

Sex¹ In The Making – A Biological Approach.²

Introduction

Hermaphroditism³ is the starting point for a lot of biological and medical debates about ‘normal’ sexes/genders. Hermaphrodites were considered a rare, fascinating and threatening, later on, in the 19th and 20th century, an aberrance of a sex/gender-pathway having only two opportunities. Medicine focused on them because of juridical necessities. In ‘natural law’ – laws which are deemed ‘determined by nature’ and not ‘made by god’, such as the French civil law ‘Code Civil’ (1808) and the German civil law ‘Bürgerliches Gesetzbuch’ (1900) – mankind was understood to be differentiated by nature between women and men. They were divided juridically into two categories, other categories were not designed by ‘natural law’ (in canonical law, for some people there was the opportunity to decide by themselves whether they wanted to be woman or man; such regulations were found until the 18th century)⁴. Biology and medicine were confronted with such a juridical and social system and created the basis to name it ‘natural’ and ‘inalterable’. Biology and medicine sought differences and found them: man and woman were postulated to be different in all tissues, organs, physiological processes and their respective behavior. People with ambiguous characteristics were examined, and the male *or* female sex/gender – *in no case both* – was identified as their ‘true sex/gender’.

In the 17th century numerous characteristics like body structure, clothing and behavior used to indicate the ‘true’ biological and medical sex/gender of a person - male or female. In contrast, in the 19th century, the gonads, and at the beginning of the 20th century, the gonads and the chromosomes were considered the exclusive signs of the ‘true sex/gender’. Physicians examined genitalia, gonads, later on chromosomes found by microscopy, discussed the appearance, behavior and sexual relations of persons and so declared the sex/gender of more and more people as ambiguous.

Since the 15th century, but especially since the 16th and 17th century, scientific accounts had often been printed in local languages, not just in Latin anymore, which had been understandable only to a small intellectual elite. Thus, more people of the upper and middle classes were exposed to new scientific accounts of sex/gender characteristics and searched themselves for ‘true’ signs of sex/gender or ‘true’ signs of doubtful sex/gender. State interest in health and in reproductivity of the upper and middle classes being intensified mechanisms in regulating the population – M. Foucault called them ‘Bio Politics’ –, promoted the rising inquisitiveness of society for the individual and the uncertainty of the individuals

themselves.⁵ ‘Wrong’ clothes, androgynous appearance and, last but not least, ‘perverted’ sexual intercourse, evoked attention and incited people to seek advice from medical ‘experts’, to examine their own sex/gender characteristics or that of their children. Treatments, especially surgery, for designing ‘acceptable’ sex/gender characteristics have been usual since the mid 20th century. In the 18th and 19th but also in the early 20th century, surgery was combined with a very high risk of death. Today, a growing community of intersex/intergender people fights against such sex/gender reassignments performed directly after birth without informed agreement of the affected persons themselves.

In this article, we present some historical biological and medical accounts defining ‘true’ sex/gender characteristics and the philosophy of late or early sex/gender reassignments are presented. It shows, how the biological and medical sciences are involved in the construction of the two sexes/genders system in modern western societies. In a final remark, some critical perspectives favoring equality-based sex/gender depictions are introduced and discussed. Although they are relatively emancipated they nevertheless also preserve a two sex/gender model. We conclude that other, more radical deconstruction models are possible, also from a biological point of view. The article offers alternative mindsets and emphasizes, that biological and medical theories about sex/gender are entrenched in society but also changeable.

Numerous characteristics of the ‘true sex/gender’

Up to the 17th century, fascination and fear determined the public opinion about hermaphrodites in France, England and the German states (these being the countries with the greatest number of studies examinations of hermaphroditism in the western world). Often hermaphrodites did not survive childhood or were convicted of witchcraft or sodomy (by this time a popular incrimination of transgressive behavior against morality, e. g. sexual relationships with the same sex/gender). Western law origins from Roman Law. This ‘old law’ took hermaphroditism into account and constituted that, in the case other persons' rights were involved (e. g. in bequest or marriage), medical experts had to prove the sex/gender of the affected person and had to decide the prevailing sex/gender.⁶ Similar regulations can be found in the canonical law of the 13th century. There, the additional theoretical case took into account, that medical ‘experts’ cannot determine the prevailing sex/gender. Only in this case, the affected person was allowed to choose her/his sex/gender. This choice was non-recurring – if a person changed her/his sex/gender role again, s/he could even be punished with death. In Europe, such laws were valid till the 18th and 19th century. Medical ‘experts’ were

entrusted to prove the ambiguous sex/gender. The decision was made by physical characteristics such as breasts, beard, voice and by the look and function of the genitalia (a woman should menstruate, a man ejaculate). The reproductive heterosexual function had an influence, too: a penis should penetrate, a vagina should be penetrated.⁷ Besides that, characteristics in personality and behavior had an influence on the decision about the 'true sex/gender'. A 'natural' urge for clothes of the 'own' sex/gender, sexual desire for the 'opposite sex' and a 'naturally' female or male occurrence in moving and acting were supposed.

Not rarely, various physicians decided contrarily. But a physician's decision was extensive, it often decided life or death of a person accused under sodomy laws.⁸ In the 19th century new, 'natural' law excluded the possibility of inexplicit sex/gender.

