavier Bichat and Francois Magendie played a leading role, fostered the rise of physiology. In the mid-nineteenth century the French government supported the further development of physiology under the leadership of Claude Bernard in order to compete with German physiology. Bernard clearly delineated the new scientific discipline from other fields and his argument was similar to that of his German counterparts. Natural-scientific reductionism, according to Bernard, could only be used as a method and would not answer questions about the ultimate cause or essence of life. He distinguished his physiological approach from a clear-cut physical and chemical reductionism as strictly as he distanced himself from biological vitalism. Physiology as an empirical, technical-experimental and practicable discipline was only about *how* life operates. Bernard's focus was on the laboratory as practical learning school and teaching facility for researchers, not only to gain knowledge but also to learn the dexterity, skills and technical ingenuity which were needed for sophisticated and reliable empirical research.

The emergence of physiology as a separate disciple exemplifies boundary work and strategies of disciplinary justification. Physiology developed as a separate discipline by (over)emphasizing its epistemological and methodological differences from biology and medicine, in particular anatomy, as well as, in the case of Claude Bernard, by keeping a distance from physics and chemistry.

[8] Apart from a lack of interest in fundamental empirical research at the established English universities and the influence of religious views (natural theology) in the study of life, in Britain, for example, the traditional status hierarchies in medicine hampered the development of experimental physiology. Academically trained doctors did not want to be involved in experiments such as vivisection because, like surgery, manual labour was considered as inferior.

The distinction of physiology from biology centered on epistemological and methodological claims:

- Whereas biologists observed organisms in their natural habitat with a focus on visible characteristics and refrained from active intervention, physiologists intervened in and manipulated life with instruments in the controlled environment of the laboratory in order to uncover the underlying mechanisms and processes of life.
- Whereas biologists considered the scientific model of physics and chemistry as inadequate for explaining life, physiologists largely adopted their methods and epistemological assumptions, although not without some nuance.

The distinction of physiology from medicine focused on:

- The contradiction between medicine as a practical and applied science (treating diseases and caring for patients) dealing with the abnormal (pathology) and physiology as fundamental scientific research (pure knowledge free of practical considerations and distortions) into the 'normal' functioning of life processes, which considers pathology not as a structural and static abnormality, but as a deviant variation of regular life processes which can be explained in the same way. Therefore, laboratory physiology should become one of the fundamental sciences on which modern medicine as an applied science should build its knowledge and expertise.
- The contradiction between medical anatomy, which traced the causes of diseases by dissecting dead bodies of patients and locating pathological causes in organs, and the physiological definition of both healthy and diseased life in terms of dynamic functional processes involving several parts of the body, which can only be uncovered through vivisection.

4. THE SECRET OF LIFE UNVEILED

In 1943 respectively 1956 the famous German physicist Erwin Schrödinger presented two lectures, the first in Dublin and entitled *What is life?* And the second in Cambridge entitled *Mind and Matter*. Crossing the borders of physics and biology Schrödinger discussed fundamental questions about life: what is its essence? When does it start and end? What is the crucial difference between living organisms and dead things? Does human life differ from other forms of life, and if so, in what way? Schrödinger was aware that the answers to these questions had theological, philosophical, existential and cultural implications, but he was also convinced that, as he phrased it,

> *the obvious inability of present-day physics and chemistry to explain such events [in space and time which take place within the spatial boundary of a living organism] is no reason for doubting that they can be accounted for by those sciences.*

Schrödinger's confidence in the power of physics and chemistry to explain the riddle of life seemed to be confirmed in the early 1950s when the British physicist Francis Crick and the American biologist James Watson described the double helix structure of the DNA molecule and explained how genetic material is replicated. This discovery, for which they received the Nobel Prize in medicine in 1962, was considered as the breakthrough for the deciphering of the code of life and provided the impetus for molecular-genetic research, which now is in the center of the life sciences. In the early 1980s a large-scale and costly international research project took off, the *Human Genome Project*. By mapping the human genome, it would become possible to fight diseases and other disorders and deviances successfully.

Some critical biologists, however, pointed out that such high-flown expectations of modern genetics are misguided because it does not involve a full understanding of life. Reductionist and determinist explanations on the basis of linear causal models, they argue, fall short in explaining the intricate reciprocal relationships between DNA, body, behavior and environment. As the evolutionary biologist and geneticist Richard Lewontin stated:

> *It is [...] when the genome project … has ended, that the fun begins, for biological sense will have to be made, if possible, of the mind-numbing sequence of three billion A's, T's, C's and G's. What will it tell us about health and disease, happiness and misery, the meaning of human existence?*

Referring to eugenic practices, other critics doubted whether these served human wellbeing and put forward ethical objections. They also asked questions about the economic and political interests which prompted this burgeoning field. At the start of the twenty-first century, the research and interventions into the genetic code stored in the DNA structure of the chromosomes in our cell nuclei are both very influential and fiercely contested: utopian and dystopian vistas are contending for priority.

The historical genesis of genetics

Genetics is the outcome of developments in biology between around 1800 and the mid-twentieth century, notably the investigation of life on an increasingly smaller, microscopic scale and discoveries about the reproduction of life and heredity:

- around 1800 a shift from organs (anatomy) to the microscopic level of tissues of which bodily organs are made (Bichat);
- in the 1830s the discovery of the cell creating proteins as the fundamental biochemical unity of life (Schleiden, Schwann);
- in 1841 the discovery that cells can divide and multiply by themselves (Rudolf Virchow: 'all cells come from cells'; Louis Pasteur: living beings can only be produced by living creatures; spontaneous generation is impossible);
- in 1859 publication Darwin's theory of evolution emphasizing the importance of heredity and passing on of inborn features;
- in the 1860s experiments with peas by Gregory Mendel and his discovery of 'hereditary factors';
- in 1882 Walther Flemming's discovery of chromosomes in the nucleus of the cell as vehicles of heredity;
- between 1900 and 1920 further research into the biological mechanisms that underpin Mendel's hereditary laws, the coining of the terms 'genetics' (1910: *Journal of Genetics*) and 'gene', and the discovery of the model of chromosomes as necklaces and genes as beads;
- in the 1920s and 1930s genetics and Darwin's theory of evolution combined with the help of population statistics, which resulted in the 'evolutionary synthesis';
- in the 1930s biological analysis of life phenomena at the molecular level, identification of DNA, the nucleic acid in which hereditary information is encapsulated;
- in 1953 Crick's and Watson's discovery of the three-dimensional structure (the double helix) of the molecule deoxyribonucleic acid (DNA), the macromolecule in each chromosome that carries the chemical instructions for making living organisms and their hypothesis of the way DNA replicates itself.
- in 1958 Crick's and Watson's hypothesis about the replication of DNA experimentally demonstrated;
- in 1960 discovery of messenger-RNA: the chemical intermediary between DNA and the protein-making processes in the cell cytoplasm.

The description by Crick and Watson of the complex structure of the DNA-molecule in the shape of double turning strings of DNA (the double helix) enabled the understanding of what genes are and what they do. They are chemical entities, stretches of DNA which are composed of four basic nucleic acids, forming long dissimilar sequences of base pairs (Adenine-Thymine; Guanine-Cytosine), which are the smallest unit of genetic information. Genetic information depends on sequences of four chemical letters of the acids A-T, G-C, and could therefore be viewed as a code book containing billions of sequences of these letters. Genes are base pairs grouped in units that are the blueprints or regulators for the chemical processes in the cells. DNA makes RNA and RNA makes the proteins (mainly in the form of enzymes) which are the building-blocks of organic material.

As Schrödinger had hypothesized in his 1943 lecture *What is life*, the assumption was that life in its essence can be explained on the basis of the structure and composition of the DNA molecule (the four nucleic acids forming endless sequences of dissimilar base pairs); the replication of the DNA molecule structured as a double helix; the function of genes: the storage, organization and transmission of chemical information, and the regulative codes for the chemical processes in the cells which produce proteins. The models and metaphors which are used to describe what genes are and do, are often those of information and communication (therefore the term bioinformatics). DNA has been compared with a code book, a library, a blueprint with instructions, a computer program, the 'digital code' which activates 'digital instructions', a recipe, a law-code, an 'architect's plan', and a telephone directory. The genome (all the genetic information of an organism) has been referred to as 'the language of life' and the 'Book of Life', echoing the age-old idea of the Book of Nature as the counterpart of the Book of Scripture, the two books in which God's revelation could be read. Genetic activity has been explained in terms of reading and writing, translating and transcribing, imprinting, coding and decoding. The information metaphor was even more relevant because the sequencing of billions of base pairs involves the processing of big data, and it can only be done with advanced digital programs. Genetics involves advanced digital technology.

When in 2000 the complete genome, that is the total arrangement of all the base-pairs of human beings was described as a result of the international Human Genome Project (launched in 1990), it turned out that on the 23 pairs of chromosomes some 30.000 genes can be found (human individuals share 99,9 of all these genes) which are composed of six billion chemical letters or three billion base pairs, enough to fill 200 phone books of 1000 pages each (less than what has been expected on the basis of the numbers which had already been found in other simpler organisms, such as bacteria and fruit flies). There were considerable differences between the genome of humans and other organisms, but they were not so vast as had been assumed. Our genome is not very different from and not more complex than that of other mammals and there is indeed much overlap with the genome of chimpanzees and other apes.

Genetic essentialism and reductionism

In the decades after the discovery by Crick and Watson, the explanation of what genes are and do was basically framed in an essentialist and reductionist interpretation. Again, Schrödinger's article had set the tone: his assertion was that there is no fundamental difference between organic and inorganic matter. Living organisms follow elementary natural laws; hereditary information is coded in complex molecules, which can be analyzed with the methods of physics and chemistry. It suggested that genetics would present a fully mechanistic explanation of life and that it was the final blow to vitalist perspectives.

The basic essentialist and reductionist assumptions are:

- The definition of genes as the decisive one-directional causal factors for making up bodies and causing diseases, and possibly also drives, behavior, feelings, and personality. This implies that genes are active and targeted forces which determine the whole organism and that it is programmed to perpetuate genes. (Therefore, genes have metaphorically been attributed agency, autonomy, causal responsibility,

selfishness, loudness and silence and even selfishness. The related chemical substances have been characterized as the cell's brains, executive power, administrators, an orchestra, messengers, chaperones, executors, functionaries, promotors, regulators and terminators, and switches that can be turned on and off.)

- The conceptualization of genes as distinct units, each of which codes for a single protein, suggest that the features of living beings can be causally reduced to certain identifiable genes, or, in other words, that there is a singular, one-to-one relation between 'genotype' and 'phenotype'. This is the well-known and popular 'gene for'-assumption: the gene for intelligence, mental retardation, aggression, criminality, breast-cancer, schizophrenia, homosexuality, obesity and what not. The individual with such genes would inevitably have or develop the related feature or disorder.
- The know-how to isolate genes and to combine and recombine them at will very soon gave rise to the belief that the genome can be changed and manipulated, that life itself can be designed and re-designed like a machine. This opened the possibility for genetic engineering ('genomics') as a crucial part of biotechnology. From the 1970s on genetics advanced the idea that vital processes are determined by the way genetic information is assembled in parts specified by gene sequences and that these parts can be reassembled in new ways. This mechanical view of life with the possibility of taking gene sequences apart and putting them together in a new way (gene-editing) was grounded in the reductionist idea that any part can, in principle, be separated from the living whole while preserving its inherent properties.

With the development of genetics, research into life became intwined with an engineering approach at the molecular level. To a large extent biotechnology even set the agenda for genetic research: gaining knowledge of life by intervening in it. From the early 1970s on new techniques were developed: isolating, cutting, splicing, recombining, copying, multiplying and transferring DNA and genes in order to modify or fabricate organisms; screening of the genome of an organism; therapeutic cloning (growing organic tissue from stem cells of embryo's); and reproductive cloning (creating complete organisms by implanting DNA in an empty egg and implanting the egg in a surrogate mother). Some milestones in genetic engineering are:

- in 1972-1973: isolating genes from viruses to create the first molecules of recombinant DNA and the first genetic-engineering project: transferring a gene from one (micro)organism to another;
- in 1976: founding of first genetic engineering company;
- in 1977: more efficient methods for sequencing DNA;
- in 1980: creation of transgenic mouse by transferring genes from another organism;
- in 1982: first genetically engineered drug;
- in 1983: technique for multiplying rapidly snippets of DNA;
- in 1985: genetic sequence of HIV established;
- in 1986: automatic DNA sequencers; first genetically engineered vaccine for humans (hepatitis B);
- in 1988: first patent for genetically altered animal (a mouse that is highly susceptible to breast cancer);
- in 1989: first genetic screening test on embryos;
- in 1993: first cloning of human embryos;

- in 1994, first genetically modified food product on the market (tomato); start of crop breeding for agricultural purposes;
- in 1996, cloned sheep Dolly.
- in 2012, CRISR-Cas9 (clustered regularly interspaced short palindromic repeats) which enabled precise and efficient 'gene-editing' or 'genetic surgery', that is replacing pieces of DNA at certain spots on a chromosome with other entailing wide-ranging applications in medicine, biology and agriculture.

Although critical voices could also be heard, a widely shared optimism prevailed in the scientific world and among the general audience about what genetics and biotechnology could offer mankind: curing diseases through repairing and replacing 'defective' genes as well as the fabrication of highly effective medication which would be tailored to individual genetic make-up; the prevention of disorders through genetic screening and counseling in order to detect hereditary diseases and other health risks; the detection of fetuses with genetic abnormalities which can be preventively aborted; germ line therapy (correcting genetic defects in embryos in vitro); in vitro fertilization in order to select an healthy low-risk embryo; genetic screening of newly born babies in order to monitor health risks; xenotransplantation for the regeneration of tissues and organs, and transplanting them; countering aging and postponing death; and the enhancement of physical and mental features. Genetic engineering was often portrayed as goldmine and a Holy Grail: man would be able to take his evolution in his own hand.

The Darwin Wars

Together with a reviving interest in evolution theory, genetics contributed to a changing image of man. Whereas in the post-war period, after the eugenic and racist atrocities of Nazism, biological determinism was in the defensive and sociocultural factors and nurture as well as the fundamental equality of human beings were highlighted, from the mid-1970s on naturalist explanations made a comeback. Sociobiology (coined by Edward Osborne Wilson) and evolutionary psychology (pioneered by John Rushton) held that man was physically as well as mentally determined by innate genetic traits which were the result of natural selection in earlier phases of evolution. Both sociobiology and evolutionary psychology stress that the essence of life is to survive and reproduce. Just like other animals, human beings showed universal and genetically fixed behavioral characteristics which were adaptive at some decisive stage in the evolutionary past, some 100.000 years ago on the plains of Africa.

Sociobiologists and evolutionary psychologists claimed that their field, which would subsume the social and cultural sciences under evolutionary biology and genetics, could provide a comprehensive naturalist explanation of human behaviors and social and cultural patterns, from egoism, selfishness, aggression, crime and war, sexuality and rape to intelligence, sexual preference and the choice of partners, gender differences, altruism, sociability and morality. They saw no problem in transposing their research on animals directly to the realm of human society and culture as well as the other way around. In many ways their explanations were even more reductionist than the genetics and evolutionary theory on which they built their argument. Darwin himself had not gone so far to reduce human culture completely to a biological explanation. Also, sociobiology and evolutionary

psychology were controversial because they seemed to question the sociopolitical ideal of equality between individuals and human groups. Another criticism was that genetic reductionism and determinism, and Richard Dawkins' assumption of the 'selfish gene' in particular, mirrored (neo)liberal individualism and naturalized it, as if the biological make-up of individuals far outweighed the shaping influence of society.

The essentialist-reductionist interpretation of genetics in general, and sociobiology and evolutionary psychology in particular, was questioned in the so-called 'Darwin wars' in the 1980s and 1990s. First, some prominent biologists (such as Stephen Rose, Richard Lewontin, Lewon Kamin, and Stephen Jay Gould) argued that the new evolutionary theories were based on simplistic and one-sided assumptions about the nature of life. Their first point was that life cannot be analytically reduced to phenomena at the molecular level. Although they did not deny that major advances in genetics were achieved through reductionist methods, in their view genetics was not able to understand the organism as a whole and neither the essence of life. Their second objection targeted the deterministic naturalism of socio-biologists and evolutionary psychologists. The psychological, social and cultural facets of man could not be reduced to nature and fully explained in biological terms. Their third critique was that sociobiologists and evolutionary psychologists suggested that their definition of human nature (on the basis of an evolutionary stage dating back some 100.000 years), was a guide for what human beings should be or do nowadays, although their present (sociocultural) conditions were very different. Factual knowledge about genetics and evolution was tacitly associated with particular social and moral values – as if what is natural, is necessarily adequate and right for human beings – the confusion of the naturalist fallacy.

