

Sex¹ In The Making – A Biological Approach.²

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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 for 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 biopolitics –, 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 on hermaphroditism in the western world). Often hermaphrodites did not survive childhood or were convicted of witchcraft or sodomy (by this time a popular indictment of transgressive behavior against morality, e. g. sexual relationships with the same sex/gender). Western law originates in 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. According to the canonical law, the affected person was allowed to choose her / his sex / gender in case medical experts were unable to determine it. 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 until 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 appearance in moving and acting were supposed.

Not rarely physicians disagreed. 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 would belong to a third sex/gender, different from both man and woman. 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 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 the highly regarded classification of hermaphrodites of E. Klebs (1876) the gonads have been depicted the most important sex/gender character. 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 with male and vice versa. Both these experiments and his experiments with rejuvenation found much response.¹³ Subsequently, the focus was on the gonads, and the identification of testis or ovaries was deemed medically and judicially necessary for determination of sex/gender. Only if both, testis and ovaries, were found, a person was declared being hermaphroditic. To the biologists and physicians of the 19th and 20th centuries, this case seemed to be very rare.

But the assertion of the sex/gender of the gonads was difficult in practice, because testes and ovaries were regarded as having parts 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 and started removing tissue by biopsy. These operations were extremely dangerous. Some physicians promised patients the diagnosis they preferred, but only if they went along with the operation (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 as hereditary, either as preformed (theory of preformation, dominant in the 18th century) or as epigenetic (theory of epigenesis, dominant in the 19th and 20th centuries). 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 sperm, 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 contribution 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 the female part in the generation to be limited to the nourishment of the embryo. The theory of epigenesis, formulated in 1759 by C. F. Wolff, (and today considered as the origin of 'modern embryology') went against the

theory of preformation and the hypothesis that a simple growth in size would be sufficient for the development of the embryo. According to Wolff, the embryo was originally constituted by undifferentiated material which then differentiated and finally turned into 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 meiosis results in two types of sperm, different in their chromosomal structure. C. E. McClung, E. B. Wilson, N. M. Stevens described male and female individuals as possessing a difference in chromosomes. The two chromosomes different in length. The shorter was named 'Y' in 1909 and the longer 'X' in 1911.¹⁶ 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 approach towards sex/gender determination in biology for all beings, for flora and fauna alike, and clutched to the gonads as sex/gender determiners.¹⁷

Important advances in chromosomal thinking of sex/gender difference were made by J. Halban and R. Goldschmidt. Halban (1903)¹⁸ 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 differ in termination. So, the gonads developed the fastest (by 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 supportive organs, but did not think that they had 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 believed that all cells, tissues, organs had to be differentiated according to 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)¹⁹ developed a more differentiated theory than Halban, he composed a logical overall concept. He included the knowledge of chromosomes and looked for principles in sex/gender determination. Goldschmidt's research focused on insects (especially *Lymantria dispar*), but he declared his results universally applicable. In the opinion of Goldschmidt, the development of sex/gender 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 claimed 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)²⁰ 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 more far-reaching would the intersexuality of an individual be; a very early turning point would lead to sex/gender appearance contradicting 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.