The 'true sex/gender' by gonads

In the late 19th century, the gonads became dominant in discourse. In some ancient natural philosophies⁹, the male testes, scrotum and penis had already been considered important male characteristics. The removal of these would according to Galenos of Pergamum be sufficient to emasculate a man. The result should be something third, in addition to woman and man. Elsewhere, Galenos pointed out, that eunuchs and women were similar.¹⁰ In Western modern biological and medical sciences, the shape and function of the external genitalia play an important role. The male testes were especially focused on, they had already been widely debated on in the late 18th century. The female ovaries were not attributed importance in the 18th century, but from the early 19th century on.¹¹ Thus, R. Virchow stated: 'The woman is woman because of her reproductive glands'. Virchow described the complete body, the physiology but also morality, of the woman as a result of the ovaries. In length he wrote: 'The woman is woman because of her reproductive glands. All her characteristics of body and mind, of nutrition and nervous activity, the sweet delicacy and roundedness of limbs, by the strange configuration of the pelvis, the development of the breasts and non-development of the vocal organ, the beauties of her hair and the soft down on her body, those depths of feeling, that unerring intuition, that gentleness, devotion and loyalty - in short, all that we respect and admire as truly feminine, are dependent on the ovaries. Take the ovaries away and we get the repulsive, coarsely formed, large-boned, pilos, deep-voiced, flat-breasted, resentful and egoistic virago (Mannweib).'¹² In E. Klebs' classification of hermaphrodites (1876), the focusing on gonads yielded in a heavily noticed highlighted event. Also, the experiments of E. Steinach stimulated the belief, that the gonads widely influenced the 'nature of human'. In

animal experiments, Steinach replaced gonads from female to male and vice versa. Both these experiments and his experiments of rejuvenation found much response.¹³ By focusing on the gonads, it was regarded in the following as medically and juridically necessary to identify testis or ovaries of a person to find out her/his sex/gender. Only if both, testis and ovaries, were found, a person was declared being hermaphroditic. To 19th and early 20th century's biologists and physicians, this case seemed to be very rare.

But the assertion of the sex/gender of the gonads was difficult in practice, because of the elements, which seemed to be characteristic for testes or ovaries, which are located in the inner body, and not detectable by palpation. It was also difficult to define whether a drawn tissue sample definitely stems from an ovary or testis. Some physicians got far ahead of surgery, such as removing tissue by biopsy. These surgeries were extremely dangerous. Other physicians promised patients a diagnosis of their sex/gender in the way the patients wanted, but only under the precondition to do this surgery (seemingly in some cases without disclosing the risks involved).¹⁴

The 'true sex/gender' by heritage

Another initial point for describing human sex/gender differences is by the consideration of hereditary predispositions rather than the gonads. All organs of the individual were seen hereditary, either as preformed (theory of preformation, dominant in the 18th century) or as epigenetic (theory of epigenesis, dominant in 19th/20th century). Both theories are linked to ancient natural philosophy.¹⁵ The adherents of preformation believed, that the individual resides already completely formed, either in the ovum (Ovists) or in the sperm (Spermists, Animalculists). They thought, that all future human offspring was carried in Eve's first ovum or Adam's first sperm¹⁶, and therefore no development would be possible. After an initializing event by the 'male affecting principle', a simple growing of the individual was seen as sufficient. The female donation to generation was seen as small, both by Ovists and Animalculists. Ovists believed that 'male initializing power' would be necessary to trigger the growth of the embryo. Animalculists thought that the female part in generation to be limited to the nourishment of the embryo. The epigenesis, formulated in 1759 by C. F. Wolff, (which today is considered the origin of 'modern embryology') voted against the theory of preformation and the hypothesis that a simple growth in size would be sufficient for the development of the embryo. Wolff described, that in the origin of the embryo only undifferentiated matter exists, which would develop. Based on this, undifferentiated matter would convert to differentiated matter, and finally to a fully developed individual.

With the description of ovum, sperm and the termination of fertilization, ovum and sperm were enclosed as the origin of heritage. Finally, chromosomes were identified as carriers of hereditary predispositions – and they were sexed/gendered. H. Henking showed in the last decade of the 19th century that the result of meiosis is two types of sperm, different in their chromosomal structure. C. E. McClung, E. B. Wilson, N. M. Stevens described male and female individuals possessing a difference in chromosomes. The chromosomes which differed in length, were named as ‘Y’ chromosome (in 1909), the shorter one, and as ‘X’ chromosome (in 1911), the larger one.¹⁷ These findings of sexed/gendered chromosomes were a result of research with insects. With time, biology transferred many results obtained from experiments with insects to human beings. This was controversial, many, particularly physicians, refused this universal approaches of sex/gender determination of biology for all beings, flora and fauna, and clutched to the gonads as sex/gender determiners.¹⁸

Important advances in chromosomal thinking of sex/gender difference were made by J. Halban and R. Goldschmidt. Halban (1903)¹⁹ believed that heritable predispositions, which were present in the ovum (at least in the fertilized ovum), were responsible for the formation of sexed/gendered structures. Those predispositions would develop continuously and autonomously, but different in termination. So, the gonads developed fastest (up to the fifth or sixth embryonic week); they were followed by the genitals in the third embryonic month and finally, at the age of fifteen to twenty years, the secondary sex/gender characteristics developed. Halban considered the gonads as supporting, but not with formative influence on the development of the genitals and secondary sex/gender characteristics. Which gonad was present, he considered unimportant; it would merely be necessary that there was a gonad, no matter whether a testis or an ovary. Halban described that all cells, tissues, organs had to be differentiated for sex/gender. All physical, physiological and psychic characteristics would take place as sexed/gendered ones. ‘Normally’ the individual would have only female or only male characteristics, but in some individuals, both female and male characteristics occur simultaneously. Hermaphrodites represent such female/male mosaics.

Goldschmidt (1916, 1920, 1927, and 1931)²⁰ developed a more differentiated theory than Halban, a logical overall concept. He included the knowledge of chromosomes and looked for principles in sex/gender determination. For his research interests Goldschmidt took insects (especially *Lymantria dispar*) and declared the results he obtained universal. The development of sex/gender in the opinion of Goldschmidt took place in the individual *quantitative* about the distribution of parental X chromosomes (explicitly: *not qualitative*, although every individual had both, female and male heritage predispositions). If two X

chromosomes occurred the result should be one sex/gender, if only one X chromosome occurred the result should be the other. Goldschmidt described that, based on chromosomes, there could be either female or male sex/gender possibilities. However, the appearance of the individual can combine both, female and male sex/gender characteristics. Here, Goldschmidt pronounced a continuous row of intersexual (hermaphroditic)²¹ conditions. These would take place during ‘turning points’ in the development of the individual. Up to the turning point, the individual would develop as one sex/gender, and from the turning point onwards as the other sex/gender. This development would occur distinctly for all (sex/gender) characteristics. The earlier the turning point, the further reaching would the intersexuality of an individual; a very early turning point would be followed by the contrary sex/gender in appearance to the chromosomal sex/gender. But ‘normally’ Goldschmidt declared no turning point would occur, and the sex/gender would only result in either female or male.

