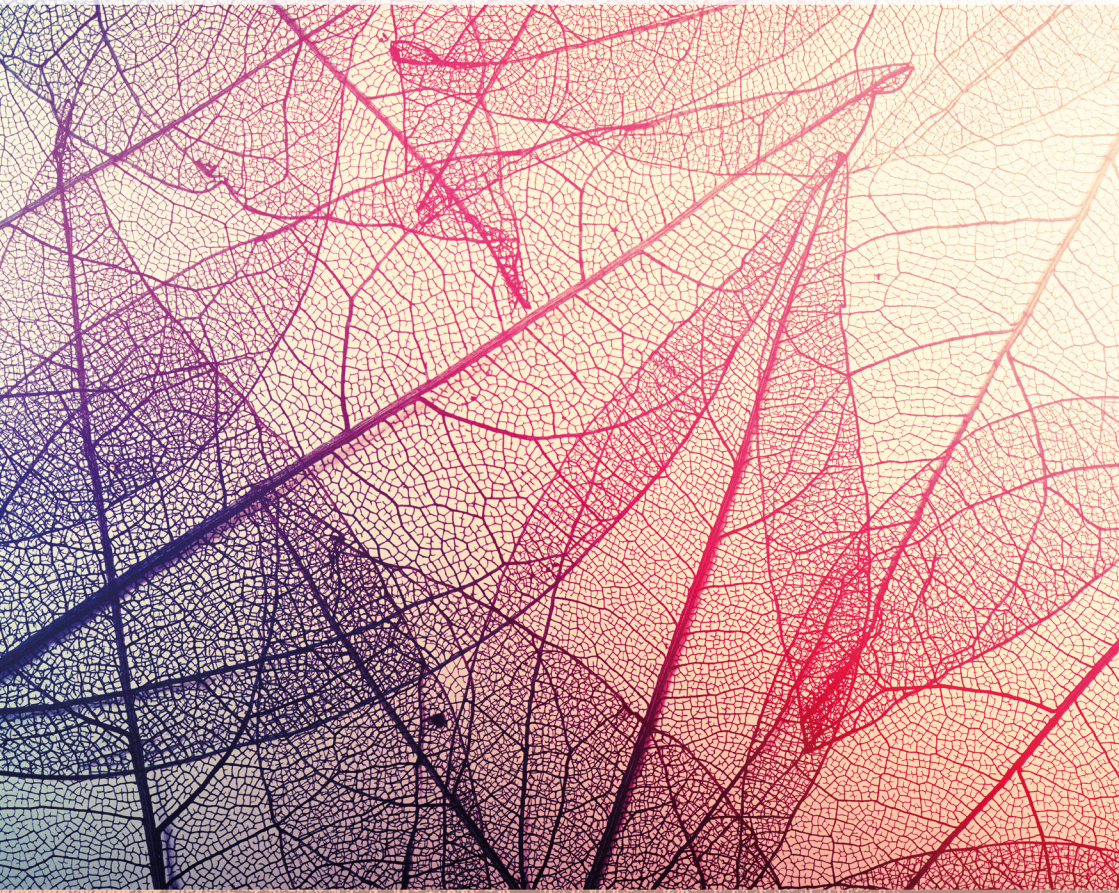
Heinz-Jürgen Voß

The Intricacy of the Human Sexes



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The series »Applied Sexual Science« seeks dialogue: it has an interdisciplinary outlook and particularly aims to link theory and practice. Members of the academy and of practical projects such as counseling centers and self-help organizations get into conversation with one another at eye-level. In this way, it might be possible to shorten the often lengthy transfer processes through which practical experiences have been making their belated entrance in scientific institutions. At the same time science may thus contribute to underpin and contextualize new concepts.

The series is based on a positive understanding of sexuality. The focus here is on the question of how a self-determined and appreciative approach to sex/gender and sexuality can be promoted in society. Sexuality is regarded as being embedded in social contexts: in modern bourgeois societies it is an area of life in which gender, class, and racist relations as well as ideological preconditions intersect, and often conflictually so. Simultaneously, in this area negotiations about an open and diversity-accepting development of society take place.

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Content

Foreword to the English Translation of the 4th Edition

Socially speaking, much has happened since the first edition of *Geschlecht: Wider die Natürlichkeit* was published in 2011. Today, the conclusions drawn from forming biological theories, as outlined here, are part of the standardized toolbox of scientifically reflecting »gender« and, more specifically, »sex« as the »biological gender.« As late as 2015, Claire Ainsworth could rightly assert in her summarizing article for the biological journal »Nature« that »biologists may have been building a more nuanced view of sex, but society has yet to catch up« (Ainsworth, 2015, 219). Yet it is obvious today, that the »nuanced view« of sexual development has broken the confinements of the experts' discussions. Many contributions to popular papers weigh equally the character of the biological sex (and its resulting diversity) but also its placement within more traditionally minded segments of society. These articles from the popular press continue propagating the view of clear-cut binary sexes, true, but nevertheless do discuss the perspectives as they are suggested here. Those segments also feel bound to propose several options of compromise. Such a debate may be an opportunity for adapting a concept of »the sex« which avoids discrimination, but also one to provide for a more open scholarly forum. Following the concept of *deconstruction*, more and more perspectives may be presented or created.