Sociobiologists and evolutionary psychologists were accused of political bias: their biological explanations served the purpose of justifying and defending the status quo of existing liberal-capitalist free market society, its egoistic and competitive ethos and its social-economic inequalities. The emphasis on the natural make-up of man as a fixed and inevitable fate and the suggestion that human nature was the result of the Darwinist struggle for life in which the fittest and best-adapted had carried the day, seemed to legitimize the right of the strongest. In this way sociobiologists and evolutionary psychologists would propagate 'biological Thatcherism and Reaganism'. The suggestion of a fixed human nature and natural inequalities (between the sexes, classes, ethnic groups, 'races', individuals with different intellectual capacities etc.) undermined democratic equality, welfare policies, and the ideal of social justice. The practices of biological engineering and design also bore the stamp of neoliberalism: living beings would be subjected to instrumental purposes and the economic logic of commodification. To critical biologists as well as social and cultural scholars it seemed that once again, biology was (mis)used in support of rightist policies, just like in the second half of the nineteenth and first decades of the twentieth century when social Darwinist and eugenic policies had been implemented in several countries, sometimes with murderous consequences.

Holistic genetics

After de Darwin wars, the essentialist-reductionist approach of genetics triggered more criticism around 2000, when the Human Genome Project had mapped the sequence of the

complete human genome. More and more biological and medical scientists involved in genetics and biotechnology began to acknowledge that such a perspective could not be sustained in the light of their own research and experiments. The functioning of genes and their function appeared to be far more complex than believed before. The idea of a unidirectional and deterministic causal relation between single genes and specific biological characteristics and functions was difficult to uphold.

Genetic research revealed that genes were not distinct units each of which coded for a single protein. A small number of coding regions seems to generate a large number of different proteins, whereas at the same time most features as well as disorders and diseases of organisms cannot be traced back to a particular gene but seems to depend on complex interactions between several genes. The same genes may produce more types of proteins whereas one protean may be the product of more 'cooperating' or interactive genes and RNA. Most phenotypic features are 'polygenetic', require many different genes and most genes are 'pleiotropic', affecting more than one feature. The assumption that a specific gene codes for a specific protean has been replaced with the insight that gene expression is regulated by processes in the cellular environment, which, on its turn is shaped by a multitude of extra-cellular factors. Although every cell in a body contains the same DNA, cells develop diverse properties in different organs of the body. Not all genes display the same level of activity (gene expression); depending on the cellular environment some are 'switched on' and others 'switched off', or they are 'loud' or 'silent'. The expression of genes seems to be conditioned by dynamic feedback processes triggered by other, self-regulating organic processes which are influenced by environmental factors on different levels, and which develop in time. Moreover, the so-called 'Junk-DNA', which composes ninety percent of all DNA, and which had been considered as a useless remnant of evolutionary history, appears to have regulative and triggering functions after all.

In the last decades, the understanding of genetics has changed from a one-dimensional, unidirectional, essentialist and reductionist explanation to a much more nuanced view on the reciprocal interaction between genes, 'junk'-DNA, cells and other organic and physical processes as well as the living environment and ways of life. A new field of research stressing this complexity emerged: epigenetics with a focus on the webs of interactions between genes and the multiple physical and chemical organic processes on different levels within organisms as well as on the interactions between the organism and its living environment. All these interactions produce irreducible emergent properties.

Another setback of the essentialist-reductionist interpretation of genetics was that many expectations, positive utopian hopes as well as negative dystopian fears, about the possibilities and consequences of genetics and biotechnology have not (yet?) come true. The achievements of biotechnology have often been overrated, partly by scientists and biotechnology companies in order to promote their research, attract grants and venture capital and boost reputations and profits. The difficulties, downsides, side effects and disappointments, however, were many. For example, until this day genetics has not marked a revolutionary turning point in the treatment or prevention of diseases. Progress has been made in finding the genes connected to some relatively rare hereditary disease such as Huntingston's chorea, cystic fibrosis, sickle-cell anemia, but most diseases are related to multiple genes interacting in complex ways. There is still a huge discrepancy between

genetics as a diagnostic tool and the lack of successful genetic treatment possibilities. On the individual level there seems to be no direct link between genes and most illnesses: environmental factors, nutrition, lifestyle and the life history also play a role and may affect the activity of genes.

Growing living tissues and complete organs is extremely difficult and the same applies for cloning: most clones already die before they have been transplanted in the surrogate mother. If cloned embryos grow into full organisms at all, they often suffer from defects and illnesses and die prematurely, such as the famous cloned sheep Dolly. Nearly 300 embryos, numerous late abortions, deformities, and neonatal deaths, were required to produce Dolly. Cloning techniques depend on endless trial and error, are very time-consuming and expensive; it is not easy to produce a healthy, normal functioning living clone. When it comes to life processes, there is apparently still much that cannot be controlled, engineered and designed. Microbiologists have succeeded, with a lot of effort, to manufacture an artificial virus, which itself is not an organism, because it depends on a host. To make the most simple, self-regulating form of life, a bacterium appears to be much more difficult. Biotechnologists in one of the laboratories of Craig Venter may have succeeded in designing a bacterium on the basis of fabricated DNA, but it remains to be seen wat this implies for the design of more complex life-forms. In this sense it is misleading to compare an organism, even a very simple one, to a complex machine. Consider a Boeing 747 airplane composed of 50.000 kinds of parts and 6 million components. A relatively simple cell, for example yeast, has millions of moving parts, approximately 6300 kinds of genetic parts and unknown numbers of chemical substances. A human body has around 1000 trillion cells, most of which are as complex as yeast and then there are millions of microbes in our bodies. The human brain has 100 billion neurons, each of which is different, with 100 trillion synapses connecting them.

As a result of the new insights in the complexity of genomics (the study of all genes together in an organism) and the many difficulties of genetic engineering, the reductionist, essentialist, mechanistic and deterministic explanations have been largely replaced by a more holist, interactive, and dynamic approach. It indicates that biological causation is not one-directional, but that genes and organisms, and organisms and their living-environments mutually condition each other in a dynamic relationship. Life is considered as an emergent property with a dynamic of its own and not reducible to processes at lower levels. A holist style of thinking has made a come-back and it can be summarized as follows.

1. An organism is more than just the sum of physical and chemical processes triggered by genes and that there is a hierarchy of complexities on different levels. Each level shows emergent properties that cannot be reduced to lower levels. The genes of an organism are embedded in the self-organizing and self-regulating organic processes, which are inseparable from the wider environment. Therefore, genetics does not necessarily exclude nurture.
2. An organism cannot be explained on the basis of a unidirectional and one to one causal chain, as if every characteristic of our body can be traced back to particular genes as the prime triggers. The relationship between the genes and other levels of the organism should be understood in terms of reciprocal and circular influences and feedback processes. Organic phenomenon on a higher level than the genes should be seen as emergent properties which are irreducible to genes and can only be

understood on the level of the organism as a whole. Also, genes are as much influenced and modified by all conditions around them as the other way around.

3. The dynamic and adaptive life processes are intermediate systems between innate characteristics and environmental influences on different levels of the organism. Genes, for example, are completely inert if they are not triggered by chemical processes in their cellular environment.

Ethical and political issues

The ethical and political dimension of genetics and genetic engineering has generated a lot of debate about the ethical consequences of what is or may become technically possible. What should be allowed and what not? At what point do therapeutic goals which serve health and life cross the border towards enhancement as an instrument for other ends? There are differences between countries with regard to the legal regulation of genetics and biotechnology. Several values and issues are at stake: ethical and religious ones, the consequences for democracy, social justice, human dignity and the experiential nature of human life.

Does genetic engineering undermine the (Kantian) moral imperative that human beings should not be used as a means to another end? Religious objections to genetic engineering in the sense that humans should not tinker with God's creation belong to this ethical category. This concerns the principle that living beings should not be instrumentally manipulated like things. Such an argument applies to, for example, stem cell research for which embryos are used, touching upon fundamental questions about the beginning of full-fledged life and the possible creation of 'designer babies'. It is also relevant with regard to 'bioeconomics', the commercialization of genetic research and biotechnology. Genetic discoveries and techniques, recombined genes and modified organic material are patented and treated as property that can sold, traded and used for profit, as is already the case in the field of agricultural. Who has the right to own and trade in genetic know-how? Should the exchange of such know-how take place on the capitalist market without inherent ethical values?

Do genetic screening and engineering undermine democratic values such as individual freedom, equality and social solidarity? This question is related the fear that genetic screening and testing may entail an evaluation of individuals in terms of their biological fitness, their (future) health and economic value, which may generate inequalities, discrimination and exclusion, for example being refused by insurance companies, mortgage lenders, or employers. The commercialization of genetic testing and enhancement may entail that only those who can afford it will benefit, that 'good genes' become clustered within certain distinct groups, who may come to believe that their success is a matter not just of luck, but of good choices and planning, and hence something deserved. A society in which biotechnology and genetic engineering are widely applied could become more unequal and competitive. Genetic screening and enhancement may bring about rising standards of health, fitness and normality rise and force upon people a particular vision about the good life in biological terms, which may boost the belief that some people with superior biological features (the 'genrich') are better than others (the 'genpoor'); in that

case the marginalized of second-class citizens could emerge. Genetics may undermine liberal-democratic rights when genetic counseling and screening will be imposed in more or less subtle ways – either by social pressure, medical insurance or the state – and the privacy of genetic information is not secured. As genetic and other medical information of individuals in digital databanks increases and if such information would become a standard part of everyone's medical record, the accessibility and the control of such information touches on the civil right of privacy and self-determination. Such databases have the potential for an expansion and refinement of strategies of control and surveillance, and they may entail stigmatization and preventive intervention into the lives of citizens.

Does genetic engineering undermine the basic notion of human nature on which values with regard to human dignity are based? Critics who raise this issue believe that all human beings share some basic innate feelings and emotions about human dignity and morality, which are supposedly rooted in a common human nature that is the result of evolution. According to Francis Fukuyama, for example, we have reason to believe that our 'natural' ethical and social instincts are good, precisely because they have evolved through natural selection in order to help us survive in a rough and tough world. In his view, it would not be sensible to change that inheritance: our instincts define us, and if we would tinker with them, we would deny and betray ourselves. Although we must also seek principles of ethics independently of our evolutionary evolved instincts, in culture, we would do well, says Fukuyama, to follow our inborn feelings. Biotechnical interventions aimed to (re)design humans beings, in particular far-going interventions such as cloning and designer babies, should be considered as violations of this human nature and may thereby undermine basic moral values. Moreover, the working of genes, which is the result of evolution, is so complex that human beings can never take into account all of the possible risky consequences of genetic engineering: manipulating nature may have unpleasant surprises in store. Such fiddling with human nature, that is already functioning reasonably well as a result of countless evolutionary adaptions, is *hubris* and the opening of a Pandora's box full of unintended outcomes, including the loss of natural ethical sentiments.

Do genetic screening and engineering undermine the experience of life as open, unpredictable, diverse and versatile? This refers to the fact that predictive and preventive medicine on the basis of genetic knowledge provides knowledge about health risks which may undermine the idea of an open future, a precondition for a sense of autonomy, self-determination and free choice. Such predictions may generate burdensome fears and uncertainties. Will there be a right to remain unaware about one's genetic profile and associated risks? There may also be reason to fear that genetic engineering will contribute to an increasingly uniform and predictable human world with an emphasis on particular (utilitarian) values such as health, achievement, efficiency and being in control. The result may be the soft and benign tyranny pictured by Aldous Huxley's in his *Brave New World* (1932), in which everyone is healthy and happy, but at the same time shallow, superficial, and uniform without all the individual differences, the diverse experiences and ambivalent feelings that belong to a full life.

5. MEDICINE BETWEEN LABORATORY AND SOCIETY

> *What you could do? – Everything! – if at least you are willing to collaborate vigorously and in a unified fashion to improve our medical institutions [...] if you decide not to rest and leave no means untested, until the government has realized the inevitable and urgent medical reform [...] if you are willing to inform the government incessantly of your conviction that our medical legislation is a shame for science and a crime toward the public, and also that the government itself should be held responsible for the regrettable negligence of one of the main and most sacred interests of the people and the state [...] May all medical practitioners [...] powerfully join forces to look after the interests of science and the public [...] Physicians unite! And no longer waste your powers!* (Jan Pieter Heije in *Archief der Geneeskunde 5* (1846) 214-215)

Jan Pieter Heije was one of the Dutch physicians who in the middle of the nineteenth century advocated a thorough reform of medicine. They had various reasons to reconsider their field and professional practice. The existing organization and approach of physicians was not adequate in times when experimental scientists made new discoveries in the area of physiology and when society was facing new and large-scale health problems.

Medicine used to be in the hands of different healers: on the one hand a small group of learned men and on the other a larger and varied group of practically trained healers. Experimental natural science was not part of medical schooling. The organization of health was rather haphazard and lacked transparency and efficiency. Physicians had little social influence and political backing. Medicine was a transactional matter between healers and clients without a broader social dimension; public health measures were only provisional in situations of emergency. Reform-minded physicians tried to bring about changes at different levels: the cognitive contents of medicine, its organization and their social responsibilities. They did not only adopt a natural scientific approach, but they also showed social engagement. For the time being their patients, however, hardly benefited from better curative methods.

The innovative professionalization of medicine was partly conditioned by changing social-political conditions. The growing influence of medicine on both individual life and the social body has been accounted for in various ways. Some sociologists and historians refer to the rise of ‘biopolitics’ and the ‘medicalization’ of society. Others assert that the growing importance of health should be understood in the broader context of the civilization process or of democratization.

The professionalization of medicine

Professionally organized medicine as we know it today emerged in the second half of the nineteenth century. Earlier on, medical practices, apart from lay healers, were in the hands of a wide variety of more or less acknowledged healers: next to an elite group of academically educated doctors, a host of practically trained and oriented surgeons, army-physicians, midwives, natural healers, pharmacists and quacks. Apart from differences in

their formal license and training, their social and economic positions were diverse, ranging from doctors who were well-off to healers who barely subsisted. The traditional organization of medicine reflected the stratified and hierarchical social order.

Apart from distinctions in status and patronage, differences in education and training, that is theoretical study versus practical handicraft training, were crucial. Academic medicine was to a large extent 'library medicine', based on the intellectual tradition of book-learning, erudition, and philosophical theories, in particular those of classic authorities going back to Hippocrates and Galen. Practical handicraft training, on the other hand, was acquired through apprenticeship in the guild-system or just non-occupational practical experience as part of another occupation (such as that of executioner, pharmacist) or interest and skill (such as knowledge of herbs). Understandings of illness were diverse and rooted in different scholarly and practical traditions and depended on licensed competences and skills, either those of the theoretical intellect or those of practical hands. Which healer treated which patient depended on their status and rank, what patients could afford, or whether they lived in towns, where learned physicians offered their services, or the countryside, where people rather depended on more or less practically skilled or unskilled healers. Medical arrangements also showed local and regional variety; there was no uniform medical organization and cooperation between various healers on a larger, let alone national scale.

The innovation of medicine, which in France started with the French Revolution, took off in many European countries from the 1840s on. Not only the organization of medicine, but also its theory and practices, and the relations between doctors and patients changed, whereas the medical domain expanded, and physicians operated on the free market for medical services while they also had to deal with the state.

Various groups of healers based on different status positions and varying competences were gradually replaced by a unified medical profession, that is an occupation on the basis of a shared scientific education and certified expertise, common interests, and codified rights and responsibilities. A common and standardized scientific training at the university and expertise in the form of applying natural-scientific knowledge – bridging the traditional separation of theory and practice – forged professional cooperation, solidarity and cohesion on the basis of merit and achievement instead of social rank. Professionalization also involved external legitimation and recognition of medical expertise, often in the form of official legal certification by the state and a more or less exclusive competence to treat illness. In this way official physicians distinguished themselves from lay-healers, who were increasingly labelled as quacks and charlatans now and who were more or less legally disqualified. At the same time physicians gained professional autonomy and authority with regard to their scientific knowledge and expertise (on the basis of educational standards, examination-requirements and best practices); medical competence and career-opportunities; the quality of medical treatment and ethical issues (on the basis of a self-monitored professional code); and a professional calling and corporate consciousness (the idea that medicine, like law, is a special occupation that serves the public good and for which they would deserve social acknowledgement). Physicians organized themselves in professional medical associations in order to defend their common interests and to act as pressure-groups for medical reform, state-support and legal backing.

The professionalization of medicine was not unique, but part of a more general development: the emergence of a market for specialized (scientific and technological) services in industrial society in order to deal with increasingly complex problems. Professionalization, however, should not be viewed in a finalist way in terms of the full and definite realization of all ambitions and aims and a guaranteed established position, but as a continuing process and confrontation with other actors such as the state, patients, other professionalizing occupations and the funders of health care. The relationship between the medical profession and the state, for example, was ambivalent. On the one hand, physicians resisted state interference with their occupation because they aspired professional autonomy and control on the basis of their scientific and practical expertise. On the other hand, they depended on government protection and regulation for establishing and maintaining their legal position, for example vis-à-vis lay healers who might compete with them on the free market, and for facilitating sanitary measures in the field of public health, which required regulation and intervention by local or national governments. National differences are relevant here. On the one hand the Anglo-Saxon world where physicians more or less realized their professional ambitions independently of the state through private initiatives in civil society and on the free market. On the other hand, continental European countries, such as France, Germany and the Netherlands, where physicians succeeded to gain support of the state, which also implied a dependence on and obligations towards government. Overall, the medical profession was vacillating between professional autonomy and protection as well as regulation by the state.