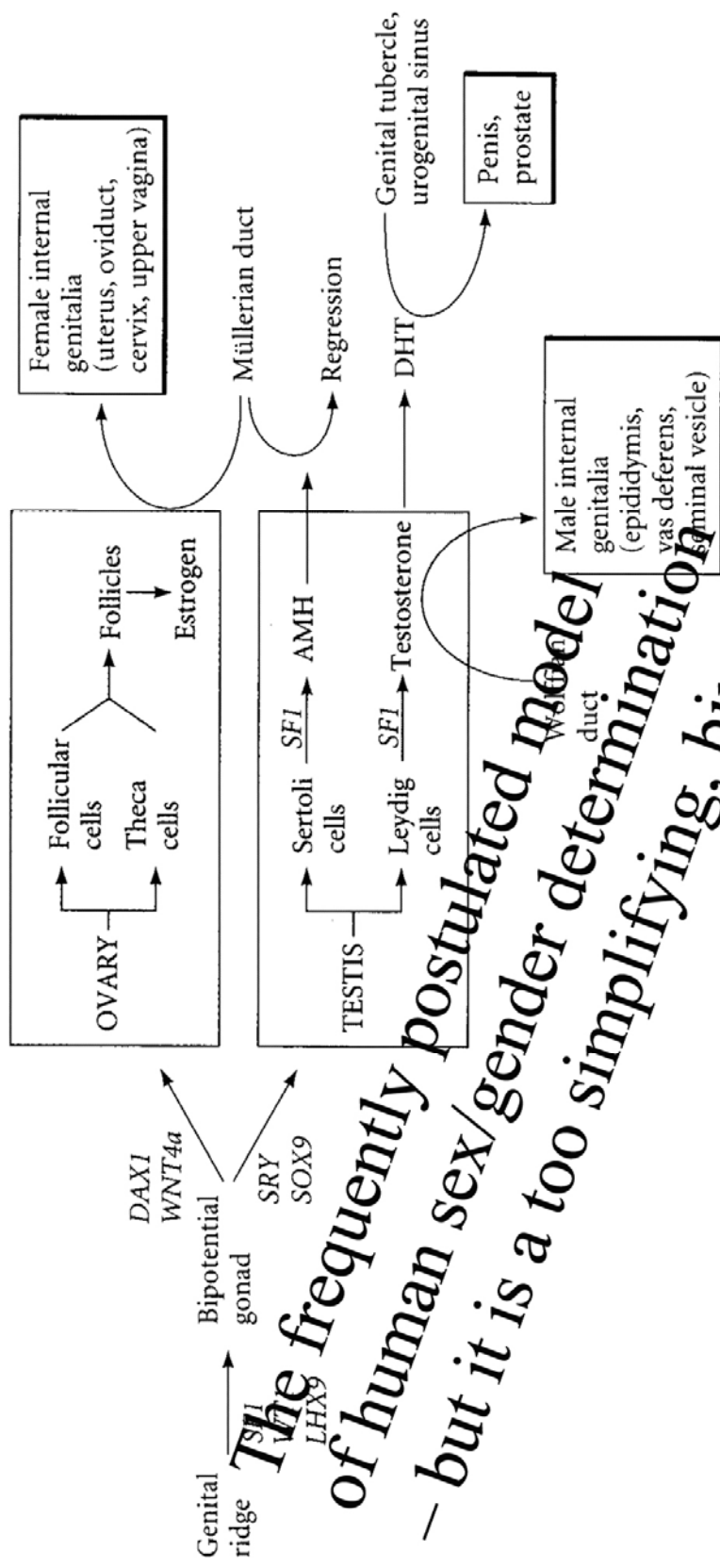
Today's sex/gender-cascades combining gonadal and chromosomal sex/gender theories

The depicted theories on sex/gender determination seem to be invincibly antithetic. The reception of theories focusing on gonads and those describing chromosomes as crucially sex/gender determining, varies between different scientific fields. Biologists tend to focus on chromosomes, whereas physicians have seen gonads as decisive in sex/gender determination. Today's accounts from the mid 20th century onwards reconcile both concepts: They describe, that specific genes, located on particular chromosomes, carry the information for the development of the gonads and discharging hormones. In detail: Dominant current theories of *chromosomal sex/gender* determination – i.e. XX chromosomes for a female, XY chromosomes for a male²² – start at a sequence cascade with lots of subsequent steps, which all are necessary for the development of as fully female or male seen sex/gender characteristics. The following steps, described for the female, would be initiated by some genes, especially DAX1, which is delineated as encoded on the X chromosome (DAX = dosage-sensitive sex reversal locus-adrenal hypoplasia congenital-critical region, located on the X chromosome). The factor encoded by DAX1, in interconnection with other factors, would stimulate the development of ovaries, which control the subsequent steps. The occurring *gonadal sex/gender* (developed ovaries) results in the *morphological sex/gender* with inner and outer genitalia such as clitoris, vagina, oviduct, uterus and cervix. Located on the Y chromosome, the gene SRY (sex determining region), has been given the overall sex/gender determining title. This title makes it clear that SRY, and therefore male development, is understood as aberrant from the female, but is thought to be a progression

from a basic female state. In this context it is comprehensible why the development described as female was not, or rather much later, examined than the development considered as male. So, SRY was ‘discovered’ much earlier than DAX1. But following up, SRY is seen as encoding TDF (testis determining factor), which in interconnection with other factors takes part in the development of testes. Testes follow the typically male regarded morphological structures penis, prostate, epididymis, vas deferens and seminal vesicle (see picture 1 for a better understanding).²³

Picture 1 illustrates that a lot of genes, factors (more than 20 genes, factors are described!) are considered to be involved in the development of female and male inner and outer genitalia. But it also illustrates that the overall sequence cascade takes into account only two possibilities – female and male. Other possibilities, which also occur and are explainable, are not considered. This is obvious in the undifferentiated gonad which is seen as extending from an undifferentiated genital ridge. In the picture, this undifferentiated gonad is described as ‘bipotential gonad’, a term which already presupposes that there are only two possibilities for sex/gender development.