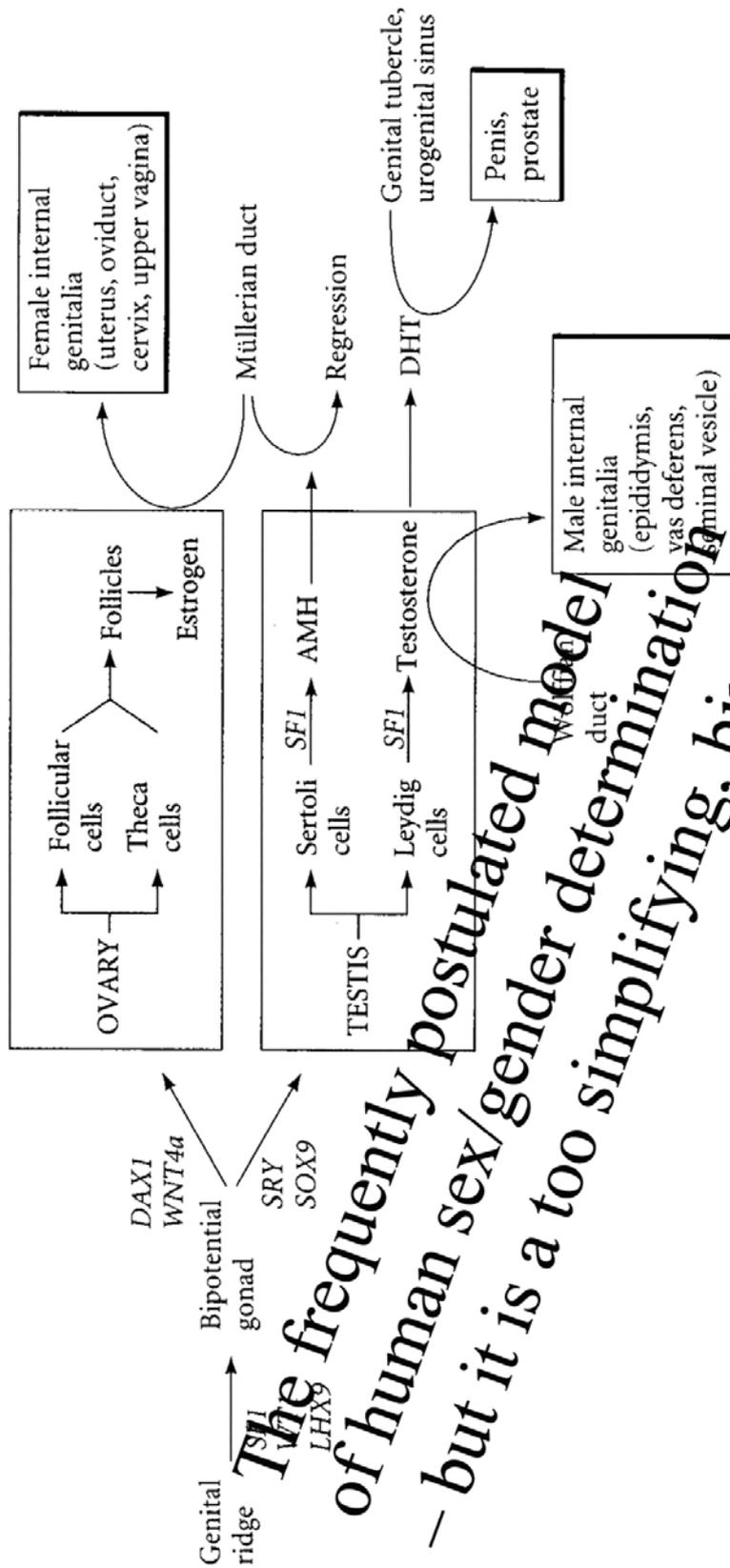
Today's sex/gender-cascades combining gonadal and chromosomal sex/gender theories

The depicted theories on sex/gender determination seem to be fundamentally antithetic. The reception of theories focusing on gonads and those describing chromosomes as crucially sex/gender determining, varies between different scientific fields. Biologists have tended to focus on chromosomes, whereas medical scientists have seen gonads as decisive in sex/gender determination. Today's accounts from the mid 20th century onwards reconcile both concepts: According to them 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 male²¹ – start at a sequence cascade with lots of subsequent steps, which all are necessary for the development of fully female or male 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 considered as female was not examined, or rather was only much later examined, than the development considered as male. So, SRY was ‘discovered’ much earlier than DAX1. 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 morphological structures typically regarded as male (penis, prostate, epididymis, vas deferens and seminal vesicle) (see image 1).²²

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. Some biologists even describe the brain as a binary organ, divided along sex / gender lines, thus ignoring 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!