The development of modern professional medicine as applied natural science involved a fusion of scientific knowledge and practical skills. A uniform scientific education and examination at an academic level in university teaching-hospitals, clinics and physiological laboratories paved the way for clinical and laboratory medicine on a scientific-experimental basis. Hospitals, earlier on charity shelters for the poor who were ill, disabled or old, were reorganized as science-based institutions for treatment and cure as well as for research and teaching medical students. Library medicine was replaced by the teaching of medicine on the basis of empirical clinical research and demonstration, practical exercise and physiological experimentation and testing. Medical knowledge was not fixed any more, but continuously updated and shared in professional cooperation. The meaning of medical experience shifted from the repeated exercise of passed-down routines (apprenticeship) to learning research and testing methods, understanding empirical observations and experiments, and applying such insights for diagnostic and curative purposes.

The natural-scientific orientation and practices of medicine went hand in hand with a new clinical and physiological understanding and treatment of disease. The traditional concept of disease as a hostile entity that intrudes and attacks the body from the outside was based on the assumption that illnesses are autonomous phenomena characterized by essential symptoms, that they that can be classified on the basis of typical features, and that they can be localized and revealed by anatomy. The traditional treatment method was based on the idea of an imbalance of the four ‘humors’ that made up the body and centered on the need to restore physical harmony by releasing the humors which disturbed the natural balance. Bloodletting was a common practice.

The traditional concept of illness and treatment methods were first replaced by the clinical-empirical approach of illness, which after the French Revolution was pioneered by the Paris school of medicine. This approach was based on systematic observation of numerous patients and the statistical registration and quantitative analysis of observations; better validated methods and instruments in order to diagnose symptoms, for example palpation (feeling) and percussion (thumping), and auscultation (listening, with the help of the stethoscope); and systematic pathological-anatomical research which linked lesions in organs and tissues with the symptoms displayed by living patients.

From the 1840s on, the physiological understanding of disease was developed in physiological laboratories. This new approach viewed illness as a functional disturbance in the body that could be understood in comparison with the dynamic workings of physical and chemical processes in the normal, healthy body. This implied that there was no strict qualitative boundary between health and pathology; as manifestations of dynamic life-processes both were rather viewed as quantitative variations on a scale of statistical normality versus abnormality. Illness was now seen as a dynamic process in time characterized by changing symptoms, functional disturbances, and particular physical and chemical processes revealed by laboratory research, for example in the field of cellular pathology and later bacteriology. Both the clinical and physiological perspectives changed the therapeutic approach. Curative interventions should correct the body's abnormal functioning by restoring, stimulating and regenerating 'normal' life processes.

Traditional medical practice was serving individual patients on the basis of contractual relations. Doctor and patient communicated with each other on a more or less equal footing, in particular if they were of the same social rank, and there was not a wide gap between medical and lay knowledge of the body. This was mostly 'bedside medicine': the doctor treating patients at home and relying on outward symptoms and what patients expressed in words about their complaints. The new clinical-physiological model increased the distance between doctors as professionalized and highly educated experts and lay patients without expertise, the more so when doctors, as members of the upper and middle class treated lower class patients. Clinical and laboratory medicine also increasingly institutionalized medical care and objectified patients: systematic clinical observation and monitoring of hospitalized patients and diagnosis on the basis of laboratory-research began to supersede personal communication. As medicine oriented itself to natural science, the relevance of social and communicative skills of doctors in their interaction with patients dwindled.

Public hygiene and health

The scientific professionalization of medicine did, for the time being, not result in better treatments and more cures for patients. Only in the longer run, from the late nineteenth and foremost from the 1940s on, would 'therapeutic nihilism' be surpassed by curative success. The first priority for doctors was not so much cure but a rational organizational modernization of medicine along the lines of scientific expertise in order to strengthen their social position and standing. Lacking therapeutic success, however, also engendered professional embarrassment: the public reputation of doctors was at stake. Therefore, several prominent physicians shifted their professional ambitions from curative medicine for individual patients to social and political engagement in the new field of preventive public

health. They claimed that medical expertise could and should contribute to the health of society as a whole, which required social reform. The professional interest of expanding their expertise to society dovetailed with the argument that they served the public good, not in a political, but in a scientific and supposedly neutral way.

The emergence of public health from the mid-nineteen century on extended the medical domain into society and broadened the definition of health and disease in terms of social norms and values as well as normality and abnormality. Apart from ad hoc quarantine measures in some city-states from the late Middle Ages on, it was in the course of eighteenth century that health and illness were explicitly conceptualized as a public issue and as part of the responsibility of the state. Preventing disease and promoting health among populations was advanced by the secular rational optimism of the Enlightenment which superseded the Christian preoccupation with salvation in the afterlife; earthy life, its quality and improvement were now worthwhile in themselves. Health and hygiene, considered as an economic asset in particular, as a crucial factor for labor-productivity in an industrializing society and as such linked to values such as thrift, utility, efficiency, and well-considered investment, embodied the capitalist-bourgeois social order. The meaning of health was entwined with middle-class virtues such as individual independence and self-reliance, self-control and responsibility, soberness and moderation, cleanliness and regularity, and willpower and foresight. Also, the enlightened notion of natural rights and the liberal state, based on popular sovereignty, advanced the idea that health and disease might be a matter of civil rights and civic duties.

The first administrative instrument for the prevention of the spread of contagious diseases and the promotion of hygiene and healthy behavior was the so-called medical police as part of government bureaucracy. In the course of the eighteenth century, this institution was established in some European countries by enlightened despotic rulers who sought to advance a more efficient, orderly and robust society that would serve the interest of the state. During the French Revolution public schemes for health care and disease prevention were discussed. Next to poverty, health and illness were among the first social issues that were associated with civil rights and duties because, as was argued, the health of the nation would ultimately depend on responsible citizens who were motivated to keep up their health. The ideal of a healthy society dovetailed with the reform projects of the French Ideologues and social reformers who were inspired by the organic social thinking of Claude Henri de Saint-Simon and Auguste Comte, Jeremy Bentham and his followers in Britain, and Thomas Jefferson in the United States. All of them attributed a prominent role to medicine in the making of a modern social order and the improvement of society through scientific-technocratic intervention and management. The operation of society was compared to the functioning of an organism: public health was viewed as a crucial precondition for an efficient and harmonious social body. Bentham compared medicine to legislation and the administration of justice. Just as the doctor cured the individual body using a scientifically based treatment, which was attuned to the type and seriousness of the disease, the judge healed the social body by his balanced verdict. Both had essentially the same purpose: fighting grief and promoting the greatest happiness for the greatest number. Furthermore, medicine and criminal justice resembled each other because of their potential preventive effects. Impressed by Edward Jenner's discovery in 1796 that smallpox could be prevented by vaccination with cowpox, Bentham advocated various public health measures like

removing filth, guaranteeing clean air and water supplies, fighting poverty, and improving housing and labor conditions.

The first steps towards the structural implementation of public health measures were taken in the middle of the nineteenth century. The rise of the sanitary reform movement aimed at environmental public hygiene, reflected an increasing concern about the disruptive effects of industrialization and urbanization on the health of the labor class and the poor. Governments faced a growing pressure, not only from the rising medical profession but also from other professions and groups of public-spirited citizens, to assume responsibility for hygienic arrangements in order to counter endemic and contagious diseases, such as smallpox, measles, tuberculosis, malaria, diphtheria, scarlet fever, typhoid, infantile diarrhea and in particular cholera, which struck Europe in four lethal waves in the 1830s, 1850s, 1860s, and the 1890s. In the course of the second half of the nineteenth century several measures were taken with respect to urban cleansing and infra-structural planning such as sewerage, drainage, clean water supplies, garbage collection and cemeteries. Public health laws were enacted, establishing medical inspection boards and health councils, and introducing (compulsory) vaccination and sanitary inspection of trades, food supplies, public buildings, and private dwellings.

The scientific method which physicians and others used to underpin the public hygiene movement was statistical medical topography. It started with systematic, quantitative descriptions and comparisons of the state of health in different locations, towns and regions on the basis of the average ratios between the number of diseases and deaths on the one hand and healthy people alive on the other. The next step was correlating the health condition of local populations to geographic, climatic, infrastructural, demographic, social or political conditions, such as pollution of air, soil and water, infectious waste, poverty, bad housing, and inert government. The findings of different locations were compared to what could be considered as a normal or average prevalence of illness and death. This was the so-called biometer, which could be used as a standard to reveal the environmental or social causes of unhealthy conditions and as a scientific lever to put pressure on governments to take appropriate measures.

Nineteenth-century thinking about public health was informed by two perspectives on the spread of epidemic diseases. Miasmatic theory**,** which was dominant in the first half of the nineteenth century, held that epidemics were caused by unhealthy environments, in particular pollution, bad water, soil and air, which would cause harmful vapors. A social-environmental approach, cleaning up the environment, seemed the best solution. The underlying assumption was that human beings were determined by external factors and that they were malleable. The other perspective, which gained ground in the second half of the nineteenth century, was Contagionism**:** the idea that pathogenic micro-organisms caused and spread contagious diseases. The suggested solution was more technocratic and medical, such as enforcing quarantine measures (closing off towns or certain areas) or detecting people who carried and spread disease. In the late nineteenth century Contagionism appeared to be scientifically validated by bacteriology: the discovery by Louis Pasteur and Robert Koch of bacteria and viruses that cause diseases such as lepra, tuberculosis, cholera, typhus, diphtheria. This made environmental hygiene, however, not irrelevant: cleaning up the environment in order to prevent the spread of pathological germs, countering

irresponsible, unhealthy individual behavior and educating (and forcing) people to behave in a hygienic way, was the only effective solution until medication and vaccination enabled direct tackling of bacteria and viruses and disease prevention.

Whereas in the mid-nineteenth century the sanitary project started as a broad movement aiming at environmental hygiene and social reform, in the late nineteenth and early twentieth century biomedical and technocratic approaches began to prevail. This shift manifested itself not only in the rise of bacteriology and medical epidemiology, but also in the growing impact of a naturalist perspective on man and society, in Social-Darwinism, degeneration theory, criminal anthropology, and eugenics. Public health was now defined as the strength, fitness and vigor of national populations; the collective interest and the improvement of the health of the social body was prioritized over individual rights. The implied health policies tended to top-down, compulsive state intervention targeted at those individuals and groups who were found to be unhealthy, unfit, deranged, abnormal, physically and mentally defective, incorrigibly criminal, immoral or anti-social. They were considered as a threat to the social organism or racial purity.

Such trends occurred in many countries, liberal-democratic as well as authoritarian and totalitarian, albeit in different degrees and with more or less serious consequences for certain groups. Several American states and social-democratic Scandinavian countries, for example, enacted eugenic laws and, with the help of the medical profession, enforced mandatory sterilization, institutional segregation, and other measures, targeting mentally retarded and disordered individuals in particular. The large-scale eugenic and so-called euthanasia programs in Nazi Germany, which has been characterized as a 'biocracy', is the most extreme example of a coercive public health policy ranging from enforced sterilization, isolation and medical experiments to so-called 'euthanasia', direct medical killing and genocide – practices in which a large part of the German medical profession was actively involved. This made clear that medical professionalism, stressing exclusive scientific knowledge and expert authority, could be at odds with a democratic and egalitarian vision of citizenship. Medical regimes might cross the liberal threshold of individual rights and liberties and subordinate democratic values to what was viewed as the collective good and national interest. The more liberalism, and segments of the medical profession as well, allied itself with values of national vitality and collective survival, the more the state overrode individual rights.

From the late nineteenth on and increasingly in the course of the twentieth century also more democratic models of public health emerged, which kept some balance between collective and individual interests, and which were based on inclusive rather than excluding strategies. Firstly, in the wake of the introduction of universal suffrage and the growing political emancipation of the working class, in most Western countries the state would increasingly assume responsibility for the accessibility of health care provisions for all citizens. Older practices of health care in the field of charity and poor relief were more and more replaced by collective insurance schemes and state guaranteed entitlements covering sickness, disability, and old age. Collective health care arrangements, which socialized health risks among the population, were an important ingredient of the emerging welfare state, which was fully realized after World War II.

Secondly, in democratic welfare societies, public health activities targeting an ever-wider array of health problems (poor nutrition, infant mortality, vaccination, child-raising, domestic hygiene, alcoholism, tuberculosis, venereal ailments and other contagious diseases) increasingly began to depend on the co-operation of the population, which might do so if such interventions were in their own well-understood self-interest and enhanced their living conditions. Although several degrees of pressure, surveillance and discipline might be applied in what now developed as social medicine, increasingly more subtle methods were applied: individualized attention to habits and living conditions of people, co-opting them through health-education, social work, house visits, social and material support, social hygienic welfare and consultation centers, and out-patient clinics in order to assist and motivate people to become self-responsible and improve their situation.

Sociopolitical perspectives

At least three historical-sociological perspectives may explain the development of public health: Foucault's concepts of biopower and biopolitics; Norbert Elias's theory of the civilizing process and the political history of democratic citizenship.

According to Foucault, since the late eighteenth century the advancement of health plays a crucial role in the shaping of modern disciplinary and surveillance society through the interlocking of power and knowledge. Whereas in traditional society political power was of a juridic nature and exercised in a negative way – disobedience and revolt could be severely sanctioned with corporal and capital punishment – the positive 'biopower' employed by modern political regimes focuses on the control of the population in order to manage and regulate its life and improve its quantity and quality. In the industrial age the health of the population was crucial for the economic productivity as well as military strength of nations. Health could be guaranteed and advanced by what Foucault calls the 'anatomo-politics of the body', that is the disciplining and normalization of individuals, and 'biopolitics', the control and surveillance of the social body. The consequence of these strategies, involving a variety of techniques, expertise and arrangement, was the broadening of the meaning of health and illness to what counted as normal and abnormal. More and more aspects of life were medicalized: the size and quality of the population; fertility, reproduction and sexuality; conjugal, parental and familial relations; birth and death; child-raising and education; mental and behavioral disorders, addictions, criminal and other deviant behaviors; labor relations and economic productivity, and habits and lifestyle. All of these issues became the object of normalizing policies ('governmentality' according to Foucault) in which medical expertise played a crucial role.

In the historical-sociological explanation of Norbert Elias health norms and hygienic behavior did not so much advanced by prescriptive discourses and imposed disciplining techniques, but they were rather the unintended result of more refined self-controlled ways of conduct. Such behavioral patterns evolved in a civilizing process triggered by changing social relations, in particular growing interdependence and equalizing balances of power. The essence of the civilizing process was increasing social pressure on individuals to control their behavior and emotions – what Elias spells out as the shifting balance from *Fremdzwang* to *Selbstzwang*. The growing preoccupation with health and hygiene from the late eighteenth century can thus be understood as part of the intensified self-control with which the rising middle class

distinguished itself from both the decadent aristocracy and the irresponsible, depraved lower classes. Hygienic habits were not so much the result of rational and professional insight in what was beneficial for health, but they were rather part of the increasing control of bodily impulses, an internalization of feelings of embarrassment and shame, and increasing physical and emotional self-restraint in social interaction. Consequently, the middle class began to disseminate its 'civilized' attitudes and behavior as a norm for the lower orders, which, later on, also began to adopt them. Against this background sanitary reform and advancing hygiene were much more than a medical project targeting disease and unhealthy living conditions. It was part of a much broader zeal of social and moral elevation of the lower classes, a civilizing campaign in order to integrate them in civil society by advancing their orderly conduct, industriousness, self-responsibility and social consciousness. Also, in the Elisian perspective, in modern society delicate and controversial social issues (sexuality, abortion, birth-control, alcohol and drug-addiction, euthanasia, problems at work, employment-disabilities, problematical or deviant behavior) have often been put in a medical framework in order to deal with them neutral, pacified and depoliticized manner. Such issues have been delegated to medical professionals and experts in order to evade conflicts about values and ethical norms. This has advanced a growing demand of and dependence on professional expertise.

A more exclusive political perspective focuses on the framing of health and illness and the related social policies in the context of the development of democratic citizenship, in particular with regard to the balance between rights, entitlements and benefits on the one hand and duties and obligations on the other. In the last two centuries the field of health and illness and that of politics and the state became increasingly mutually entwined. This entwinement originated in the late eighteenth century, the period of the American and French Revolutions, when the contours of the politics of modernity, that is liberal democracy and growing social intervention by the state, as well as professional and scientific medicine emerged. The expansion of medicine in the course of the last two centuries took place against the background of the changing relations between the state, the medical profession and citizens (whether they were patients or not), and how these relations included mutual facilitation as well as tensions and conflict. In the development of liberal democracy and citizenship, health care was entangled in various political interactions and pressures with different outcomes. Sanitary reform and public health in particular complicated the relation between health policies and liberal-democratic citizenship. The implementation of sanitary projects was hampered by the dilemma of individual freedom against collective protection. Public health reforms, although often inspired by liberal impulses, were impeded by the contradiction between the need for state intervention as opposed to civil liberties as well as the operation of the free market. Only when in the late nineteenth century liberals began to recognize that the state should shoulder greater social responsibilities, in part to placate an ever more extended electorate, more and more sanitary goals were realized. Public health policies in the era of liberalism were often not based on direct state intervention, but rather took the form of professional regimes that kept more or less distance to the state and applied supposedly neutral scientific knowledge about what is healthy (and normal). By delegating social policies to professional expertise outside the state apparatus ('governing at a distance') and granting physicians professional competence and autonomy in matters of health and normalcy, interventionist strategies were distanced from political and ideological controversy.