Binary models like the one in *picture 1* are dominating discussions of biological sex/gender determination today. Even some biologists describe the brain as biologically binary differentiated by sex/gender and ignore social processes such as learning. Probably there are no such typical settings like female and male, also in sequence cascades for sex/gender determination – we cannot know, because most of today's biologists are blind to non-binary descriptions. In this sense, it is also to be noticed that the hormones estrogen and testosterone are primarily growth hormones and exist in both, females and males. Sometimes females have – contrary to the depiction in *picture 1* – more testosterone than males, or males have more estrogen than females, but these frequent cases are not represented in *picture 1* and are often described as ‘special’ or ‘not normal’.



The frequently postulated model of human sex/gender determination – but it is a too simplifying, binary one!

Figure 1: The frequently postulated sequence cascade of human sex/gender determination, taken from: Gilbert, *Developmental Biology*, 525, fitted with a remark. The shortcuts SF1, WT1, LHX9, DAX1, WNT4 α , SRY, SOX9 label the genes and their products, respectively (SF1: steroidogenic factor 1, located on chromosome 9 in position q33 (shortcut: 9q33); WT1: Wilms' Tumor 1, located on 11p13; LHX9: LIM homeobox protein 9, located on 1q31-1q32; DAX1: dosage-sensitive sex reversal locus-adrenal hypoplasia congenital-critical region (1), located on Xp21.3-p21.2; WNT4 α : wingless-type MMTV integration site family, member 4, located on 1p36.23-p35.1; SRY: sex determining region, located on Yp11.3; SOX9: sex determining region Y-box 9, located on 17q24.3-q25.1). AMH labels the anti-Müllerian duct hormone, DHT labels dihydrotestosterone)

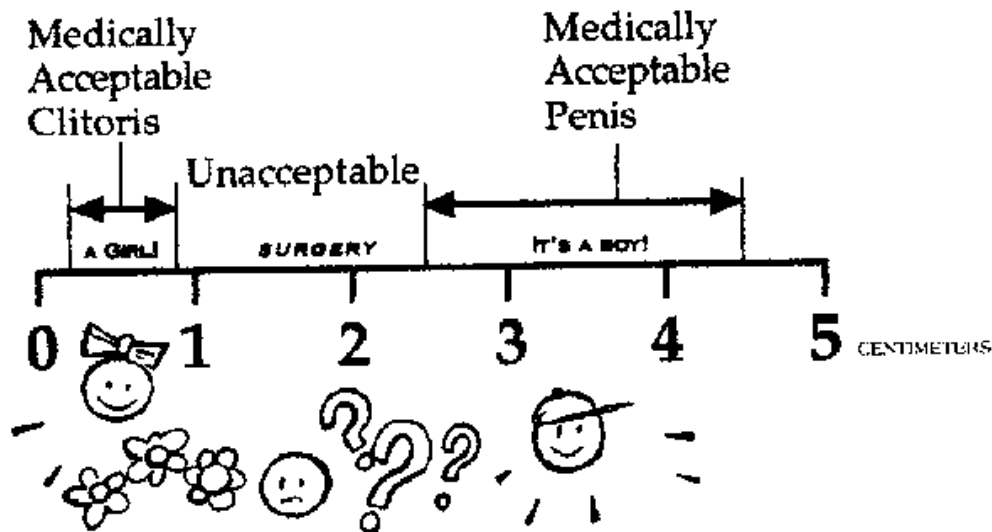
The possibility of biological variety

The previous descriptions show that there were several very different concepts of biological and medical theories. Behavior, gonads and hereditary predispositions were historically seen differently as the most important signs for the ‘true’, binary understood, sex/gender. It became clear that social, especially juridical mandates provoked biological and medical research explaining the highly sex/gender divided social sphere. Today's biological and medical theories offer a pool of sex/gender characteristics, which are used to ‘discover’ the only one sex/gender of a patient. *Chromosomal sex/gender, genetic sex/gender, gonadal sex/gender, inner genitalia, outer genitali; finally the sex/gender of rearing* announce the variety of sexes/genders, which biology and medicine created.²⁴ There are a lot of individuals whose characteristics do not correspond with any of these biological and medical sexes/genders. There are individuals with XX chromosomes (an as typically female classified set of chromosomes) and penis and testes which emit sperm (as typically male classified physical and physiological characteristics).²⁵ There are women who were prevented from starting at The Olympic Games because of high levels of testosterone (an as typically male classified hormonal status) or because of chromosome constitution.²⁶ There are people with both sets of genitalia, and so on. There is variety in all the sexed/gendered characteristics described above – therefore it is time to recognize these varieties. It is also prudential for biology and medicine to recognize the variety of possibilities because the last few decades have shown that the search for linear, simple descriptions for highly complex phenomena hinders thinking of complexity and variability.²⁷ So individual differences could probably be described and not classified in a sexist way. Maybe characteristics would be desexed/degendered opening new possibilities for desire and love, compared to outer genitalia orientated homo- or heterosexual ones.