A word on terminology used in this translation: the German language (in which this book was originally written) does not differentiate between the social »gender« and the biological »sex.« It is the single »*Geschlecht.*« This book before you, however, does argue that the difference between »gender« and »sex« are marginal. Both are social

constructs. Therefore, the distinction between those two English words may apply when due. The focus of the discussion is on »sex« as a social construct, not necessarily gender. Also, translations from German sources which have been previously published are noted as such. All others follow the German original.

It becomes more and more clear that sex and the relationships of the sexes must be seen in their context but also as interwoven with racism and our understanding of capital. This monograph, *The Human Sexes as Biological and Social Inventions*, has outlined the connections since the first edition by developing views on »sex« from a »materialistic«, a Marxist understanding. It has presented the factual living conditions of people in a society marked by its Capitalist structure. The following monograph, *Queer and (Anti-)Capitalism*, written by Salih Alexander Wolter and myself in 2013, follows this concept. It presents just how (and why) people are categorized in the »modern«, bourgeoise social structure, but also what role is played by arguments of »naturalness.« By understanding the categories/power relations of »race«, class and sex as interwoven, the opportunity for new insights arise.

A substantial debate of this topic – and beyond – necessarily requires all participants to be interested in other perspectives. It requires them (us) to willingly think in interlinked and complex structures, but also to willingly question what may be perceived as self-evident. Debate depends on a respectful exchange. Some »participants« have chosen a less than respectful critical approach to the discussion. Instead they have taken the path of unsympathetic attack. Hatefulness and hate-speech have become tools for discrediting »adversarial« and especially emancipatory arguments. Therefore, it is vital to insist on a consensual culture of civil debate.

Some critical and, at times, even pointed discussion may be essential when societies re-negotiate the »right« path, as they have always done. Yet any discussion must not harm the integrity of the participants. Such a democratic, open, and accepting culture of debate deserves to be upheld, especially in these days of increasing threats from racist, nationalistic, and right-wing powers. Their aggressive style of argumentation must not leave an imprint on the democratic or even the emancipatory culture of discussion.

Current society is marked by a binary-normative concept of sex, and is especially discriminatory against trans* and inter* people, and subjects them to violence. They are even more at risk if they are *of color*. In this case, it is vital for cis-men and -women, i. e., those unquestionably accepting their sex as assigned at birth, to demonstrate solidarity.

Attack-style discussions may be countered by referring to scientific conclusions. As one example, right-wing populists and extremists currently employ the term »gender-ideology« to discredit some newer insights to sex by the disciplines of gender studies or biology. Yet, when looking closely and scientifically, employing the term of »gender-ideology« for such an attack makes little sense. In its scientific usage the term does, in fact, describe the dominant, stereotypical binary concept which the attackers seek to defend. It may be a helpful strategy to use the term »gender-ideology« in an emancipatory way as the scientifically based term for analysis. This scientific discussion of the term »ideology« as focused on the subject of sex may conclude the introductory remarks to the fourth edition. Here, too and following the intention of this monograph, »gender« and »sex« are discussed in light of their social development:

The philosopher Louis Althusser wrote in his *Idéologie et appareils idéologiques d'État:* »As is well known, the accusation of being in ideology only applies to others, never to oneself [...] That is why those who are in ideology believe themselves by definition to be outside of ideology.«[1] Only a scientific approach at least partially allows one to glimpse an ideology from the outside. Even there, this glance may (or, better, will) be limited, as ideology also affects scholars. Althusser discusses several aspects of society in a critical way in which ideology (which he understands as un-reflected action) is the primary means to govern people, while repressive means remained secondary. According to Althusser, »Schools and Churches use suitable methods of punishment, expulsion, selection, etc., to ›discipline‹ [repressively] not only their shepherds, but also their flocks« (ibid.) Yet, children are essentially integrated into the ideological structure of society in a non-repressive way. Through ideology, they are

1 Althusser, Louis (1971). »Ideology and Ideological State Apparatuses«. Lenin and Philosophy and other Essays. pp. 121–176. *Translated* from the French by Ben Brewster. https://www.marxists.org/reference/archive/althusser/1970/ideology.htm

formed to *subjects* at schools, churches, etc., and thus rendered manageable and governable.

Ideology, in such a scientific-analytical sense is often absent in the current debates. It is nothing a person simply adopts and represents. Ideology always must be seen under the conditions of social relations to power and the structures of order. For this reason, Althusser refers to »ideological state apparatuses«, as ideology is the predominant form of exerting power in areas of society which the Italian Marxist Antonio Gramsci terms »civil society« (in order to contextualize Althusser and Gramsci, as well as their approaches: see *Queer und [Anti-]Kapitalismus* [Voß/Wolter 2013], 35 et seqq.).