6. MEDICINE PRAISED AND CALLED IN QUESTION

Way into the twentieth century, human life was marked by disease and death. Although it was possible to fight a number of dangerous infectious diseases effectively, such as the plague, cholera, diphtheria, typhus, tetanus and rabies – thanks to bacteriology which was boosted by the work of Louis Pasteur and Robert Koch – and sanitary measures had improved public health, in many cases curative medicine had little to offer. Often doctors could not do much more than diagnose a disease and give some prognosis of its outcome.

In the decades after the war, however, a therapeutic revolution took place. Penicillin and other antibiotics, polio vaccination, insulin, psychopharmaceuticals, intensive care, open heart surgery, endoscopy, organ transplantations, modern genetics – these are just some examples of a series of medical success stories and promises. They raised the expectation of physicians as well as among the public that it was possible to drive out disease permanently.

Despite its successes, however, medicine became increasingly controversial in the last three decades of the twentieth century. Biomedical scientists failed to agree on the best road toward health: some swore by clinical research, others expected everything from genetics and again others claimed that medicine was on the wrong track if physicians only looked into bodies and had no attention for living-conditions. Some even cast a chill on the optimism by indicating that many medical discoveries are largely coincidental and that there are limits to the scientific power to control living nature. Most people still die of a disease such as cancer, heart attack, stroke or new infectious diseases such as AIDS, corona infection, or Ebola fever. Physicians had better show more modesty, according to James Le Fanu in his book *The Rise and Fall of Modern Medicine* (1999) in the twentieth century: ‘medicine is not, or should not be (as it has become), synonymous with scientific progress.’

Outside the medical world opinions were even more divided. Critical social scientists claimed that physicians were more interested in money and power than in their patients’ well-being. Medicine, they felt, had become a technological-pharmaceutical complex in which highly specialized physicians geared their attention not so much to people than to organs, biochemical processes, laboratory experiments and sophisticated medical technology. Medical progress appeared to be bought at the cost of a certain ruthlessness in the treatment of patients, who were used as objects for medical research. Moreover, in their view medical science had spread its tentacles to every corner of society by increasingly ‘medicalizing’ people’s everyday life.

The public shows ambivalence when it comes to the blessings of medicine. Western man has never been as healthy as today and human life expectancy has never been as high. And yet people’s fear of death and disease seems to have increased rather than decreased; they are continuously confronted with a plethora of information about health risks. The steadily growing demand for medical help points to our – perhaps too – high expectations of what is possible in modern medicine. Conversely, more and more conflicts occur between physicians and patients, while many people also seem to reject regular medicine and turn to alternative healing practices, which are flowering as never before.

Although the health condition and life-expectancy of people has improved enormously, the preoccupation with and anxiety about health and disease, also in terms of risks for the future, have increased whereas trust in professional, scientific medicine is not self-evident anymore.

Medical optimism and setbacks

The development of health care in the post-World War II period showed tensions between one the hand an optimistic belief in medical progress and the possibility to bolster health and, on the other, a number of setbacks, controversies and paradoxes.

The postwar belief in medical progress through scientific-technical control was advanced by several innovations in clinical medicine: new large-scale research methods such as clinical trials and use of statistics; the introduction effective new medication such as penicillin, antibiotics for infectious diseases and tuberculosis; cortisone for diabetes and psycho-pharmaceutical drugs against psychosis; better treatment possibilities of chronic diseases; new medical (diagnostic, surgery and life-saving) technologies such as intensive care and screening. All of this was facilitated by growing funding for medicine and extended health care insurance schemes, which were advanced by the expanding welfare state.

Around 1970 there seemed to be a relative, in the light of rising expectations, stagnation in the progress of clinical medicine, and it was increasingly criticized for:

- Its reliance on the commercial pharmaceutical industry which pushed up the costs of more and more new drugs, but which added less to better treatments.
- Its blind faith in technology, which, critics asserted, was getting out of control. Expensive technologies seemed to be applied as a purpose in itself without considering their use for patients. Technology may lead to over-diagnosis and the prolonging of life without considering its quality, and it seemed to be a barrier for communication between physicians and patients who felt objectified.
- Its neglect of the social causes and prevention of illness, in particular of new ‘welfare diseases’ such as heart and vascular diseases, cancer, strokes, diabetes, high blood pressure, cholesterol, and obesities. Clinical medicine was challenged by (leftist) social medicine, which on the basis of epidemiology and social scientific methods, focused on unhealthy and polluted environments, deprivation, bad nutrition, stress, and lifestyle.

Social medicine, however, could not boast of tangible results and the question whether diseases have biological or social causes remained controversial. In the 1980s and 1990s the pendulum seemed to swing back to a biomedical approach, in particular because of the promise of the diagnostic and therapeutic promises of genetics.

‘Healthism’ and the ‘new public health’

All of this does not mean that the optimism about the design and planning of health disappeared. Against the background of neoliberal policies, in the late twentieth and early twenty-first century a new ideology flourished among experts, policymakers as well as the public at large: ‘healthism’ which focused on risk-control as the means for advancing individual as well as public health. Healthism refers to the ‘will to health’, the belief that

health can be controlled, advanced and designed on an individual level and, the conviction that individuals can (and should) take control of and are responsible of their physical (and mental) condition. This is the idea that health and disease are not merely a biomedical issue, but also a matter of personal choice and attitudes. Healthism also involved the adoption of social norms and cultural values as standards for what should be considered as healthy and normal, implying broadening definitions of health. Its meaning shifted from the mere absence of disease to physical and mental well-being and personal self-development, which was in line with the official definition of the World Health Organisation of health as 'a state of complete physical, mental and social wellbeing.' One of consequences was a medicalization of rather common difficulties in life and social issues. The widening definition of health and disease also blurred the boundaries between treatment and the enhancement of one's physical and mental condition and the maximization of the duration and quality of life. Another characteristic of healthism was the popularization of medical knowledge and a commercialization of health care. Medical knowledge increasingly multiplied in a large diversity of scientific and popular information and viewpoints on health and illness in the media, information campaigns, on the internet, by voluntary initiatives, social interest groups, patient's organizations, and individual citizens who assert their interests and rights. As medical consumers, patients as well as healthy individuals, shop on a market for health products, commodities, self-health practices, and the services of semi-medical professions and a wide array of alternative healers.

Many elements of the healthist ideology are reflected in the 'new public health', that since the 1980s and 1990s, under the influence of neo-liberalism, has put its stamp on thinking about and practices of health care. The new public health is grounded in a view of health and illness as a continuum and in terms of risk. Predictive and preventive strategies aiming at reducing and controlling health risks broadened health care from treating and curing disease to the protection of the still healthy from possible illnesses in the more or less distant future through the detection and monitoring of such risks. The focus was on individuals, in particular those belonging to identified risk groups, who are expected to be conscious of and well-informed about their health-status and risks. Individuals should assume responsibility for preserving, managing and optimizing their health by adopting a healthy lifestyle: don't smoke, don't take (too much) alcohol and drugs, don't have unsafe sex, don't eat too much and shun sugar and fat, do exercise and sports, take part in medical check-ups, screenings and vaccinations. The new public health has a background in the neoliberal criticism of the welfare state and emphasis on self-reliant and self-responsible citizenship. Citizens are challenged to think in new ways about health and illness in terms of individual attitudes: autonomy, rational self-interest, self-responsibility, competence and what is called 'empowerment', that is an entrepreneurial social attitude. The basis assumption is that the state can only continue to guarantee adequate health care if citizens help themselves with respect to their own health and that of others.

Setbacks, controversies and paradoxes

The optimistic belief in medical progress and the possibility to design health as well as the neoliberal and new public health assumption that health and illness depend, at least to some extent, on individual choice and responsibility has run up against several setbacks, controversies and paradoxes.

Firstly, although the achievements of modern medicine were impressive, the human capacity to design health and control disease is not without natural limits. Not only is health still largely a matter of nature and fate, of inevitable biological distinctions between individuals, neither can we escape the confrontation with an unpredictable nature that strikes back again and again. In the past decades we have seen the comeback of 'old' epidemic diseases such as tuberculosis, malaria, cholera and polio, and the popping up of new infectious diseases (Aids, Sars, Ebola, Dengue, Legionella, Mexican flue, Covid, Q-fever, the Zika-virus, Lyme, and new venereal diseases). Such diseases can spread all over the world as a consequence of mass migrations, global travel, intensive farming, the overuse of antibiotics creating resistant micro-organisms and advancing mutations, reactivation of germs under the influence of other infections, sexual promiscuity, commercialization and mass-production of blood-products, climate-change, and closer interaction between animals and humans. The battle between pathological micro-organisms and the human immune system is still going on: it is 'Our wits Versus Their Genes'. Neither should we forget that relatively new welfare diseases are partly the consequence of the success of medicine and the elimination of other (infectious) illnesses from which people in the past used to die, mostly at a younger age. The ageing of the population inevitable entails that more and more people are suffering and will suffer from the natural biological consequences of ageing and die eventually from diseases which in the past were not so frequent because people had already died from physical decay and other ailments.

The neoliberal suggestion that health and illness are a matter of individual choice and responsibility not only plays down differences between individual biological constitutions, but also underrates the extent to which ill health is still being determined by socio-economic and cultural factors, such as poverty, lack of education, entrenched habits, bad living conditions and unhealthy environments. The assumption that information, encouragement and good will automatically lead to healthy behavior has proved to be misguided. Unhealthy behavior can be caused by several irrational motivations or situations that are difficult to change. Also, preventive and predictive medicine tends to benefit the more prosperous, well-educated and informed people rather than the lower-class with less opportunities and more health problems. Thus, predictive and preventive medicine may entail rising health standards, an increase of the gap between the already healthy and the unhealthy, and a marginalization of groups such as the chronically ill, the physically and mentally disabled, and psychiatric patients.

Since the 1960s, as a result of the broadening of coverage by health insurance in the welfare state, in many countries the costs of health care have tended to rise much higher than anticipated. Also, improved technological – and more and more expensive – treatment possibilities, increasing numbers of chronic patients, and the ageing of the population entail that continuously rising costs are difficult to check. It is in fact the very success and the promises of medicine that have provoked rising standards and expectations as well as growing dependence and consumption of health care and health services, not only to cure illness, but also to improve and optimize health. The paradox is that while never in history people have been so healthy and live as long as today, at the same time they seem to be more uncertain and worried about their health than ever before. Also, the right to medical care and the pursuit of health seems to be boundless, whereas the financial resources are

finite. Therefore, economic considerations have won ground in the organization and delivery of health care, while the expansion of collectively funded health care has come to a halt and the state is redefining its responsibilities and partly withdrawing. All of this entails conflicts over supply and demand, costs and benefits, and access and priorities – ever more urgent political issues in Western welfare states.

Not only the limits of the collective funding of health care, also the emphasis on health risks, which are difficult to pin down and predict, triggers uncertainty, the more so because individuals are thrown back on themselves with regard to the ultimate responsibility for complex choices they are supposed to make. Taking prudent decisions about the implications of particular risks and how to respond is further complicated by the fact that an expanding range of popular, commercial and professional information about health and illness is full of revisions, contradictions and discord, not only among the public at large but also among policymakers and experts. This has advanced not only a growth of alternative medicine, but also an undermining of trust in science and professionalism, and the state as well. The irony is that the desired self-initiative of empowered citizens can also turn against government policies and professional expertise, as, for example, increasing distrust of vaccination and screening as well as resistance against public health measures during de Covid-epidemic make clear.

Individual autonomy and its discontents

Both the neo-liberal emphasis on the free market and the thinking about health and illness in terms of risk, assume individual responsibility, self-determination, free choice, knowledge, competence, and motivation. Together with informed consent, autonomy is also the key principle in contemporary medical ethics, but autonomy is not without problems. Apart from the question whether this ideal is achievable for everyone at all, it seems to be especially inadequate to answer the ethical and political controversies that arise in the context of the illness, practices of predictive medicine and also genetics and biotechnology.

Firstly, the right of autonomy, which has also been embraced by the patient movement since the 1970s, gives rise to difficulties in medical practice. Being ill, implying suffering, pain, dependency, and anxiety, often entails an infringement on self-determination. The discourse about individual autonomy, which is rooted in the liberal ideal of possessive individualism, the natural right of ownership of one's body, tends to disregards that illness and handicaps often imply a loss of physical and mental control. As long as people are healthy (and young) they seem to have a body, but when they fall ill (and become old) the body has us. In this sense illness often denies the modern requirement of autonomy. Doesn't the experience of being ill and the certainty that we will all die make us aware of the fact that our ability to own and control our bodies is temporary at best and for the rest limited? And that in fact the body owns and controls us instead of the other way around?

The neo-liberal conceptualization of the patient as an informed and free choosing citizen and consumer is also problematical because it presupposes transparency which is often lacking. The conditions in which patients typically find themselves differ from those of healthy and citizens and consumers on the free market. Despite commercialization and privatization, the largely monopolistic offerings of collectively funded health care and the conditions imposed

by health insurers as well as scientific and technocratic expertise, restricts the range of choices and decisions. Patients do not always have the proper information at their disposal to be *able* to choose, and it is questionable whether they always *want* to have a choice since they cannot deal with the efforts and capacities which self-determination requires.

Secondly, in some ways predictive and preventive medicine may even undermine the very principle of autonomy and thereby also democratic rights. The idea of an open future, which the principle of autonomy presupposes, is in fact called into question by predictive medicine, because it provides knowledge about the chance of becoming ill at some point in the future. Such predictions may not only generate feelings of uncertainty, but also entail other negative side-effects, such as being refused by insurance companies, mortgage lenders, or employers. Predictive medicine may entail discrimination and social exclusion and thus undermine the democratic principles of freedom, equality and solidarity. Moreover, the neo-liberal public health discourse about individual responsibility for health may entail that citizens who do not or cannot give priority to their health and lead unhealthy lives, either willingly or not, are blamed for their illnesses. The question has been raised already whether they should still be entitled to the benefits of collective health insurance or whether they have to pay more for it. Can governments or insurance companies enforce health standards on citizens as a duty, both for their own benefit and for maintaining collective solidarity?

The third set of problems concerns the professional power of medicine to define what constitutes a health risk, who are at risk, and what the consequences of such risks are. Informed consent, which nowadays is an important principle in medical ethics, is difficult to realize in predictive medicine. For a variety of reasons lay people are often not in a position to judge on the advantages and disadvantages of predictive medicine, even more so when experts and professionals do not convey unambiguous information. People may lack knowledge vis-à-vis professional expertise, and they may not be able to assess the practical consequences of predictions. All of this raises the question whether people should follow the professional definitions of health risks or whether they should be enabled to evaluate the merits of predictive medicine and biotechnology themselves. Should the domain of health and illness be democratized and if so, how? How to realize informed citizenship in this field? Should governments initiate public debates about predictive medicine and biotechnology in order to enable citizens to discriminate between good and bad uses of these practices, practically, personally as well as with regard to fundamental human and civil rights? Apart from the financial boundaries of health care, these issues are urgent in contemporary health policies.

7. THE MIND IN STANDARDS AND NUMBERS

Studies on the history of psychology often refer to 1879 as the year of birth of this science. Psychology, which used to be part of philosophy, became a distinct academic discipline when the University of Leipzig set aside a room for the philosopher and physiologist Wilhelm Wundt for doing experiments. Wundt put up several devices with which he and his staff measured mental activities, in particular perception and mental reaction times. This was the first official psychological laboratory in the world. It attracted students from all over the world who learned how to work with the new psychological methods and techniques. In this way they brought the human mind within the reach of standards and numbers – something which had been considered impossible by leading philosophers Descartes and Kant, because they asserted that the instrument of knowledge, the immaterial rational mind, was beyond the reach of the natural scientific categories of space and mechanical causation and the method of quantification. Wundt's example was soon followed elsewhere in Europe and in the United States. The belief that mental processes could be measured and quantified, established psychology, like physiology, as an empirical and experimental science that had definitively moved away and emancipated from abstract philosophy and solipsistic, introspective armchair psychology.

It is questionable, however, whether the way experimental psychology was shaped by his followers, was in line with Wundt's intentions and his view of psychology. The science of psychology, according to Wundt, was much more than investigating the mechanistic workings of the mind in relation to sensory stimuli (what he called 'perception') in the laboratory. Psychology should cover much more: it should also study the much more complex products of the active, interpretating and meaning-giving human mind, as expressed in language and culture. Apart from 'perception', the creative faculty of 'apperception' played a major part in Wundt's understanding of the operation of the human mind. In this respect his psychology was ambiguous; it still reflected age-old philosophical controversies about the nature of human consciousness.

The making of psychology as a scientific discipline

In 1873-1874 Wilhelm Wundt published *Grundzüge der physiologische Psychologie* in which he argued that 'psychology' should become an independent discipline with its own domain apart from, on the one hand, philosophy and, on the other, physiology. Five years later he established a laboratory at the University of Leipzig for doing research into elementary (reflexive) mental processes that are triggered by physical stimuli and sensual perceptions (seeing, hearing and feeling). His focus was on the way and the length of time (reaction intervals) in which sensual stimuli are processed by the mind. In 1881 and 1890 he also started professional journals (*Philosophische Studie* and *Zeitschrift für Psychologie und Physiologie der Sinnesorganen*) for publishing research results for an academic audience and promoting interest in the new field.