The medical construction of only two sexes/genders – the homo- and heterosexist matrix

There are other, more emotional reasons for engaging against a socially and biologically restrictive two-sex/gender-system. Since the 1950/1960 individuals with ambiguously defined outer genitalia have been medically treated. Up to the mid 20th century a surgical treatment was difficult and dangerous for the patients. Because of this, many physicians developed surgeries that did not put the patients' lives in danger. Other surgeries especially clitoris excision were more frequent because they were understood as only removing something superfluous, but it was also risky as infections could occur.²⁸ The most important difference between these treatments in the management of ambiguous genitalia from the 1950th/1960th

forward is that the first-mentioned surgeries implicated people by the age of twenty or twenty five. It was the thought that the outer genitalia could develop late; in general physicians refused to perform surgery before an age of 25. In the 1950s J. Money, J. G. Hampson and J. L. Hampson declared, with reference to S. Freud²⁹ and K. Lorenz³⁰, that children would be sexually/gender-neutral at birth. Money, Hampson and Hampson had researched people with ambiguous genitalia and declared that chromosomal, gonadal, hormonal sex/gender and also the inner and outer genitalia *would be unreliable indicators for the developing gender role* of an individual. They declared that sex/gender of rearing was a better indicator for the sex/gender that would develop later on in the individual. Money, Hampson and Hampson thought a child as being devoid of sex/gender and thus sexually neutral at birth. The sex/gender role wouldn't simply develop the way it used to be thought, but be imprinted, learned and instilled. The most intensive period of learning would occur between the age of eighteenth months up to three or four years. Money and the Hampsons thought it to be cruel growing up with ambiguous genitalia or doubtful sex/gender. Society expects a definite sex/gender, the parents await a boy or a girl, and every day children are addressed as definite boy or girl. From this psychological foundation, Money and the Hampsons, in cases of unambiguous sex/gender, recommended an early reassignment of sex/gender of the newborn before the age of the eighteenth month.³¹ The first sign of unambiguous sex/gender in the medical practice is the look of the outer genitalia – is the clitoris too long, the penis too short? This is the simple sign (see picture 2) which triggers an extensive medical diagnosis procedure. This case management of infants with doubtful sex/gender took place, not only in the United States, but also in many other societies especially in the West, and still applies today.



Phall-O-Metrics

Picture 2: The lengths of clitoris/penis decide sex/gender; taken from: Fausto-Sterling, *Sexing the body*, 59.³²

Do no harm! In the last few decades, affected people fought against early reassignment of their sex/gender, with some success. So that these agonizing procedures are more and more under discussion and scrutiny. Some physicians, ethicists and jurists support these struggles. Physicians claim an informed and self-determined process in which patients (or her/his parents) and physicians cooperated. Ethicists declare early sex/gender reassignments to be physical injuries, because these are performed without the consent agreement of the affected children themselves. They argued that a meaningful agreement can only be made at a later age, of fourteen, sixteen or above. Jurists pass laws which save and increase the rights of patients and make mistakes of physicians expensive, in consequence of civil laws. So some changes have taken place but there is still much that needs to be done to prevent early sex/gender reassignments.

A new philosophy of sex/gender

This account makes it clear that sex as a more biological category than gender is also embedded in society. A highly sex/gender divided society results in such thinking within the biological and medical sciences (coming from such a society), too. Natural sciences, especially biology, defined social rules as 'made by nature'. Thus biology explained

sex/gender with respect to ‘nature’ as being developed very early in every individual, namely in the embryonic state. Biology designed sex/gender as a universal principal of all living beings, as sex/gender was common among both fauna and flora. But biology also presupposed the social division in woman and man for all its research and included aberrants of their own theories as ‘not normal’ and ‘pathological’.³³

In the last decades some critical accounts of sex/gender differences are made. These focused on equality and made clear that differences in brain, in musculature, bone structure, nervous system etc. are individual and socialized. One of the leading scientists in this domain is A. Fausto-Sterling who widely initiated these debates and described equality between woman and man in a far reaching way.³⁴ In the debate about ambiguous sex/gender Fausto-Sterling offered a system of ‘five sexes’. She proposed three categories in addition to those of woman and man. She called them ‘herms’ (short form for ‘(true) hermaphrodites’), ‘ferms’ (‘female hermaphrodites’) and ‘merms’ (‘male hermaphrodites’).³⁵ ‘The five sexes’ are useful for depathologizing ambiguous sexes/genders, avoiding early sex/gender reassignment and increasing acceptance and acclaim also for people with unambiguous sex/gender. In this sense the concept of ‘five sexes’ is very progressive. But in a philosophical understanding even this concept of Fausto-Sterling restores the extreme end points, woman and man. The three additional categories seem to be created as well as named that way only as aberrance to woman and man. One must not do so. Fausto-Sterling and other scientists³⁶ and their concepts of equality lay the foundation for far-reaching concepts, which deconstruct the end pole categories ‘woman’ and ‘man’ and open the thinking for *differentiated, individual* characteristics which are non-classifiable.

¹ In the following the term ‘sex/gender’ is used instead of the terms ‘sex’ or ‘gender’. It makes clear that the more biological term ‘sex’ is also embedded in society and that there is no unaffected and unchangeable biological ‘sex’. In more biological descriptions it needs accustomizing to the term ‘sex/gender’ but it disrupts the reading. So the construction – also the biological one – of ‘sex/gender’ becomes obvious once more. Additionally, it is not possible to set clear boundaries between ‘sex’ and ‘gender’; historically the understanding of sex/gender and its boundaries were changeable. In German there is the term ‘Geschlecht’ which combines the meanings of the English ‘sex’ and ‘gender’. So in my opinion it is more useful for deconstructing both, ‘gender’ and ‘sex’.

² This article is a result of the researches for my dissertation ‘Geschlechterdekonstruktion aus biologisch-medizinischer Perspektive’ (working title; German, ‘Deconstructing Sex/Gender from a biological and medical point of view’). The dissertation will probably be published in 2010. I gratefully thank my friends M. Brade from www.mbtranslated.de and D. Caceres for proofreading this article.