Picture 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, WNT4α, 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; WNT4α: 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

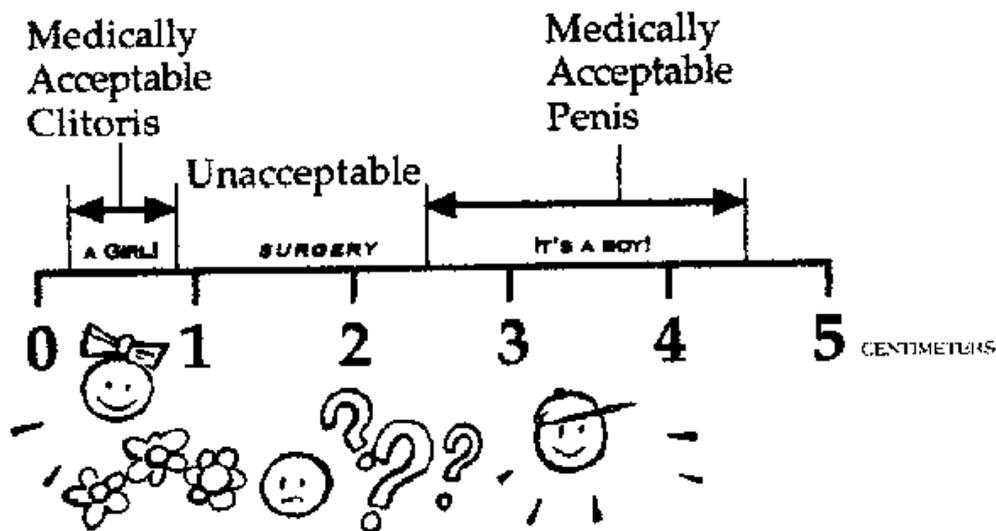
As we have seen, biological and medical understanding of sex / gender differentiation has varied a great deal. Behavior, gonads and hereditary predispositions were historically seen differently as the most important signs for the 'true', binary understood, sex/gender. It became clear that social, especially judicial 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 and only true sex/gender of a patient. *Chromosomal sex/gender, genetic sex/gender, gonadal sex/gender, inner genitalia, outer genitalia*; finally *the sex/gender of rearing* announce the variety of sexes/genders, which biology and medicine created.²³ 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 (a set of chromosomes typically classified as female) and penis and testes which emit sperm (as physical and physiological characteristics that are typically classified as male).²⁴ There are women who were prevented from starting at The Olympic Games because of high levels of testosterone (a hormonal status typically classified as male) or because of chromosome constitution.²⁵ 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 hinder thinking of complexity and variability.²⁶ So individual differences could probably be described and not classified in a sexist way. Desexing / degendering characteristics could open new possibilities for desire and love, possibilities that go beyond homo- or heterosexual fixation on the outer genitalia.

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

There are other, more emotional reasons for fighting against a socially and biologically restrictive two-sex/gender-system. Until the middle of the 20th century, surgical treatment was difficult to conduct and dangerous for the patient. Surgeons developed operations that did not put their patients' lives in too great a danger. Clitoris excision, for instance, for regarded as relatively harmless, because the part removed was regarded as superfluous. However, not even such minor surgery was without risk of infection.²⁷ People who were surgically treated

for ambiguous genitalia were usually between 20 and 25 of age. Since it was believed that the outer genitalia could developed late, surgeons usually refused to perform genital surgery on patients under 25.

Since the 1950s, medical and surgical treatment of individuals with ambiguous genitalia has become more common. In stark contrast with the traditional practice, surgery started to be performed mainly on very young children. In the 1950s J. Money, J. G. Hampson and J. L. Hampson declared, with reference to S. Freud²⁸ and K. Lorenz²⁹, 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 would not 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 was cruel to let the child grow up with ambiguous genitalia and doubtful sex / gender. Society expected 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.³⁰ The first sign of unambiguous sex/gender in the medical practice is the appearance 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*, 59.³¹

Do no harm! In the last few decades, affected people have fought against early reassignment of their sex/gender, with some success. These agonizing procedures are thus more and more under discussion and scrutiny. Some physicians, ethicists and jurists support these struggles. Physicians want to see more cooperation, and welcome better informed and more self-determined patients. Ethicists declare early sex/gender reassignments to be physical injuries, because these are performed without the agreement of the affected children themselves. They argue that a meaningful agreement can only be made at a later age, of fourteen, sixteen or above. Lawyers dispense laws which save and increase the rights of patients and make physicians' mistakes 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

Sex, although more a 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 principle 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’.³²