It was in Wundt's laboratory that scientific psychology was first practiced as the organized and systematic activity of a team of researchers. There was a close link between teaching psychology (at the philosophical faculty) and training students to do experimental research

on the basis of conscientious and verifiable methods and the use of high-tech measuring instruments. The research focused on the quantitative analysis of the elementary mental processes of the average mature human mind, excluding the subjective mental traits of the test person. The scientific objectivity of experimental psychology should be guaranteed by the restricted and controlled research conditions of the laboratory and an adequate preparation of the test subject, who was informed about the aims of the experiment and who knew what was expected of him, that is avoid all arbitrary subjectivity from his mental response to physical stimuli triggering mental activity. In Wundt's laboratory psychologists and students of psychology performed the role of researcher as well as test subject.

Psychology as experimental science was delineated in the first place from philosophy, which was the field in which the nature and working of the mind used to be studied. Since Descartes the philosophical method to study the mind had been self-reflective introspection, but this method was now criticized as subjective 'armchair' psychology. Experimental psychology was about objective, systematized, conditioned and quantifiable introspection that was deliberately (and artificially) evoked and that could be repeated under the same laboratory conditions. The test person should be able to control introspection by focusing on the mental process that was to be measured and by ignoring all subjective and distorting influences, such as spontaneous associative thoughts, imaginations, fantasies, and feelings that might interrupt and distract the normal, undisturbed succession of physical stimulus and mental response. Repeating the same experiment was intended to filter out coincidental and subjective distortions as much as possible.

Experimental psychology also evolved out of physiology. Wundt had been educated as a philosopher as well as a physiologist and he had been a student of the renowned physicist and physiologist Herman von Helmholtz. The differentiation of psychology as an experimental science from philosophy was facilitated by physiology, which had established itself already as an experimental science. It was involved in investigations into the working of the nerves, in particular the relation between sensory experiences and neurophysiological processes. In the 1830s physiologists such as Johannes Müller argued that the nerves were the mediating organ between sensory experiences and mental processes and that the organization and properties of nerves determined how external stimuli were experienced by the mind. Reality was not perceived directly by the mind, but the nerves mediated between the perception of something and being aware of it – like in Kant's epistemology the a-priori forms of experience and the categories of reason mediated between empirical observation and scientific knowledge. The assumption of the mediating role of the nerves undermined the idea of a purely immaterial, free-floating mind and generated the idea that invisible, inner mental processes could be researched in a scientific, experimental way on the basis of controlled physical stimuli. The assumption that nervous processes were of an electric nature, brought Von Helmholtz to the idea that the transformation of a physical stimulus into a mental response took time and could be measured. This discovery stimulated others to measure mental reaction times in a systematic way in order to analyze the working of the mind. The same method was also used to investigate how the mind processes varying sensual experiences, how attention is focused, and to what extent the intensity of mental experiences are related to physical ones.

Apart from Helmholtz, Gustav Fechner was a pioneer in this field, which he called 'psychophysics' (*Elemente der Psychophysik*, 1860). Whereas Helmholtz as a physicist and physiologist espoused a rather materialist approach of the mind, Fechner emphasized that the world of the mind was immaterial, but that it could only be approached by science via physical processes and sensual experiences. His research in the 1850s focused on the way in which changing intensity levels of physical stimuli were mentally experienced. Based on his experimental findings, Fechner introduced a mathematical formula to calculate the ratio between the intensity of physical stimuli and that of mental experiences: when the first was increased according to a geometric series (2-4-8-16), this was experienced at the mental level as an arithmetic series (2-4-6-8). The conclusion was that the human mind processed physical stimuli in such a way that large variations in physical intensity were transformed into manageable proportions. This proved, according to Fechner, that physiological and psychological phenomena happen parallel to each other, but that they are qualitatively different, although he did not yet argue that psychology should be separated from physiology. This is what Wundt did, while at the same time adopting the experimental method of physiology.

Wundt argued that material and mental phenomena were part of different realities. Material things are external to human consciousness and therefore the human experience of this external reality through the senses is always indirectly and mediated. Mental phenomena, on the other hand, are immediately present in consciousness, although not directly observable. With respect to the relation between body and mind Wundt adhered to psychophysical parallelism, which implied that natural scientists such as physiologists and psychologists study related phenomena from different viewpoints. Physical and psychological processes, Wundt argued, happen in parallel fashion, accompany each other without being causally related and reduceable to each other. Wundt argued that mental processes show dynamic patterns of causality which differ from those in the material world.

With respect to the nature of the human mind, however, Wundt was ambivalent. He established psychology as an experimental natural science, but he also promoted it as a cultural science. Experimental psychology was the study of simple, elementary mental processes that were provoked deliberately by focused physical stimuli. These stimuli triggered the senses and affected the dimension of the mind which Wundt referred to as 'perception'. This was about the operation of the mind as an empirical registration mechanism which could be researched in an empirical and analytical way through controlled and objectified introspection.

On the other hand, he also developed psychology as a cultural science. His so-called *Völkerpsychologie* was about the study of human self-reflection and interpretative consciousness, that is the 'higher' mental processes, which do not depend on the senses, physical triggers, reflexes and conditioning, and which cannot be experimentally investigated. The cultural products of this active, meaning-giving dimension of the mind can, according to Wundt, only be grasped through the descriptive and interpretative study of the (cultural) products of the creative human mind. These are found in cultural patterns, values, meanings and purposes; in language, writings, literature, narratives, myths, poetry, religion, the visual arts, and material artifacts. This was about the 'apperceptive' dimension of the mind: the mind as an active selecting, goal-oriented, voluntaristic, shaping, creative and

synthesizing force. The whole of these mental products is more than the sum of its composite parts. The synthesizing mind processes and molds the perception of reality into something that cannot be reduced to empirical experiences and that can only be studied with the interpretative methods of the historical and cultural sciences.

Association versus faculty psychology

The two dimensions of Wundt's psychology can be traced back and reflect the two main currents in the history of the philosophy of the human mind: empirical association psychology and rationalist or idealist faculty psychology.

Association psychology was based on empiricism for which John Locke laid the groundwork. Unlike Descartes, Locke rejected the existence of innate ideas and principles. He viewed the mind as tabula rasa and receptive registration mechanism that depended on input through the senses. All knowledge can be traced back to sensory experience. Things around us cause sensations in us because of their properties. Sensations give rise to elementary or 'simple' ideas: representations in the mind of fragments of the outside world. They are the direct, objective reflection of the primary qualities of things in the outside world and the basic building blocks of the contents of the mind. Next, these singular ideas are further processed through reflections and associations, which result in compound ideas. For example: the sensory experiences of the primary properties grainy + white + sweet are the building blocks of the composite idea: 'sugar'. Multiple composite ideas in turn form the building blocks of general and abstract as well as evaluative ideas without a direct relationship with the immediate sensory experience, such as 'sugar is unhealthy' or 'sugar causes obesity'. Abstract ideas and reasoning are composed of compound ideas which are associated with each other in different and ever complex ways.

Association psychology holds that the operation of the mind can be explained on the basis of the analytical and reductionist natural scientific model. The material as well as mental reality is, as it were, in essence, at its most fundamental analytical level, made up of moving particles or singular elements. Thinking can be analytically reduced to the simple ideas that are caused by sensory perceptions. The mind is viewed as a space which is filled by simple ideas as a result of sensory experiences. Elementary ideas are the atoms of mental life, representations of pieces of the external world, which come into contact with each other in that empty space, which attract and repel each other, which enter into relationships or collide, and which are molded in composite ideas, like atoms become part of molecules. Just like many molecules make up matter, the contents of the mind are structured by the association of many composite ideas. Thinking is associating, connecting simple ideas and the building of hierarchical structures of composite ideas which are established according to certain regularities and laws, the basic mechanisms of association, such as those of similarity and contrast, intensity, frequency and duration. In association psychology the mind can be investigated by analyzing it and reducing it to the smallest parts (the elementary ideas), in the same way as natural scientists study material nature in terms of moving particles that follow mechanical laws.

While the basis for association psychology was laid in English empiricism, the opposing faculty psychology originated in Cartesian rationalism and developed further in German

idealist philosophy. According to the eighteenth-century philosophers Wilhelm Leibniz and Christian Wolff the mind was not merely a passive registration mechanism and its contents not a reflection of the structure of external reality. The mind was given with a pre-structured, active shaping and synthesizing force: the mental capabilities or functions (understanding, will, desire, curiosity, greed, ambitions) determine how we perceive the world. Kant echoed this view of the mind with his epistemological assertion that perceiving and understanding depend on the a-priori structure of the rational mind. This perspective is also related to the Romantic idea that the mind is an active and creative, organizing and shaping force – like a shining lamp that throws light on reality instead of a reflecting mirror – and not only on the intellectual, but also on the emotional, intuitive and imaginary level. The essential difference between association and faculty psychology is the contrast between two epistemological models: the mechanical-analytical one and the holistic one, similar to the contrast in the life sciences between reductionist physiological and biological vitalist explanations of life.

Psychology beyond Wundt

These opposing philosophical perspectives on the human mind were not only the historical roots of Wundt's dualistic psychology, but also explain why it was perceived and taken up by other psychologist, including students who had been trained in his laboratory, in dissimilar ways and in different national contexts. In the United States in particular, Wundt's psychology was viewed through the filter of association psychology. Most scientists who introduced psychology as a new discipline at American universities, wanted to advance it as a natural science as well as a practical profession; therefore, they emphasized the experimental nature of psychology. At the same time, they extended the experimental method to the mind's more complex aspects, which Wundt referred to as apperception and which he excluded from experimentation. Soon various forms of psychological research were developed that had not been anticipated by Wundt, while the involved psychologists ignored that his psychology was also culturally and historically oriented – his magnum opus was *Völkerpsychologie* counting 10 volumes (1910-1920) – and that in his later career he had more and more focused on this dimension of psychology. So, the American picture of Wundt as the founder of psychology as an experimental natural science was selective and one-sided. It served the professional policy of those psychologists who wanted to legitimize the natural scientific character of psychology and who did not want to associate their discipline with the humanities, which were considered as unscientific.

In Germany the legacy of Wundt was more varied: both the experimental and the cultural approach was acknowledged. Apart from German psychologists who, like most American psychologists, followed the natural-scientific model, also a number of influential psychological schools or perspectives emerged that rather embraced the cultural model of faculty psychology: phenomenology, so-called *Aktpsychology* and *Gestaltpsychology* as well as hermeneutical psychology. These shared an explanation of the mind's operation in terms of an active, intentional, interpretative, and shaping dynamic force that enables perception and understanding reality as meaningful and coherent.

Different images of man play a role here. Whereas in experimental psychology the underlying view of man was the same as in the natural sciences, implying that mental

functioning could be analyzed in terms of a mechanical machine-like device, the image of man in the more holistic type of psychology stressed intentions, purpose and interpretation as the crucial features of the human mind. In phenomenological and hermeneutic psychology in particular man appeared as a historically and cultural shaped being. Whereas Following Kant's idea of the a-priori universal rational mind, Wundt situated the intentional-voluntarist dynamic of psychological processes in some sort of essence of the generally shared human mind. Wilhelm Dilthey and others, on the other hand, argued that the human mind did not have a fixed essence, but that it was shaped by language, cultural patterns and social relations in a changing historical context. This culturalist perspective emerged in late nineteenth-century Germany against the background of debates about the distinction between the natural and the cultural sciences, a growing criticism of positivism, and an apology of the independent epistemological and methodological position of the humanities in the domain of science. All of this was related to cultural pessimism about the consequences of modern industrial society, which was swayed by technology, materialism, and cold objectivation, and which suffered from fragmentation, disorientation and the loss of spiritual values.

At the same time, the view of man as an irrational being that is driven by instincts, unconscious drives and desires, as it was articulated since Romanticism by philosophers such as Arthur Schopenhauer, Carl Gustav Carus, Karl Robert Eduard von Hartmannn and Friedrich Nietzsche, also gained in foothold in (medical) psychology. Whereas the Cartesian and Enlightened tradition, that dominated psychological thinking until far into the nineteenth century, had always presented man as an essentially rational, thinking and transparent being that in principle was able to control his emotions and instincts, the growing interest in the hidden irrational dimensions of the human mind resonated in psychiatry and in Sigmund Freud's psychoanalytic theory in particular. Freud presented himself as a disenchanting 'archeologist of the mind' who investigated the hidden and dark dimension of the human mind and thereby shattered man's illusions about himself. Psychoanalysis would reveal how man deceived himself through unconscious psychological mechanisms.

Freud believed in enlightened rationalism, but at the same time he opposed its transparent image of man as intrinsically reasonable, self-conscious and self-controlled. Man was basically an irrational being driven by drives and impulses, by unconscious cravings and inner conflicts. Man was not transparent for himself and not his own master. Freud claimed that his psychoanalysis was the third historical blow to human self-esteem after Copernicus and Galileo had discovered that the earth is not the center of the universe and Darwin had made clear that man's origin was not divine but rooted in animalistic nature. Freud's topography of the three-layered mind (Id, Ego and Superego) suggested a convoluted and dynamic battlefield of antagonistic drives, impulses, memories, trauma's, fantasies, desires, yearnings, anxieties, and frustrations which were largely of a sexual and aggressive nature. Freudian man was a torn and neurotic being, captured in unending struggle between unruly passions and the need to tame them for the sake of a peaceful society and a civilized life.

Freud's image of man in terms of compulsive instinctual drives pushing persistently and relentlessly and thereby defying willpower and rational and moral posture, drew on the Romantic notion of inherent driving forces, which also influenced the image of man in physiology. The human mind and nervous system, full of (unconscious) emotions, drives and

tensions that push for a way out towards expression and that can only be regulated and controlled by a conscious self, were compared with a steam boiler under pressure with energy that has to be released in a controlled way in order to prevent explosion. When the release of the energy produced by the unconscious Id was blocked by the Ego and Superego – Freud called this resistance – the accumulating energy would seek an alternative, pathological way out resulting in nervous and mental complaints. Psychoanalytic therapy offered a way out through overcoming resistance and relieve the psyche of the troublesome tensions and pressures in a regulated and controlled way, without however providing a definite and lasting solution for the conflict between the conscious self and the dark world of unconscious drives. This drive model still plays a role in modern common-sense psychological understanding of emotional life, in particular creativity, sexuality and aggression which are experienced as pushing forces from within causing tension that must be released.

8. QUANTIFIABLE MINDS AND MANAGEABLE BEHAVIOR

The rise of scientific psychology between 1870 and 1914 coincided with the second industrial revolution in the Western world. The research by psychologists and the institutional settings in which psychological experiments were conducted, showed remarkable differences between Germany, France, England and the United States. While psychology in Germany primarily came into being as a strictly academic science, in other countries it also emerged as a practical science, which was applied in order to solve new problems in modern mass society. If Wilhelm Wundt geared his attention mainly to the general features of mental processes shared by all human beings, in Britain Francis Galton, cousin of Charles Darwin and founder of eugenics, focused on differential psychology and testing techniques, while the Frenchman Alfred Binet was preoccupied with hypnosis of psychiatric patients and measuring intelligence. Especially in the United States the insights and methods of psychology were applied because of the expectation that they would significantly contribute to tackling social issues.

> *All natural sciences aim at practical prediction and control, and in none of them is this more the case than in psychology today. We live surrounded by an enormous body of persons who are most definitely interested in the control of states of mind, and incessantly craving for a sort of psychological science which will teach them how to act. What every educator, every jail-warden, every doctor, every clergyman, every asylum-superintendent, asks of psychology is practical rules. Such men care little or nothing about the ultimate philosophic grounds of mental phenomena, but they do care immensely about improving the ideals, dispositions, and conduct of the particular individuals in their charge.* (William James, *A Plea for Psychology as a 'Natural Science',* 1892)

> *Psychology […] is a […] branch of natural science. Its theoretical goal is the prediction and control of behavior. […] If psychology would follow the plan I suggest, the educator, the physician, the jurist and the businessman could utilize our data in a practical way. […] Those who have occasion to apply psychological principles would find no need to complain as they do at the present time. […] One of the earliest conditions which made me dissatisfied with psychology was the feeling that there was no realm of application for the principles which were being worked out in content terms.* (John Broadus Watson, *Psychology as the Behaviorist Views it*, 1913)

However, studying human behavior on the basis of ingenious experiments under controlled conditions in a laboratory or clinical setting raised the question whether such research results in knowledge about the way people think and behave in daily life. The famous behaviorist psychologist Burhuss Frederic Skinner unwittingly hinted at a vexing problem of experimental and applied psychology when he wrote in 1956:

> *In my young years as experimenter I was possessed by a selfish desire for domination. I remember how angry I was when a prediction did not materialize. I could shout to the subjects in my experiments 'Behave, damned, behave as you should behave!'*

A divided discipline

In the twentieth century psychology was one of the most rapidly expanding professions, but much less than other professional fields such as medicine, it was a coherent whole. From the beginning psychology was a divided discipline in several ways. Firstly, it investigated variable objects: either the generalized human mind or individual differences; either the rational mind or the inner space of emotions, unconscious motives, reflexes; either (invisible) mental processes or (visible) behavior.

Secondly, psychology harbored varying images of man. Next to the metaphors of the mechanical machine and the biological organism, and the view of man as an irrational and instinctual creature or an interpreting meaning-giving actor, there was the behaviorist image of man as a learning animal or a stimulant-response machine which could be conditioned like a robot. Cognitive psychology, on the other hand, considered man as an active processor of information and in various psychotherapeutic approaches the humanist idea of man as an authentic, emotional, motivated and self-actualizing being was prominent.