³ The term ‘hermaphroditism’ designates people with both male and female physical, physiological, mental and sociocultural sex/gender characteristics. Sex/gender characteristics have lead to different classifications of hermaphroditism depending on historical and individual circumstances. The designation ‘hermaphroditism’ comprises two meanings, i.e. a person classified as hermaphroditic has *both female and male sex/gender characteristics* but also *their sex/gender characteristics are between as typical female or typical male defined sex/gender characteristics*. Today ‘intersexual’ is the usually used term. It emphasises the latter meaning of ‘hermaphroditism’, that the sex/gender characteristics of a person are between the sexes/genders. The terms ‘intersexuality’ / ‘intersex’ were created by R. Goldschmidt in 1916. Goldschmidt wanted to describe with these terms ambiguous phenotypic characteristics, which he assigned chromosomal clearly one sex/gender – female *or*

male [R. Goldschmidt, 'A Preliminary Report on Further Experiments in Inheritance and Determination of Sex', *Proceedings of the National Academy of Sciences of the United States of America* vol. 2, no. 1 (1916): 53-58, p. 54; R. Goldschmidt, 'Die biologischen Grundlagen der konträren Sexualität und des Hermaphroditismus beim Menschen', *Archiv für Rassen- und Gesellschaftsbiologie einschließlich Rassen- und Gesellschaftshygiene* vol. 12, no. 1 (1916): 1-14, p. 6.]. Additionally Goldschmidt used the term hermaphroditism for individuals who include both female and male germ cells – ovum and sperm [R. Goldschmidt, *Mechanismus und Physiologie der Geschlechtsbestimmung*, Berlin: Verlag von Gebrüder Borntraeger 1920, pp. 159/160; pp. 159-185.]. In this article 'hermaphroditism' is used because it is more open, the term 'intersexuality' is only used for chromosomal explanations in the sense used by Goldschmidt and for the intersex community, which is using the term to title themselves.

⁴ Both civil laws the 1794 Prussian 'Allgemeines Landrecht' and the 1756 Bavarian 'Codex Maximilianeus Bavaricus Civilis' guaranteed the right to choose the sex/gender, but only for the (very rare) case, that no medical prevailed sex/gender was found [See for example: A. Wacke, 'Vom Hermaphroditen zum Transsexuellen – Zur Stellung von Zwittern in der Rechtsgeschichte', in *Festschrift für Kurt Rebmann zum 65. Geburtstag*, München, 1989, 861-903, pp. 883-888]. The French situation was similar. For France, L. Daston and K. Park (1985) described that hermaphrodites were only in very rare cases free to choose their sex/gender in the 17th and 18th century. Sex/gender was a juridical and a medical category and medical 'experts' decided in cases of doubtful sex [L. Daston, K. Park, 'Hermaphrodites in Renaissance France', *Critical matrix* vol. 1, no. 5 (1985): 1-19]. In the newer French 'Code Civil' (1808) and the German 'Bürgerliches Gesetzbuch' (1900) there isn't such a exception for cases in those medicine can't found the 'true sex/gender' of a person [Wacke, 'Vom Hermaphroditen', 883-888].

⁵ M. Foucault, 'The birth of Social Medicine', in *Michel Foucault – Essential Works III: Power*, ed. J.D. Faubion, New York, 2000, 134-156. M. Foucault was wrong as he described that already in the 19th century 'social medicine' pertains everyone. His reflections are valid only for upper and middle classes, but not the lower ones. See for the hard, uncertain and unhealthy living of lower classes in Europe for example: B. von Arnim, *Dies Buch gehört dem König*, ed. I. Staff, 1982 (first ed. 1843), Frankfurt/Main: Insel Verlag, pp. 405-443; K. Marx, F. Engels, *Manifesto of the Communist Party*, London: William Reeves 1888 (first German ed. 1848), available online: <http://etext.library.adelaide.edu.au/m/marx/karl/m39c/> (last seen: 14.07.2008); J. Kuczynski, *Die Geschichte der Lage der Arbeiter in Deutschland – von 1800 bis in die Gegenwart*, Berlin: Die Freie Gewerkschaft Verlagsgesellschaft mbH, 1947, especially pp. 38-61; J. Kuczynski, *Die Geschichte der Lage der Arbeiter in England – von 1640 bis in die Gegenwart*, Berlin: Die Freie Gewerkschaft Verlagsgesellschaft mbH, 1949, especially pp. 99-124, 173-179 (see for descriptions in English: J. Kuczynski, *Labour Conditions in Great Britain 1750 to the Present*, New York: International Publishers, 1946).

⁶ See: Wacke, 'Vom Hermaphroditen', 879-881; see also: Y. Thomas, 'Die Teilung der Geschlechter im römischen Recht', in *Geschichte der Frauen – Band I Antike*, eds. G. Duby, M. Perrot, P.S. Pantel, Frankfurt/Main, New York, 1993, 105-171, p. 107.

⁷ See for example the classifications of hermaphroditism from A. Paré and G. Arnaud de Ronsil: A. Paré, *On Monsters and Marvels*, translated by J. L. Pallister, based on 'Des Monstres et prodiges', Chicago: The University of Chicago Press, 1982 (French first ed. 1573), pp. 26-31; G. Arnaud de Ronsil, *A Dissertation on Hermaphrodites*, London: Printed for A. Millar, 1750 (available online at Eighteenth Century Collections Online (ECCO)), especially pp. 17-20, 29.

⁸ See for Europe of the 12th/13th century: C.J. Nederman, J. True, 'The Third Sex: The Idea of the Hermaphrodite in Twelfth-Century Europe', *Journal of the history of sexuality* vol. 6, no. 4 (1996): 497-517; see for France of the 15th/16th century: Daston, 'Hermaphrodites in Renaissance France'; K.P. Long, 'Sexual Dissonance: Early Modern Scientific Accounts of Hermaphrodites', in *Wonders, Marvels, and Monsters in Early Modern Culture*, ed. P.G. Platt, Cranbury, London, Ontario, 1999, 145-163; K.P. Long, *Hermaphrodites in Renaissance Europe*, Hampshire, Burlington: Ashgate Publishing Company, 2006; see for England of the 16th/17th century: R. Gilbert, *Early Modern Hermaphrodites – Sex and other Stories*, Houndmills, Basingstoke, Hampshire, New York: Pallgrave, 2002; J.C. Mann, 'How to Look at a Hermaphrodite in Early Modern England', *Studies in English literature 1500-1900* vol. 46, no. 1 (2006): 67-91.