In the last decades some critical accounts of sex/gender differences have seen the light. 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 is largely responsible for initiating these debates and described equality between woman and man in a far reaching way.³³ 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’).³⁴ ‘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’s restores the extreme end points, woman and man. The three additional categories seem to be perceived only as deviations from woman and man, which is unacceptable. Fausto-Sterling and other scientists³⁵ 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’. This usage makes clear that the more biological term ‘sex’ is also embedded in society and that there is no unaffected and unchangeable biological ‘sex’. 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 research for my doctoral dissertation ‘Geschlechterdekonstruktion aus biologisch-medizinischer Perspektive’ (title; German, ‘Deconstructing Sex/Gender from a biological and medical point of view’). The dissertation is published in 2010: "Making Sex Revisited: Dekonstruktion des Geschlechts aus biologisch-medizinischer Perspektive" (Bielefeld, 2010, engl. "Making Sex Revisited: Deconstructing sex from a biological and medical point of view"). I gratefully thank my friends M. Brade from www.mbtranslated.de, S. A. Wolter 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 led 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', i.e. 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 when he claimed that already in the 19th century 'social medicine' pertained everyone. His reflections are valid only for the upper and middle classes, but not for 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, 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, *Making Sex Revisited – Dekonstruktion des Geschlechts aus biologisch-medizinischer Perspektive*, 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 that 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*]. In order to show that scientific knowledge is socially and culturally embedded, and in order to efficiently question the present-day bipolar model of sex / gender, one needs to appreciate that there has in fact never been a singular, unquestioned 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, while female development happened without additional effects. The man was understood as superior evolvment, but the woman as basically, primitive status. This patriarchal thinking was criticized and refused as sexist 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 Medicin*, ed. R. Virchow, Frankfurt/Main, 1856 (article from 1847), 735-779, p. 747. Except for small modifications, the English translation of this passage is quoted 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 T. Landau, ‘Ueber Hermaphroditen. Nebst einigen Bemerkungen über die Erkenntniss 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 Preformation: The ancient adherents of the theory of pangensis (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 was 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 See: U. Mittwoch, ‘Three thousand years of questioning sex determination’, *Cytogenetics and Cell Genetics* vol. 91 (2000): 186-191, p. 188.

¹⁷ 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.

¹⁸ J. Halban, ‘Die Entstehung der Geschlechtscharaktere. Eine Studie über den formativen Einfluss der Keimdrüse’, *Archiv der Gynäkologie* vol. 70 (1903): 205-308.

¹⁹ See for some impressions: R. Goldschmidt, *Die sexuellen Zwischenstufen*, Berlin: Verlag von Julius Springer, 1931, especially pp. 1-16.

²⁰ See footnote 3.

²¹ Those chromosomes, X and Y, are described as ‘sex chromosomes’. This definition is simplifying because the process which is regarded as determining the outlook of the inner and outer genitalia involves a lot of chromosomes (e.g. chromosomes 1, 9, 11).

²² For biological accounts on sex / gender determination, see 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.

²³ For short remarks to such an understanding, see: 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.

²⁴ 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.

²⁵ See: A. Ljungqvist, ‘Gender Verification’, in *Women in Sport*, ed. B. L. Drinkwater, Oxford, London, Edinburgh, 2000, 183-193.

²⁶ See: F. Mussmann, *Komplexe Natur – Komplexe Wissenschaft. Selbstorganisation, Chaos, Komplexität und der Durchbruch des Systemdenkens in den Naturwissenschaften*, Opladen. Leske/Budrich 1995.

²⁷ For example, Arnaud de Ronsil describes, in the 18th century, the operation for opening the vagina for promoting menstruation, and he also discusses patients who wish to have their clitoris or penis removed. Arnaud de Ronsil, *A Dissertation on Hermaphrodites*, 30-42.

²⁸ 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 being has 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. Outward sexual characteristics will evolve in the course of life.

²⁹ 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.

³⁰ 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.

³¹ A. Fausto-Sterling, *Sexing the body – gender politics and the construction of sexuality*, New York: Basic Books, 2000.

³² S. Hirschauer, ‘Die soziale Konstruktion der Zweigeschlechtlichkeit’, *Kölner Zeitschrift für Soziologie und Sozialpsychologie* vol. 46, no. 4 (1994): 668-692, pp. 675-679.

³³ Fausto-Sterling, *Myths of Gender*; Fausto-Sterling, *Sexing the body*.

³⁴ 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.

³⁵ 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.