Thirdly, psychology employed a wide range of theoretical and methodological approaches: experimental methods, the test, the survey and statistical method, clinical methods in the field of diagnosis, therapy and treatment, and interpretative and hermeneutic perspectives.

Fourthly, the profession was struggling with the tension between scientific-academic and 'applied' or practical psychology and, related to that, the tension between 'hard', analytical psychology at a distance from daily life on the one hand and practical application and 'soft' psychology closer to common-sense experience on the other. The psychology of formulas, figures and statistics was far away from the 'let's talk about it' psychology found in psychotherapeutic, counseling and coaching practices, self-help groups and popular psychobabble, which has spread all over society and the media as a way to understand and talk about the self.

The last two contradictions are at the core of what a Dutch psychologist, Johan Teunis Barendregt, has characterized as the 'neurotic paradox' of (clinical) psychology. On the one hand psychologists had the ambition to attain the status of a hard objective science which, however, implies that their knowledge is far removed from common-sense knowledge and that the social relevance and usefulness of their research is unclear. On the other hand, they wish to leave the ivory tower of pure science, enter society, use their knowledge for practical purposes and relate their knowledge with common-sense understandings of how people think, feel and behave. This brings, however, the risk that they are not taken seriously as scientists, and it may jeopardize their professional legitimacy as such.

Different national contexts

When we compare the development of psychology in France, Britain and the United States to the way in which Wundt grounded the new discipline, we see some striking differences. For Wundt psychology was a pure academic science. He did not show any ambition to apply psychological knowledge for practical purposes and that was one of the reasons why he never separated psychology from philosophy. In France, Britain and America the nature of

psychological knowledge was intrinsically related to practical purposes and applications in society. The location of Wundt's psychology was the university laboratory and the philosophical faculty and library. French, English and American psychologists took psychologists out of academia into hospitals, clinics, psychiatric institutions, schools, companies, factories, government organizations, the army, the immigration service, consultation services, mental health facilities and public survey agencies. Applied psychology was utilized by agencies of social intervention and planning. Wundt was not so much interested in finding individual differences as in discovering general psychological patterns in perception and thinking of the average normal adult human. In France, England and the United States, on the other hand, psychological knowledge was to a large extent about the differences between individuals as the objects of intervention rather than as the subjects of the general human mind. Differential psychology met the growing need for solutions for social problems and challenges in an ever more differentiated and complex industrial mass society. People were challenged by growing demands with respect to their mental skills and self-regulation as well as by the need to find their appropriate place on the basis of education, training, vocation and a specialized occupation.

All of this entailed a different framing of psychological testing. Wundt's experimental method centered on shared competence: the test-subject and experimenter were both psychologists and exchangeable. Not the number of test-subjects was relevant but their competence to respond to the test in a correct way, that is to control introspection and exclude subjective distortion so that he could represent average man and the human mind in general. In French, British and American applied psychology the focus was on testing lay people in greater numbers and the statistical processing of the test-results in order to gain knowledge about the distribution of psychological capacities and features among the population.

The emergence of the first forms of psychology in France, Britain, the United States and the Netherlands shows that in these countries academic psychology did not take precedence over practical psychology. Motivated by the belief that the study of the human mind held the key to tackling many of society's problems, practical psychology had a dynamic of its own and influenced the course of psychological research.

In France psychology arose in a medical-psychiatric as well as educational context. In psychiatric and neurological clinics doctors introduced psychological methods for diagnostic and therapeutic purposes (such as hypnosis, suggestion therapy and psychotherapy) in order to treat mental and nervous patients. The French neurologist Jean-Martin Charcot played a leading role in this. With regard to education, in 1905 the psychiatrist Alfred Binet, together with Theodore Simon, developed the first intelligence test in order to identify children with inherent learning difficulties in schools on the basis of a systematic comparison of different levels of mental performance. They established a norm for the intellectual level of children of a certain age. In this way they designed a metric scale for the assessment of intellectual development on the basis of a comparison of the chronological age and mental age. Binet did not consider intelligence as a fixed, inborn condition but rather as a loose ensemble of abilities and as a developmental phase of which the outcome was still open. The purpose of his test was to diagnose in what way and how much underperforming children lagged behind their peers in order to remedy their deficit – without stigmatizing and excluding them. Binet

believed that mental abilities were determined by upbringing and environment and could be improved.

In 1912 the German psychologist William Stern proposed the formula of the intelligence quotient (IQ) defined as mental age divided by chronological age multiplied by 100. This formula was adopted by American psychologists such as Henry Goddard and Lewis Terman, who conceptualized different levels of intelligence in a Social Darwinist and eugenic explanatory framework**.** The test was used in particular to diagnose feeble-mindedness, which was considered as an inherited pathological trait and associated with deviant and asocial behavior. In 1916 Terman devised the Stanford-Binet test which could also be used to measure the IQ of adults, and which became the standard for testing in the next decades. This test differed from the Binet-Simon test which was made for educational purposes, that is measuring the mental abilities of pupils at a certain age. The American Stanford-Binet test, on the other hand, measured IQ as an inherent and permanent level of intellectual functioning. In 1917 this test was applied on a massive scale in the American army military: 1,7 million recruits were tested, and the results were considered as alarming.

In England Francis Galton introduced psychology as a method to underpin his Darwinist view of man. Galton argued that if evolution proceeded by variation and natural selection, then it was of crucial importance to develop methods for measuring and comparing differences in individual abilities and performances among the general population. He was one of the first to develop psychological tests for a large lay public: his test-subjects should represent the population as a whole. In 1884 he established the so-called Anthropometric Laboratory, which drew wide attention among the public and in which more than 9,000 people were tested. He used sampling and statistics to process the results of the tests and establish correlations between the social characteristics and living conditions of the test-subject and their mental abilities, which were represented in graphics of bell-curves on the basis of which deviations could be established. This was what he named psychometrics. He built on the popularity of phrenology which had been used since the early nineteenth century in Britain and the United States for utilitarian and practical purposes. Following the evolution theory of his uncle, Galton strongly believed that individual mental capacities and talents were inborn and inheritable. Nature was much more decisive than ‘nurture’, the term he introduced for the impact of upbringing and the environment. Galton was the founding father of eugenics: the idea that a population, or ‘race’ to use the current terminology, can be improved through selective, managed and planned procreation and in particular through preventing those who were considered defective or inferior to have children. In the United States and in some other countries psychology came to serve the objectives of eugenics: psychological tests were used as a method to identify defective problem groups such as the feebleminded and asocial which were considered harmful to the progress of society and whose procreation should be prevented.

It was in the United States where, from the early twentieth century on, psychological knowledge and methods were applied for the first time in a wide array of social fields:

- Education and child raising: testing intelligence, monitoring learning progress and schooling levels.
- Clinical psychology in the field of psychiatry (diagnostic tests), mental health care, psychotherapy, psychoanalysis, counseling, behavior and cognitive therapy.

- Forensic psychology: investigating the personality and motives of delinquents.
- Military psychology: testing the mental fitness of soldiers and selection for officers and technical functions, matching the man and the job. The two World Wars boosted the development of psychology, not the least because psychologists were employed by the state and could test large numbers of recruits and officers.
- Immigration policies: psychological testing of immigrants with different national or ethnic backgrounds in order to develop criteria for admission in the United States.
- Eugenic policies: testing intelligence and diagnosing feeblemindedness as indication of the need for (mandatory) sterilization.
- Industrial, labor and occupational psychology: vocational guidance, testing of aptitudes, personnel selection and management ('the right man in the right place'); social relations on the work floor, efficient organization of labor and monitoring intrinsic motivation.
- Commercial advertising to boost sales of mass-produced consumer goods.
- Research into and testing of personality, character and mental make-up in order to shape mentally balanced and self-responsible citizens in democratic society.

One of the reasons for the pioneering role of practical psychology in the United States was that it probably was the most individualized society in the Western world and that it went through rapid social transformations as a consequence of large-scale industrialization and urbanization as well as massive immigration of newcomers with varying national and cultural backgrounds who had to be integrated in an increasingly differentiated and complex society. There was a widely shared feeling that these transformations should be managed and regulated to prevent disintegration. Practical psychology focused on individual differences in order to adjust individuals to the requirements of a dynamic society without undermining social cohesion. It became increasingly important to gear personal goals to the needs of larger organizations and networks, without undermining the sense of individual liberty, initiative and enterprise which were central in the American Dream. People should fit in without experiencing a demoralizing loss of their individuality. Psychology provided the approach which appeared to meet this requirement of gearing individualism to the social management of an increasingly egalitarian and meritocratic achievement society.

The theoretical orientation of American psychology, functional pragmatism and behaviorism, reflected its practical leaning. Functional pragmatism, which was developed by William James, Charles Sanders Peirce and John Dewey, built on the theory of evolution and association psychology. The basic idea was that the human brain and its operation through the mechanisms of association were the result of functional adaption in evolution. Mental capacities were explained as the particular human way of survival in the interaction with changing environments and of dealing with the challenges of the external world. Consciousness, described by James as a continuous stream of thinking, was a functional problem-solving instrument for adaptation and survival, which served the needs of practical life. Thinking and acting were inseparable and what human beings define as truthful knowledge was based on the pragmatic criterion of either or not contributing to successfully dealing with practical problems in daily life.

Behaviorism, which was even closer to a physiological-mechanistic approach, also built on Darwinian assumptions, in particular the idea that the mental life and behavior of animals and humans were comparable, and that the nervous system, including the brain, was a

sensual-motoric mechanism. Experiments with animals, such as the well-known tests of the Russian physiologist Ivan Pavlov with dogs, could be used as a model for psychological experiments. The focus was on observable behavior which could be explained in terms of mechanistic learning-processes and the conditioning of reflexes.

The American pioneer of psychological behaviorism, John Broadus Watson, adopted this model because in his view this was the only way to transform psychology into an empirical natural science. Consciousness itself, the contents of the mind, could not be the object of scientific study, because it was not observable. Moreover, introspection was subjective and therefore unreliable. The mind should be seen as a black box which remained closed for scientific scrutiny. What a psychologist could and should study in experiments, was visible behavior triggered by a stimulus, the cause, and followed by a response, the effect. Mental processes, behavioral patterns and habits were nothing but the result of mechanical conditioning, the imprinting from birth of environmental influences in the organism under the influence of liking and aversion, of rewards and punishments. Behaviorism, which harbored a utilitarian perspective on man and followed the model of association psychology, assumed that humans are malleable and shaped by the environment. Watson and his followers believed that human behavioral patterns and habits could be designed and that systematic education, a controlled environment and social engineering were crucial to tune individuals to the requirements of society. Behaviorism set the tone in Anglo-Saxon psychology between the 1920s and 1950s, but it failed to explain more complex mental processes. Since the 1960s, the 'cognitive revolution' in the wake of the advance of the computer and rising educational standards pushed behaviorism to the background: man was now viewed as an active processor of information.

Historical background

The social-historical background of practical psychology is that of individualization and psychologization as social processes. As a consequence of social modernization collective and hierarchical social ties and structures loosened. Fixed social positions based on ancestry, status, rank and collective bonds as well as traditional moral-religious categories to evaluate people changed into a more egalitarian and meritocratic social ethos. In the modern social order, the assessment of educational and vocational qualifications, individual capacities aptitudes, talents and achievements, and personal characteristics advanced the interest in individual differences in personality and mental qualities and capacities. After World War II the meritocratic ideal increasingly evolved into what could be called a 'psychocracy', a social ethos in which mental capacities played a decisive role in the distribution of educational chances, opportunities, and jobs, and therefore in the meritocratic legitimization of occupational ranking and socioeconomic inequalities.

Also, traditional authority, based on fixed norms and standards of conduct, was gradually replaced by a culture of personal self-determination and self-development as well as more egalitarian interpersonal and social relationships. Moreover, talking about personal feeling and emotions became the way modern people express their individual authenticity and uniqueness. This reflects the growing awareness of the inner self as separate from the social world and a sense of inwardness, the experience of an inner space of thoughts, motives and feelings. With the loosening of fixed social structures and hierarchies and increasing

individualization, people lost many of the long-established fixed reference points for orientation in their lives. They were thrown back on themselves and turned inward, finding new points of reference through self-reflection, for which the psychological view of man offered a framework and guidance. The relation between individualization and psychologization is reciprocal: individualization was a fertile ground for psychological knowledge about individual minds, while a psychological perspective on man contributed to individualistic ideas and practices. Psychology reflected individualization and psychologization in society, but at the same time it also shaped the way people understood themselves and each other in psychological terms.

The second crucial factor for the development of practical psychology was the increase of social management: the organization and regulation of social life – what Foucault called 'governmentality' – by focusing on the knowledge, control, influencing and design of individual thoughts, motives and behavior. As modern industrial and urbanized society became increasingly segmented and differentiated, more and more aspects of human conduct became a matter of public concern, of social policies and systematic planning in various fields, such as poor relief, social security, education, work health and illness, normality and abnormality, which to a large extent were incorporated in interventionist government policies, in particular in welfare states. Social management through practical psychology fitted in with the requirements of a democratic society, in which commanding, enforcement and disciplining were not the appropriate sociopolitical strategies anymore. The more subtle and flexible ways of adjusting or normalizing people - care and help for your own well-being, emancipation and happiness, for 'your own good' as well as motivational encouragement to develop and actualize one's 'passion' and 'true self', and 'get the best out of yourself', leave room for negotiation on a more or less equal basis, thus tuning in with democratic values.

9. WOLF CHILDREN AND UPBRINGING

Wolf children have both intrigued and upset people for centuries. Mythical stories, such as the ancient legend of Romulus and Remus, the wolf children considered to be the founders of Rome, suggest a long-standing interest in children who grew up 'wild', away from human society. In many of the stories, their solitude is alleviated by animals, notably wolves and bears, but also, for instance, pigs, sheep and gazelles. The interest in such children can be found in literature and film. Examples are Werner Herzog's movie on Kaspar Hauser and the one by Truffaut on the 'wild boy from Aveyron'. Also, philosophers, physicians, biologists, anthropologists, behavioral scientists, psychologists, pedagogues, and linguists have shed their light on them children and the consequences of their isolation from the social world. Apparently, feral children, as they were also called, do not only cause worries, fascination and wonder, but also raise fundamental questions about human development, its requirements and the relation between 'nature' and 'nurture'.

> *[…] the history of the interest in and the response to wolf children [is] also a history of the development of the psychological and educational notion of the problem. […] the measure in which one started thinking on human development and developmental obstructions and conditions in relation to wild or wolf children also revealed something about the rise of and changes in pedagogical thinking.* (Rang, 'When the social environment of a child approaches zero', 1987)

One of the best-known cases was that of Victor, the 'wild' boy of Aveyron who roamed the woods of this French region until in 1800 he was captured and ended up in Paris, where scholars showed great interest in him. The boy was put into the care of the young physician Jean Marc Gaspard Itard who recorded his findings in two studies: *Mémoire sur les Premiers Développements de Victor de l'Aveyron* (1801) and *Rapport sur les Nouveaux Développements de Victor de l'Aveyron* (1806). Itard wrote about Victor:

> *My fourth object was, to lead him to the use of speech, by subjecting him to the necessity of imitation.*
>
> *If I had wished to have published only successful experiments, I should have suppressed this fourth section from my work. […] But my intention is not to give the history of my own labours, but merely that of the progressive developments which appeared in the mind of the Savage of Aveyron; and, of course, I ought not to omit any thing that can throw light on his moral history. I shall be even obliged to advance, on this occasion, some theoretical ideas; and I hope I shall be pardoned for doing so, when it is considered what attention I have paid, that they should be supported upon facts, as well as the necessity under which I feIt myself of answering such enquiries as these: 'Does the savage speak?' 'If he is not deaf, why does he not speak?'*
>
> *It may easily be conceived, that, in the bosom of forests, and far from the society of every rational being, the ear of our savage was not in the way of experiencing any other impression than those which were made upon it by a very small number of sounds which were in general connected with his physical wants. It was not, in such a situation, an organ which discriminates the various articulate*

modifications of the human voice: it was there simply an instrument of self-preservation, which informed him of the approach of a dangerous animal, or of the fall of some wild fruit. It is evident that the ear is confined to certain offices, when we consider the little or no impression which was produced upon this organ, for a whole year, by all the sounds and noises which did not interest his own particular wants; and, on the other hand, the exquisite irritability which this sense exhibited with regard to those things that had any relation to his necessities. When, without his knowing of it, I plucked, in the most cautious and gentle manner, a chestnut or walnut: – when I only touched the key of the door which held him captive, he never failed instantly to turn back, and run towards the place whence the noise arose. If the hearing did not express the same susceptibility for the sounds of the human voice, for the explosion even of firearms, it may be accounted for from that organ being little sensible and attentive to any impressions except those to which it had been long and exclusively accustomed. […]

At the beginning of the month Nivose, I made a remark still more interesting. One day whilst he was in the kitchen, busy in boiling potatoes, two persons, behind him, were disputing with great warmth, without his appearing to pay the least attention to them. A third came in, who joining in the discussion, began all his replies with these words: 'Oh! it is different.' I remarked, that every time this person permitted his favorite exclamation to escape him, 'Oh!' the Savage of Aveyron suddenly turned his head. […] This preference for o induced me to give him a name, which, according to the French pronunciation, terminates in that vowel. I made choice of that of Victor. This name he continues to have, and when it is spoken in a loud voice, he seldom fails to turn his head, or to run to me. It is, probably, for the same reason, that he has since understood the meaning of the negative monosyllable no, which I often make use of, when I wish to make him correct the blunders which he is now and then guilty of in our little exercises and amusements. […]

I had reason to believe that the vowel o was the first understood; and I thought it very fortunate for my plan, that this simple pronunciation was, at least in sound, the sign of one of the wants most frequently felt by this child. However, I could not derive any actual advantage from this favorable coincidence. In vain, even at those moments when his thirst was most intolerable, did I frequently exclaim eau, eau, bringing before him a glass of water: I then gave the vessel to a person who was near him, upon his pronouncing the same word; and regained it for myself by this expression: the poor child tormented himself in all kinds of ways; betrayed a desire for the water by the motion of his arms; uttered a kind of hissing, but no articulate sound. It would have been inhuman to have insisted any longer on the point. I changed the subject, without, however, changing my method. My next endeavors were with regard to the word lait.