⁹ References to ancient philosophies are taken in exact small boundaries. Therewith it should be described that in the making of 'new knowledge' modern western biological and medical sciences took those into account. By no means should it be claimed that knowledge is historically homogenous or develops continuously. See for the different ancient natural philosophies of sex/gender: H.-J. Voss, 'Das differenzierte Geschlechterverständnis der Antike', in progress (It is a critical statement to the simplifying descriptions in T. Laqueur, *Making Sex – Body and Gender from the Greeks to Freud*, Cambridge, London: Harvard University Press, 2003 (first ed. 1990)).

¹⁰ T. Laqueur (2003 (1990)) was wrong when he wrote, there was an ancient 'one sex model', in which the woman was only described as imperfect man / human. Ancient natural philosophical theories about sex/gender were very differentiated and some of the natural philosophers – such as Hippocrates, Aristotle, Galenos or Soranos – described physically and physiologically differences between two sexes/genders. But Laqueur was

right, when he wrote, that definitions of sex/gender were historical different and changeable [Laqueur, *Making Sex*]. To show that scientific knowledge is socially and culturally embedded, and to abandon today's western two sex/gender model it is better to realize, that to no time there was only one not discussed and not contradicted natural philosophical sex/gender model. See for a differentiated understanding for example: E. Lesky, 'Die Zeugungs- und Vererbungslehre der Antike und ihr Nachwirken', *Abhandlungen der Geistes- und Sozialwissenschaftlichen Klasse*, 19 (1950): 1-201, pp. 182/183; R. Flemming, *Medicine and the making of Roman women: gender, nature and authority from Celsus to Galen*, Oxford: University Press, 2000, pp. 323/324.

¹¹ It was frequently presupposed in historical (but also today's) biological and medical sciences, that male development needed some active stimuli, however female development happens without additional effects. The man was understood as superior evolution, but the woman as basically, primitive status. This patriarchal thinking was criticized and refused as sexism by feminist scientists. See for example: R. Bleier, *Science and Gender – A Critique of Biology and Its Theories on Women*, New York: Pergamon Press, 1984, pp. 2-7; L. Birke, *Women, Feminism and Biology – the Feminist Challenge*, Brighton: Harvester Press, pp. 14-25; A. Fausto-Sterling, *Myths of Gender. Biological Theories about Women and Men*, New York: Basic Books, 1992 (first ed. 1985); L. Schiebinger, *The mind has no sex – women in the origins of modern science*, Cambridge, London: Harvard University Press, 1989, pp. 268-297.

¹² See: R. Virchow, 'Der puerperale Zustand. Das Weib und die Zelle', in *Gesammelte Abhandlungen zur wissenschaftlichen Medizin*, ed. R. Virchow, Frankfurt/Main, 1856 (article from 1847), 735-779, p. 747. Except for small modifications the English translation of this passage is removed from: C. Sengoopta, 'The modern ovary: constructions, meanings, uses', *History of Science* vol. 38 (2000): 425-488, p. 428.

¹³ See: H. Stoff, *Ewige Jugend – Konzepte der Verjüngung vom späten 19. Jahrhundert bis ins Dritte Reich*, Köln, Weimar, Wien, 2004, pp. 30-43.

¹⁴ See for difficulties of physicians deciding the sex/gender of a person and for some physicians which follow patients' will: T. Landau, 'Ueber Hermaphroditen. Nebst einigen Bemerkungen über die Erkenntnis und rechtliche Stellung dieser Individuen', *Berliner klinische Wochenschrift* vol. 15 (1903): 339-343; T. Landau, 'Mann oder Weib? Bemerkungen zu dem Aufsatz v. Neugebauer's in d. Bl. 1904 Nr. 2', *Zentralblatt für Gynäkologie* no. 7 (1904): 203-204; F.L. von Neugebauer, 'Mann oder Weib? Sechs eigene Beobachtungen von Schweinzwittertum und „Erreuer de sexe“ aus dem Jahre 1903', *Zentralblatt für Gynäkologie* no. 2 (1904): 33-51. Critical to the following of the patients will: F.J. Taussig, 'Shall a Pseudo-hermaphrodite be allowed to decide to which sex he or she shall belong?', *American journal of obstetrics and diseases of women and children* vol. 49 (1904): 162-165. For this debate see also: A.D. Dreger, *Hermaphrodites and the Medical Invention of Sex*, Cambridge, London: Harvard University Press, 2003 (first ed. 1998), pp. 110-126, 166; G. Mak, 'Das vergeschlechtlichte Selbst als Nebenprodukt der medizinischen Geschlechter-Konstruktion. Hermaphroditen in klinischen Begegnungen im 19. Jahrhundert', *Invertito* vol. 6 (2004): 95-109, pp. 103-108; G. Mak, "'So we must go behind even what the microscope can reveal" – The Hermaphrodite's "Self" in Medical Discourse at the Start of the Twentieth Century', *GLQ* vol. 11, no. 1 (2005): 65-94, pp. 73-79; R. Herrn, 'Das Geschlecht ruht nicht im Körper, sondern in der Seele – Magnus Hirschfelds Strategien bei Hermaphroditengutachten', in *Das Zwei-Geschlechter-System als Menschenrechtsverletzung*, eds. 1-0-1 [one 'o one] intersex, Berlin, 2005, 55-71.

¹⁵ Preambulation: The ancient adherents of the theory of pangenesis (among others Empedocles, Leukippos, Demokritos, Corpus Hippocraticum, Galenos) believed, that seed was made up of an extract of all parts of the body – therefore the seed would present all body parts. Epigenesis: The ancient philosophers Diogenes and Aristotle thought, that seed would be cooked from blood and that only the man, but not the woman had seed (the woman would have only an earlier stage of seed, which they called katamenia). Diogenes and Aristotle believed that the woman would give the material, which would be formed by the heat of the seed of the man; they believed that differentiation would be necessary.

¹⁶ Adam and Eve were thought in Christian religion being the first humans, and that all humans have descended from them.