The fourth day of this my second experiment, I succeeded to the utmost of my wishes; I heard Victor pronounce distinctly, in a manner, it must be confessed, rather harsh, the word lait, which he repeated almost incessantly: it was the first time that an articulate sound had escaped his lips, and of course I did not hear it without the most lively satisfaction. […] (J.M. Itard, *Mémoire sur les Premiers Développements de Victor de l'Aveyron* (1801) English translation in Malson 1972, 116-140)

Apart from Victor, there have been many cases of so-called 'feral children' who grew up in extreme social isolation. Likewise, Itard was hardly the only one interested in them; to this day many scientists shared his fascination.

Historical background of feral children

What are feral children? In more or less real or fictional stories they appear as children raised by wolves or other animals; children who have grown up in isolation in forests and children isolated and/or held in captivity in society. The interest for feral children throws light on the changing ways of thinking about what makes human beings human, the boundary between humans and animals, human development, the importance of education, the question to what extent human beings can be shaped, and the role of nature and culture or nurture. Wild children also triggered evolutionary perspectives on human beings: the wild child as an atavism, a return of what primitive man might have been before the development of culture.

Four historical periods can be distinguished in which such stories circulated with different perspectives. In the early modern period feral children undermined the idea of man with God-given innate ideas (*ideae innatae*) based on the Christian notion that human nature is predetermined by God. Humanism to a certain extent broke with the idea of a predetermined human nature and replaced it with the idea that human beings can develop and improve themselves. The Enlightenment introduced two new perspectives. The first was the empiricist one which presented the child as a mental *tabula rasa* and implied the claim that feral children can be civilized and socialized through a compensatory education. The second was the naturalist approach, for example of the naturalist Carl Linnaeus who devised a hierarchical categorization of all species in nature and situated homo ferus (the wild child) as an intermediate stage between primates and *Homo sapiens*. The assumption was that feral children were the result of sexual intercourse between a human and an animal, and therefore close to beasts. The nineteenth century witnessed the rise of the nature-nurture discussion. Were the defects of feral children caused by social isolation or were these children mentally defective to begin with, and was the isolation a consequence of malfunctioning? Present-day 'wild' children are in fact children who have been locked up and socially isolated. Their condition is explained in terms of developmental psychology which focuses on the succession and irreversibility of certain mental stages, their relation to the development of the brain, and the importance of social interaction to stimulate mental capacities, in particular symbolic thinking, language, and having a 'theory of mind', that is being able to imagine that others have intentions and feelings.

Victor and Itard

In 1800 Victor, the famous wild boy of Aveyron, was brought to Paris where he raised the attention of the physician or alienist Philippe Pinel, the director of an asylum for the insane and member of the intellectual circle of the Ideologues. Pinel believed that the insane could be cured through a controlled environment and 'moral therapy'. However, Pinel diagnosed Victor as a born idiot, who could not be treated. The physician Jean Itard, the director of an

Institute for Deaf-Mutes and also an Ideologue, opposed this diagnosis. He believed that deaf-mute children were not mentally defective and that they could be educated through specific didactic methods. In his view Victor could be compared to deaf-mute children and his defects could be remedied through a compensatory education. He believed that all human mental capacities developed through learning and that Victor could become human after all. The story about Victor is interesting because Itard extensively recorded his attempt to educate Victor and as such it is one of the earliest empirical reports of experimental pedagogy – which was exceptional because pedagogy used to be philosophical and historical, that is knowledge about the theories of the past. Itard tried to prove that Victor was not feebleminded as many others assumed and he wanted to substantiate his more general ideas about the development of man based on sensualist philosophy, the assumption that man was born without innate ideas and totally shaped by the environment. Therefore, it would be possible to socialize and cultivate wild children (and in fact every primitive man) through a compensating education in order to make good what they had missed.

Itard's optimism about the power and effects of education was rooted in the enlightened belief that man was a being who was inherently good and who could be shaped. Education and learning were crucial for the improvement and progress of mankind. Such a view opposed the traditional Christian assumptions about children. The notion of original sin implied that every human being was born wicked, if not evil. The main goal of education was disciplining, breaking the will of the 'little tyrants'. (It is striking that on older paintings depicting children, they are often portrayed with dogs and parrots, which points to the suggestion that children should be trained like dogs and that they should speak like parrots, that is imitating their parents.)

A new view on childhood: Locke and Rousseau

John Locke in his *Some thoughts concerning education* (1693) and Jean-Jacques Rousseau in his *Émile, ou De l'éducation* (1762) were the philosophic pioneers who broke with this tradition. They emphasized that the child's nature was essentially good and not spoilt by original sin. The goal of education should be the unfolding of this nature and the cumulative improvement of individual abilities and qualities. Although Locke and Rousseau did not doubt that children needed guidance and control in order to suppress their egoistic desires, they stressed that education should be positive and stimulating rather than negative and repressive. Because the nature of the child was a *tabula rasa* and malleable, it was possible to shape them, to link their will and desire to sensations of pleasure and pain on the basis of encouragement and reasonable correction and persuasion. Locke opened his *Thoughts* with the statement: 'I think I may say, that of all the Men we meet with, Nine Parts of Ten are what they are, Good or Evil, useful or not, by their Education.' And Rousseau started his famous treatise on education *Émile* (1762) with the statement that everything what man is, was the product of upbringing and education. This idea was shared by many Enlightened philosophers, such as Kant who wrote: 'Man can only become human through education; he is nothing but what education makes out of him.'

Rousseau in particular emphasized that child-rearing should start with the child's innate, 'natural' feelings and proceed by developing them and removing all impediments to the

unfolding of the child's natural and authentic essence. He added that the natural goodness of children was vulnerable and should be protected against bad influences from what he considered as an artificial and corrupt society. The basic idea was that virtue could be created out of the child's essentially good nature if he was kept innocent of artificial society, if he learned from concrete experience and if his introduction to abstract thinking and social customs was postponed as long as possible. Emphasizing the child's 'natural' purity and innocence, Rousseau explicitly expressed the notion of the particular nature of the child as a separate developmental category and the assumption of the fundamental distinction between childhood and adulthood.

In traditional society, children tended to be integrated in the social world of adults at an early age, as soon as they were able to work and to contribute to economic resources and the household income; children were an economic investment, also for old age. The late eighteenth century saw the birth of the (middle-class) idea that childhood was a distinct episode in life that should be devoted to upbringing, development and schooling (and play) in order to prepare for adult life, and that children should be protected and guided, in the first place in the nuclear family. Rousseau emphasized that the mother, because of her assumed natural nurturing qualities, was the first and most important caretaker of the child. With this he opposed the traditional practice, in particular among the upper classes, to entrust babies and toddlers to wet nurses and domestic servants. The normative model of 'natural' motherhood spread in the context of the nineteenth-century middle class ideology of the nuclear family as the private haven in a heartless world, in which women were supposed to play a caring role.

Rousseau in a way also introduced ambivalence with regard to child-raising. On the one hand he suggested that education should be geared to the spontaneous, free unfolding of the child's unspoiled nature. On the other hand, children should be constantly guarded, controlled, protected, watched and observed in order to shield them from the corrupting influence of society and thus safeguard their innocence and purity. In fact, Rousseau was far from advocating unlimited freedom of the child to do what it wants and likes. He favored the development, through habit-formation and conditioning, of internalized self-control, which the child should experience not as something imposed from the outside, but as a self-evident part of his own self and character. The challenge to find a balance between respect for the child's individual nature, implying the need for educational restraint, and interference in order to mold it, is a recurrent issue in the history of modern upbringing.

When one reads Rousseau's *Emile* it is hard to escape the impression that the educational setting which Rousseau advocates is like Bentham's panopticon. The irony is that in order to facilitate the assumed natural development of the child, continuous supervision and monitoring is required. The notion of the importance of childhood as a separate phase in life and the assumed vulnerability of children would in the longer run create a demand for expert advice in order to find the delicate balance between the free unfolding of the child's nature and the need to protect it against supposedly harmful influences.

In spite of its ambivalence, Rousseau's approach became influential in nineteenth-century educational theory. Education gained new meaning and importance, as can be seen in the visions about the perfectibility of man and the projects and models designed by leading

thinkers such as Johann Heinrich Pestalozzi, Johann Herbart and Jean Itard. The early nineteenth-century Swiss educator Pestalozzi followed Rousseau's ideas in his effort to organize schools which would not, as usual, impose a disciplinary regime. The child's potential to develop into a harmonious human being depended on, he believed, the cultivation of its individuality and the unfolding of its nature. Education had to be taken out of the hands of the clergy. The early nineteenth-century Prussian philosopher Johann Herbart stressed that the child's interests develop in cumulative stages and that its world of experience should be the starting point of teaching.

Nature and nurture

It was the very experiment of Itard with Victor, however, which partly undermined the enlightened optimism about the educational malleability of children. In fact, Itard's effort to transform the wild Victor into a civilized human being failed. After five years he had not succeeded to learn Victor the use of language and abstract symbolic thinking, the precondition for cognitive development. Itard could not but acknowledge the limitations of sensualist philosophy: it appeared that the lack of linguistic competence, the failure to acquire language and symbolic thinking at a particular phase in the child's development could not be repaired and compensated. Moreover, the way Itard educated Victor was rather one-sided: for Itard education seemed to be rational development; emotional attachment was rather neglected. Emotionally Victor did not surpass the childish stage of narcissism and egocentrism: he was not able to identify with another person, which is a fundamental psychological precondition for social communication.

The disappointing results of Itard's education experiment were more or less corroborated by other eighteenth- and nineteenth-century examples of feral children such as the Hannoverian Peter who never learned to talk (1724) and Kaspar Hauser who was educated by a local doctor in Nuremberg (1828). Kaspar acquired some basic speech but hardly spoke in the first person, confused dreams with reality, and had difficulties to grasp the idea of his reflection in the mirror.

In the early nineteenth century some thinkers about the development of man began to criticize the enlightened idea of the tabula rasa, that humans were malleable and could be fully shaped by education, even if they had lived outside of society and culture. The naturalist Johann Friedrich Blumenbach for example, who was one of the teleomechanicist thinkers in biology, argued that the development of the child depended on the interaction between environment and an inherent *nisus formativus*, an active, goal-directed shaping force to grow into a human being. The problem of feral children was, according to Blumenbach, that this inborn developmental force, which was characteristic for normal children, was lacking or defective. They had been mentally retarded from their birth and that explained their wild state.

Such thinking was the starting point for the idea that the development of the child is internally programmed, that the child has to pass through certain developmental stages and that education has to be geared to these cumulative phases. Such educational theories about internally driven development were often of a teleological nature. They were based on assumptions about inherent progress and the association of certain successive stages

with an evaluative scale. The underlying assumption was that individual development more or less reflected the cultural development of mankind from primitiveness to civilization. In this perspective nurture hinged on some sort of inbuilt natural development. The relation between nature and nurture would remain a disputed issue in educational theory. Developmental thinking implied that child-raisers should be informed about the stages of normal development and that there was reason for worry if children did not show the appropriate behavior or capacities at a certain stage.

The case of Genie

Modern research into the linguistic skills and symbolic competence of children has established that acquiring language is crucial and that it is connected to the physiological development of the brain; language skills are considered to a large extent as 'hard-wired'. Sensations, input through communication, alone are not sufficient for the development of mental faculties. The notion that the development of the child proceeds through successive, qualitative steps and depends on the interaction between innate, physiological development and environmental, social stimulation is central here.

This appears to have been affirmed by research into more recent cases of feral children such as the thirteen-year-old 'Genie' (a pseudonym) in Los Angeles who was discovered in 1970 by child welfare officials after having been held in isolation and captivity by her parents for years. The neglected and abused girl, who in public discussions about her case was compared to Victor of Aveyron, was hospitalized and became the object of extensive medical and psychological observations and tests as well as neuro- and psycholinguistic research into her cognitive, linguistic and social abilities. The effort to learn Genie language and also communicative skills implying the use of grammar and the ability to identify with other individuals, was only partially successful. It appears that such abilities have to be internalized through social interaction during certain stages in a child's early development in order to unfold them. Certain developmental processes are irreversible and cannot be repaired when they have not occurred at a certain age. The phases of socialization seem to a large extent to be related in a complex and delicate way to the stages of the organic development of the brain. If certain stages are not realized when the physical make-up of the child's brain is still malleable, the basic mental skills will never be acquired, and the later stages will be impossible to achieve.

This kind of psycholinguistic research should be seen against the background of discussions between the followers of the linguist Naom Chomsky who claimed that the ability to learn language depends on inborn linguistic competences and the adherents of the behaviorist Skinner who argued that linguistic skills are shaped through learned behavior on the basis of conditioning. Against this background there was the famous experiment by Laura-Ann Pettito, who was inspired by Skinner's theory: she tried to learn the chimpanzee Nim Chimsky sign language. Although the ape learned to use many signs, she could not prove that he really was able to learn language, because the chimpanzee was not able to combine signs and apply them in a flexible and creative way and therefore did not acquire the basics of linguistic competence.

10. THE PERFECTIBLE CHILD: FROM DISCIPLINING TO STIMULATING

The hand that rocks the cradle, as the saying goes, rules the world. Since the eighteenth-century conceptualization of children as individual beings with their own capabilities and needs, they have been the target of various educational ambitions. Divergent goals and methods have been suggested in the past by clergymen, moralists, philosophers, teachers and doctors. After 1900 a new player joined the debate on the proper way of raising children: the academically trained expert who offers advice and guidelines to parents and other educators on the basis of scientific research and insights. This not only holds good for physicians advising parents on their children's bodily well-being, but increasingly also psychologists, psychiatrists and pedagogues, who became concerned with children's social-emotional and cognitive development. The notion that raising children requires scientifically based expertise rather than just common-sense experience, became widespread in the course of the twentieth century. However, experts on child-raising have put forward very different educational ideals, norms and goals, as a selection of quotations from pedagogical guidebooks from the 1920s, 1940s, 1970s and 1990s make clear. But this diversity does not take away that there is also a recurring assumption, apparently engrained in Western culture: that the biological parents, and notably mothers, are attributed the crucial role in child-rearing.

> *The sensible way to bring up children is to treat them as young adults. Dress them, bathe them with care and circumspection. Let your behavior always be objective and kindly firm. Never hug and kiss them. Never let them sit in your lap. If you must, kiss them once on the forehead when you say goodnight. Shake hands with them in the morning. Give them a pat on the head if they have made an extremely good job of a difficult task. Try it out. In a week's time you will find how easy it is to be perfectly objective with your child and at the same time kindly. You will be ashamed of the mawkish, sentimental way you have been handling it.* (John B. Watson, *Psychological Care of the Infant and Child*, 1928)

> *How can you make sure that he will refrain from touching specific objects? This is the main problem between age one and two. You will always have to teach him that there are a few things he should not touch. […] But you cannot stop him by saying no, at least not at first. Even later on much depends on the tone in which you say it, and how often you repeat it. It is not a method of which you should expect much. Do not call out 'No!' with a challenging voice from the other end of the room. This forces him to make a choice, and he will say to himself: 'Shall I be a sheep and do what she tells me to do, or shall I be a man and grab the lamp's cord?'*
>
> *You have to remember that his nature tells him to explore things and to protest instructions. There is a good chance that he will still be after the lamp's cord, watching you with one eye to see how angry you will get. It is much more sensible to go directly toward him the first few times he is moving toward the lamp and take him to the other side of the room. Quickly hand him a magazine, or an empty cigarette box, something for him to play with cheerfully and without danger. It is no use to put a rattle into his hand that months ago he already stopped playing with. And what if after a few minutes he again moves toward the lamp? Take him to the other side of the room again and distract*

him again, swiftly, decisively and with a smile. (Benjamin Spock, *Baby- and Childcare*, 1946)

Baby and child is written from the angle of your baby or child because her angle matters most, and yet it is still ignored most, despite the extent to which the raising of children has changed. The book considers what happens within her, from the moment of birth to the day you send her to school. This book looks at the developmental stage she is in, what she can think already and by which divergent feelings she is driven. Babies and children live from one minute, hour or day to the next, and you will be preoccupied most with these brief periods during de twenty-four hours you provide care to her. And from everything she does in those broken-up days, you can interpret what she is, what she was and how she will be. The better you understand her and her current developmental stage, the more interesting you will find her to be. As you find her more interesting, you will give her more attention and the more attention you give, the more you will get back in return.

[…] if you love your child, if you are proud of her and satisfied about yourself because so far you did well as parents, it is quite possible you will never think about the topic of 'discipline' during her time as a child. The child has moods and so do you. She makes mistakes, as you do as well, and sometimes she does whatever she likes to do rather than what she should do, just like anyone else. If you can simply get along well and treat each other as human beings, nothing in particular needs to be said about discipline. (Penelope Leach, *Baby and Child*, 1977)

On a regular basis all mothers have to deal with a baby that 'exhausts mama', a baby that cries a lot, is listless and a pain, or, in short, one that is hard to handle. Mothers that have such little one are no exception. They are not alone in having to cope with their problem. […] When mothers realize that every now and then worries, irritation, or being a nuisance are a normal, healthy part of becoming independent, this will make them stronger, more self-assured.

A mother knows what she is doing. She knows that a baby does not come with a user's manual for its upbringing. Every baby 'shops' after every leap and makes its own choice, and the only thing you can do is help it to do so. She also knows that only the one who knows the child best can also help it best. So: the mother herself, she is the leading expert. What is thereby useful to her is information on what happens in her baby's mind with each new leap. This is what we provided in this book. This should make it easier to understand the baby and support it. We are convinced that this makes a lot of difference for a baby's later development, which is partly in the mother's control. The one who takes care of a baby knows best what it needs – not relatives, neighbors and friends. After all, their child may be or have been totally different. This much we made clear in this book, and we hope that mothers dare to be self-aware and resilient, as well as immune to conflicting and unsolicited advice.

We have shown that in its first year each baby is 'born' eight times over. Eight times the world as it knew it is reversed again. Eight times it lost its bearings and did everything it could to 'hang onto mama.' Eight times it returned to its safe basis. And eight times it re-found its balance, so to speak, ('exhausting mama') before getting ready for the next leap in its development. (Hetty van de Rijt and Frans X. Plooij, *Oei! ik groei! De acht sprongen in de mentale ontwikkeling van je baby*, 1992/1998)

Historical background

The growing role of different kinds of expertise in the field of childrearing started in the course of the nineteenth century as a consequence of a number of factors and developments. We see more and more emphasis on schooling and the gradual expansion of an institutionalized and mandatory system of formal education. Apart from the private sphere of the family, the school came to be considered as central to the world of children, in order to prepare them for the adult world of work in an increasingly complex and differentiated industrial society and also to shape them in orderly and responsible national citizens. Educational reformers argued that the family was inadequate and in need of a publicly controlled supplement. Next to learning, the school should train children for the future requirements of adult life, such as self-control, descent conduct and sense of duty and responsibility. From the late nineteenth century on compulsory primary schooling was introduced. Pushing back the prominent role of philosophers and clergymen, professional teachers became more influential as educational experts. In the early twentieth century increasing governmental efforts targeted at the schooling of children in order to prepare them for the ever more demanding requirements of the labor market and for raising them as responsible citizens who shared basic (national) values.

In order to make schooling more effective and measurable, pupils were increasingly differentiated according to their intellectual level. Testing methods for assessment of achievement and intelligence were introduced. Assessment and testing in schools implied norms with regard to mental development in general, and certain criteria with respect to the required abilities at a certain age. If children failed to meet these norms there was reason for worry and intervention. Special schools and classes and also psycho-educational clinics on the basis of specialized therapeutic-educational approaches (German *Heilpädagogik*; Dutch *orthopedagogiek*; and Anglo-Saxon clinical child and adolescent studies) were established for children who did not meet the average standards and/or who suffered from (milder forms) of retardation. In this context psychiatric and psychological involvement in education increased after World War II. There was a further growth of regular testing, pedagogical informed instruction methods and the introduction of school psychology that focused on the emotional development and social adaptation of children. Testing and selection of intellectual capacities and levels became even more important, the more so because of the increasing significance of higher education, rapidly rising numbers of students, and the need for selection-procedures with regard to differentiated educational levels and growing occupational specialization.

The second field that advanced educational expertise and professionalization was that of health and hygiene and the care for ‘problem-children’. In medicine pediatrics was established in the mid-nineteenth century, which focused on children’s physical health and the hygienic conditions in which they were raised, and which emphasized the responsibility of mothers for the health of their children. In this way physicians established themselves as experts on children’s physical and mental development and they formulated norms with regard to the upbringing and development of children. In the longer run this would result in

a network of child health centers and medical services in schools for regular health check-ups of children.

Another trend was the increasing concern about and interference with 'problem-children' in order to save them from neglect, discipline them into useful members of society and later on also to treat them with therapeutic methods. From the mid-nineteenth century institutionalized care-arrangement were established for orphans, 'street children' and young delinquents with the aim of disciplining and civilizing them. Around 1900 several social and state-supported initiatives tried to improve the lot of deprived children: the banning of child labor in factories, philanthropic welfare schemes and social work to promote proper child-rearing practices, medical advice for mothers, legal measures to protect children against parental neglect, maltreatment and abuse. Philanthropist, clergymen and lawyers often took the initiative, but from the late nineteenth century on this work was professionalized by social workers and later also by psychologists, psychoanalysts and psychiatrists, for example in the Child Guidance Clinics for treating children with developmental, relational and mental difficulties.

The influence of psychology in educational theory

In the early decades of the twentieth century attention increasingly focused on the mental development of children and youths, and this boosted the influence of psychology in child-raising. The work of the American psychologist Stanley Hall was one of the first initiatives to create a science of pedagogy on the basis of psychological knowledge of children's development. He pointed to puberty and adolescence as important and precarious stages in the development from childhood into adulthood. On the basis of similar stage models, the American psychologist Arnold Gesell and the Swiss psychologist Jean Piaget constructed normative scales for assessing children's mental development. All of this intensified the idea that child-rearing was anything but simple and self-evident, but required serious attention from parents, in particular mothers. The need for popular educational advice swelled. The traditional middle-class pattern of raising children, that is emphasizing the building of moral character through instilling virtues, did not meet the new psychological standards of experts: mothers needed advice about specific skills and the emotional development of their children, either in addition to their maternal intuitions or as a correction thereof if such intuitions were considered as inadequate.

Psychoanalysis in particular was an important source of inspiration for studying and advising on the mental and emotional development of children. The psychological approach can be found in popularized motherhood manuals and parenting guides, which appeared in greater numbers from the interwar period on, first in the United States and later in other parts of the Western world. Such guidebooks were adopted mainly by self-conscious middle-class parents who were keen on monitoring the development of their child. An important consequence of the psychologization of child-raising was that explicit moral standards were increasingly replaced with standards of normal cognitive and emotional development. The task of parents was now to be informed about the mental and emotional progress of their children and to facilitate and stimulate normal development, which increased their responsibility for their wellbeing and future success. Also, a commitment to children's happiness emerged, as the titles of child-rearing guides, such as *How to Have Cheerful Kids*

(1927) or *Child Training: The Pathway to Hapiness* (1948) illustrate.

At the same time the psychological perspective might trigger uncertainty among parents about how to deal with their children and expert advice. Psychoanalysis held that the psychic development of children was conditioned by hidden unconscious processes, which were related to the way they were treated by their parents. Emotional interactions seemed to be one of the main causes of all that could go wrong in the child's psychic development, which might result in neurosis, traumas and inner conflict. Each child posed a risk for mental problems and disorders, and parents could be blamed for them, which entailed that not only children with psychological problems but also their parents were targeted for therapeutic interventions.

Next to psychoanalysis, behaviorism established itself as a psychological theory on education, in particular in the United States. John B. Watson, author of *The psychological care of the infant and child* (1928) believed that the child could be shaped and advocated an objective scientific approach in childrearing. He opposed the current idea that the 'mother-instinct' was a guideline for good childrearing. Maternal love was in his view far too sentimental and emotional. It did not prepare children for the tough adult world of work, competition and achievement. Instead, he propagated an unemotional and almost mechanistic way of habit training through systematic conditioning in order to confront children with harsh reality as early as possible. Watson's child-raising model, however, did not really catch on in practice. It was incompatible with the prevailing Western ideology (and reality) of the family and the nurturing mother as the 'natural' childrearing setting. Neither was it in tune with anti-authoritarian, child-centered and egalitarian values, which set the tone in particular in the postwar period. Other popular educational experts advocated a more relaxed and liberal child-centered approach: the needs of babies and children should be respected and met rather than cast in the mold of disciplinary conditioning: 'Babies want attention; they probably need plenty of it', as an influential American psychologist wrote.

As a consequence of this more lenient and compliant course, after World War II psychology and in particular psychoanalysis gained more and more influence in expert advice on child-rearing. They stressed the importance of emotional ties between mother and child. John Bowlby, for example, pointed out that affective attachment, the so-called mother-child symbiosis, was crucial. His argument implied that a good mother stayed at home in order to be available for her child(ren) full-time and devote herself to their needs. If the mother did not cater after the child's emotional well-being, its development might be disturbed, with all possible harmful consequences. Bowlby's concept of maternal deprivation provided ammunition to those who argued that good mothering was the key to an emotionally healthy childhood, and it opened the door for 'mother-blaming' if something went wrong in the child's development. Such arguments held a prominent position in the defense of family values and the responsibility of mothers for the emotional well-being of their children. Mothers should understand their behavior and expressions and act as a guide for the child in order to guarantee that it passed all the crucial mental and emotional stages in its development in a well-balanced way. Mothers were more or less expected to sacrifice, devote and adapt themselves day and night to the needs of their children. The worry was that mothers lacking the proper psychic sensitivity might deprive their children of maternal love, which was the opposite of the behaviorist concern with maternal overprotection.

The psychological approach was not without ambivalence with regard to the nurturing skills of mothers. On the one hand women's assumed intuition for mothering, the so-called maternal 'instinct', was viewed as the sound 'natural' basis for good childrearing, but on the other hand the repeated message of experts was that women needed to be informed about child-psychology and to learn from experts how to be good mothers. Again and again, experts expressed doubts and mistrust about mothers' capability to bring up her child according to their standards. Mothers were supposed to have extensive knowledge of what the child supposedly needs in a particular phase of its development, but at the same time they could never be as informed as the experts and they had to rely on some sort of intuition, which apparently could not always be trusted. This might result in continuous uncertainty and doubt, in particular when child-rearing was increasingly psychologized in the course of the twentieth century and its standards upraised. Uncertainty and doubt, which was triggered by experts, created its own demand among parents for expert advice.

For mothers the psychological educational model was very demanding and possible vexing. Child-raising was no longer a matter of moderating and controlling undesirable behaviors of children, but even more of fostering desirable emotions and expressiveness. For this maternal 'instinct' and intuition were not sufficient. The way experts framed the educational role of mothers was ambivalent. On the one hand, they highlighted what mothers spontaneously can and should do. On the other hand, while suggesting that each child was at risk for mental and behavioral problems, they continuously raised doubt whether mothers could meet the psychological requirements of a good education. The psychological approach left parents in permanent uncertainty, turning experts into the educators (and possibly therapists) of parents.

Against this background Benjamin Spock**,** the author of the popular *The commonsense book of baby and child care* (1946), advocated a more relaxed approach. His view of children was grounded in an optimistic interpretation of Freud's psychoanalysis and a progressive liberal and rather pragmatic educational philosophy. He described instincts, drives and impulses not so much as irrational and difficult to control. Spock believed that children were essentially reasonable and manageable. With a loving home and a sufficient sense of security, they would develop without too much trouble. Mothers should trust and rely on their own capacities and adopt a flexible permissive and tolerant attitude towards children, while at the same time not sacrificing their own needs for those of the child. Perhaps this was one of the reasons why Spock was so popular among parents. His reassuring advice seemed not so demanding and did not trigger their uncertainty to the same degree as other psychological experts. At the same time Spock continued to underline that mothers should be completely available for their children since they were the natural caretakers.

Psychology dominates pedagogical theory to this day, but in the 1960s the role of psychoanalysis was partly succeeded by a more cognitive-psychological model that focused of intellectual development (for which the mother was again made responsible). This was related to the fear that children lagged behind in schooling. From the mid-1980s on the dominant psychological perspective on child-rearing was also challenged by biomedical perspectives emphasizing the significance of constitutional factors in the development of children, their temperament and acquisition of language. The biomedical approach derived

strength from genetics and prenatal diagnosis and a re-medicalization of mental and emotional disorders among children, as for example the widespread diagnosis of ADHD and massive prescription of Ritalin make clear.

Changing models of self-development

Overall, from around 1900 three different overall goals or models for self-development succeeded each other in theories about child-rearing. In the first decades childrearing and education centered on adaptive self-development, emphasizing the importance of what was generally referred to as 'character', that is self-control, will-power, moral awareness, and a sense of discipline. This was about the unconditional adaptation of the individual to unquestioned social norms and values.

From the 1920s and 1930s on this ideal, as a consequence of the growing impact of psychology, was more and more replaced by guided self-development. The older moral-didactic discourse about the need to develop 'character' gradually gave way to psychological arguments about the unfolding and actualization of 'personality'. Individuals should be granted more responsibility for self-development. They could only develop their personality in a meaningful way if they, of their own accord, were able to internalize social norms and values in an autonomous self.

After World War II and in particular in the 1960s this model evolved into the more radical notion of spontaneous self-development: the ideal of free self-realization, personal growth and emotional self-expression, which was boosted in the culture of personal liberation, emancipation and unhampered self-determination. The control of emotions and the individual's adaptation to society were no longer considered signs of responsibility, but as the repression of the authentic self and an assertive individualism.

The ideal of spontaneous self-development marked the era of permissive, anti-authoritarian child-raising, which made emotional unfolding a goal in itself. The assumption was that the environment had to be adapted to the needs of the child, that everything should be done to make the child happy, and that the child should not be commanded, but respected as an equal being with its own will and rights. Talking, explaining and negotiating became the modern democratic pedagogical strategies. This did not relieve parents and in particular the mother from their responsibility for the child's development. Parents did not have the task to discipline or shape the child, but they were supposed to be available for the child, to consider its needs and well-being, and to stimulate its optimal development. Modern parents have the task to design the education of their child as a project in order to provide them with a successful start in adult life.

The downside of the permissive upbringing was the 'pampered child syndrome': its product might be the spoilt, egocentric, irresponsible and demanding child who doesn't know of any boundaries because (s)he assumes that everything is negotiable, who cannot deal with disappointments because (s)he has only heard praise for anything (s)he does, and who in fact are not ready to face the requirements of the adult world. The question is whether children can deal with the freedom which modern education provides them. Spontaneous self-development often turns out to be a risky obstacle course, where anything can go wrong

'along the way' and which raises a lot of uncertainty among parents about how far their permissibility should go and at what point they should draw a line.

Such uncertainty gives continuously rise to a demand for expert advice, which however does not end uncertainty and doubt because such expert advice is versatile, conditional and ambivalent, or even contradictory, because experts are not in agreement about the best methods of raising children. Also, in democratic times pedagogical experts do not want to impose their knowledge on parents and they leave the ultimate decision and responsibility to them. Experts present themselves as equal discussion-partners who only offer suggestions how to deal with children while leaving practical implementation and responsibility to the parents. In this way expert advice may reinforce parental anxiety and even fuel new worries because expert knowledge on child-rearing implicitly may include changing and enhancing educational norms and standards. Moreover, concern about mental and cognitive problems among children and youths has increased. Complaints like ADHD, autism, Asperger, fear of failure, and dyslexia have reached epidemic proportions. These are probably related to the tendency to label 'difficult' and unacceptable behaviors as psychological and medical problems, and to treat them accordingly.

At the same time our meritocratic and achievement-oriented society has raised the importance of the quality of parenting, in particular with regard to cognitive, psychological, and behavioral attributes as well as self-regulatory skills and emotional robustness. Such skills are crucial in order to be successful in today's economy and society. Parenting style is increasingly key to achieving those ends. Combining warmth with discipline appears the most effective parenting strategy to prepare children for neoliberal society.

Nowadays many parents and in particular mothers seem to struggle with anxiety and feelings of guilt, because they have internalized certain ideals of the perfect parent while at the same time, they cannot meet the standards suggested by experts. All of this affect them the more so, because in the context of the nuclear family, mothers are often thrown back on themselves: others can be hardly involved because in the context of the nuclear family, child-raising has been privatized and individualized. In most educational theories there is little attention for the influence of the wider social-cultural environment and possible alternatives for the focus on the responsibility of parents and in particular mothers.

Against this background some commentators have pointed to these counter-productive effects of the burgeoning industry of expert pedagogical advice: Frank Furedi's *Paranoid parenting: Why ignoring the experts may be best for your child* (2001) and Judith Warner's *Perfect madness: Motherhood in the age of anxiety* (2005). Others, such as Judith Harris in her *The Nurture Assumption: Why Children Turn Out the Way They Do* (1998), have argued that the influence of parent on their children has been overrated: the peer-group, other children with which the child associates, seems to be much more important. The socialization of the child, especially from puberty on, also takes place outside of the nuclear family in the interaction with peers. Harris' polemic book generated a lot of publicity and controversy; it apparently stroke a sore chord in our culture.

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