¹⁷ See: U. Mittwoch, 'Three thousand years of questioning sex determination', *Cytogenetics and Cell Genetics* vol. 91 (2000): 186-191, p. 188.

¹⁸ This controversy is described by: L. Moszkowicz, 'Intersexualitätslehre und Hermaphroditismus und ihre Bedeutung für die Klinik', *Klinische Wochenschrift* vol. 8, no. 7 (1929): 289-294, and vol. 8, no. 8 (1929): 337-342.

¹⁹ J. Halban, 'Die Entstehung der Geschlechtscharaktere. Eine Studie über den formativen Einfluss der Keimdrüse', *Archiv der Gynäkologie* vol. 70 (1903): 205-308.

²⁰ See for some impressions: R. Goldschmidt, *Die sexuellen Zwischenstufen*, Berlin: Verlag von Julius Springer, 1931, especially pp. 1-16.

²¹ See footnote 3.

²² Those chromosomes, X and Y, are described as 'sex chromosomes'. This definition is simplifying because a lot of chromosomes (like chromosome 1, 9, 11) in the process which is seen as determining the outlook of outer and inner genitals are involved.

²³ See for biological accounts to sex/gender determination for example: S.F. Gilbert, *Developmental Biology*, Sunderland: Sinauer Associates, 2000, pp. 523-545; L. Pinsky, R.P. Erickson, R.N. Schimke, *Human Disorders of Human Sexual Development*, Oxford: Oxford University Press, 1999.

²⁴ See for short remarks to such an understanding: B.L. Hausman, *Changing Sex. Transsexuality, technology and the idea of gender in the 20th Century*, Durham, London: Duke University Press, 1995, p. 77; L.B. McCullough, 'A framework for the ethically justified clinical management of intersex conditions', in *Pediatric Gender Assignment – A Critical Reappraisal*, eds. S.A. Zderic, D.A. Canning, M.C. Carr, H. McC. Snyder, New York, 2002, 149-173, pp. 152-156; O. Tolmein, 'Recht und Geschlecht – ein Plädoyer für die Anerkennung von Hermaphroditen', in *Das Zwei-Geschlechter-System als Menschenrechtsverletzung*, eds. 1-0-1 [one 'o one] intersex, Berlin, 2005, 128-135, pp. 129/130.

²⁵ See for example: H. W. Jones, W. W. Scott (Eds.), *Hermaphroditism, Genital Anomalies and Related Endocrine Disorders*, Baltimore: The Williams & Wilkins Company, 1971, p.193-196; A. de la Chapelle, Analytic Review: Nature and Origin of Males with XX Sex Chromosomes. *Amer J Hum Genet* vol. 24 (1972): 71-105.

²⁶ See: A. Ljungqvist, 'Gender Verification', in *Women in Sport*, ed. B. L. Drinkwater, Oxford, London, Edinburgh, 2000, 183-193.

²⁷ See: F. Mussmann, *Komplexe Natur – Komplexe Wissenschaft. Selbstorganisation, Chaos, Komplexität und der Durchbruch des Systemdenkens in den Naturwissenschaften*, Opladen. Leske/Budrich 1995.

²⁸ For example a surgery of opening the vagina for promoting menstruation and the wants of the patient for putting away the clitoris/penis was described by Arnaud de Ronsil in the 18th century; see: Arnaud de Ronsil, *A Dissertation on Hermaphrodites*, 30-42.

²⁹ Money and the Hampsons referred to the 'theory of bisexuality' (German: 'Bisexualitäts-Theorie') which points out, that every human is both, woman and man. Every human would have male and female characteristics, which finally develops more or less unisexual through socialization. Freud, W. Fließ, O. Weininger in the first decade of the 20th century thought that each individual is woman and man in differently portions. During life sexuality and other psychical as sexed/gendered seen characteristics would develop.

³⁰ Lorenz delineated that imprinting (German: 'Prägung') is essential for the development of behaviour. Lorenz was self-declared Nazi and used his racist, sexist and inhuman conviction for his career – retaining this thought during life up to death, 1989.

³¹ J. Money, J.G. Hampson, J.L. Hampson, 'Hermaphroditism: Recommendations concerning assignment of sex, change of sex, and psychological management', *Bulletin of the Johns Hopkins Hospital* vol. 97, no. 4 (1955): 284-300; J. Money, J.G. Hampson, J.L. Hampson, 'An examination of some basic sexual concepts: The evidence of human hermaphroditism', *Bulletin of the Johns Hopkins Hospital* vol. 97, no. 4 (1955): 301-319; J. Money, J.G. Hampson, J.L. Hampson, 'Imprinting and the Establishment of Gender Role', *AMA archives of neurology and psychiatry* vol. 77 (1957): 333-336.

³² A. Fausto-Sterling, *Sexing the body – gender politics and the construction of sexuality*, New York: Basic Books, 2000.

³³ S. Hirschauer, 'Die soziale Konstruktion der Zweigeschlechtlichkeit', *Kölner Zeitschrift für Soziologie und Sozialpsychologie* vol. 46, no. 4 (1994): 668-692, pp. 675-679.

³⁴ Fausto-Sterling, *Myths of Gender*; Fausto-Sterling, *Sexing the body*.

³⁵ A. Fausto-Sterling, 'The Five Sexes – Why Male and Female Are Not Enough', *The Sciences*, March/April 1993: 19-25; A. Fausto-Sterling, 'The Five Sexes, Revisited – The Varieties of Sex Will Test Medical Values and Social Norms', *The Sciences*, July/August 2000: 17-23.

³⁶ For some accounts in German language see: S. Ebeling, S. Schmitz, S. (eds.), *Geschlechterforschung und Naturwissenschaften – Einführung in ein komplexes Wechselspiel*, Wiesbaden: VS Verlag, 2006; B. Mauss, B. Petersen (eds.), *Das Geschlecht der Biologie (NUT-Schriftenreihe Band 11)*, Mössingen-Thalheim: Talheimer Verlag, 2006.