According to Althusser, the areas which are primarily affected by ideology and which therefore have to be seen as »ideological state apparatuses« are religious life, school, family, the legal system, politics, unions, media, and culture as such, but also literature and sports. One of the more prominent, and clear, examples is the women's rights movement's demand to understand the private sphere as political as well. Social structures and bourgeoise ideology are present in the private sphere, the family, such as when women are functionalized as housewives and caretaker for the children.

These and other debates are being discussed at current Feminist congresses such as the female double burden of working and having to raise the children, but also the intersectional interwovenness of gender relations with racism and class-based conditions. White women, too, profit from racial conditions and the overexploitation of the global south by the north, for instance. Following Althusser in a scientific-analytical sense, we are dealing with a *racist ideology* that limits the options for social mobility for those who are defined as »migrants« of any generation in German society.[2] It is also a gender-ideology which limits and defines the scope and sphere for white, bourgeoise women – and which makes even those women appreciate their conditions as »fair« and »justified.«

Those examples are well-known, when considering books such as *Guten Morgen, du Schöne* (English as *Good Morning, My Lovely*, 1977, by

2 A note to context: as this monograph was originally written in German, references are also often stated in their German context as exemplary for other modern societies.

Maxie Wander) and the initial publication of the *Black*[3] German women's movement's *Farbe bekennen: Afro-deutsche Frauen auf den Spuren ihrer Geschichte* (English as *Showing Our Colors: Afro-German Women Speak Out*, 1986/Engl. 1992, ed. by Katharina Oguntoye, May Ayim, Dagmar Schultz).

If gender-ideology, however, moves beyond the Patriarchal suppression of women it is rarely understood or interpreted as such. This is rather surprising as Louis Althusser, again, wrote in detail on the matter as early as 1970/71. He pointedly discussed the importance of gender-ideology, meaning the development of children to female or male subjects of the state, when writing that:

> »it is certain in advance that [the child] will bear its Father's Name, and will therefore have an identity and be irreplaceable. Before its birth, the child is therefore always-already a subject, appointed as a subject in and by the specific familial ideological configuration in which it is ›expected‹ once it has been conceived. [...] [T]he former subject to-be will have to ›find‹ ›its‹ place, i.e. ›become‹ the sexual subject (boy or girl) which it already is in advance« (Althusser, 1970/71).

Thus gender-ideology leads to expecting every child as »girl« or »boy.« In many cases, the child's bedroom is prepared accordingly, and the first question after birth is often: »Is it a boy or a girl?« Parents may prevent the question by dressing the child in pink or bright blue – as society deems those colors as inherently defined as female or male ones. But even if parents wish to raise the child in an as gender-neutral way as possible, they are constantly confronted with expectations by the state (civil registry), and the religious, educational, family, cultural etc. ideological state apparatuses.

Although the social *character* of creating sex is apparent, the ideological structures – both within the family and society in general – have become so solidified that the *process* of creating sex is rather ignored. *Gender-ideology* is so pervasive that is has become almost impossible to question the

3 By definition, *Black* is capitalized as it refers to a marginalizing position, not to any feature which could be essentialized.

social conditions of creating sex, or the importance of sex in the modern, bourgeoise society. Scientific understanding fails against the *ideological state apparatuses*. »Naturalness« is often used in this context.

Whether referring to »God« or »Nature«: society cherishes the ideology that the infant, the new-born child, unquestionably has a sex. Society does not seriously discuss expectations, the abstractions that go along the chromosome perspectives, the ultra-sound images and their interpretations which are based on mathematical algorithms, or reports of medical experts. Scientific insights into the matter – which Althusser described as possible through fundamental analysis – are, historically speaking, the result of feminist agents in their respective disciplines in Germany. They are more currently discussed in the institutionally rather marginalized *gender studies* (in contrast to the US, for instance, there are no institutionally organized German *gay* or *queer studies*).

Judith Butler, the feminist and queer theoretician, for instance, was met with fierce resistance when publishing the German translations of *Gender Trouble: Feminism and the Subversion of Identity* (1991) and *Bodies that Matter: on the Discursive Limits of »Sex«* (1997). This, while Butler basically concludes the same as Louis Althusser did in 1970: she contextualized in her work the fundamental issues of how sex is created in society. Different from other feminist authors, but like Althusser, she also considers seemingly unquestionable, clear-cut biological certainties. Butler outlines that even the physical and psychological features are only read and interpreted by society. Thus, Butler addresses one of the pillars of the prevailing ideology then.

Enjoy this revised and up-dated edition in its English translation,

Heinz-Jürgen Voß, Hanover, March 2018/July 2021

Foreword to the 1st German Edition

Hardly any other subject leads to more uninformed discussions than that of »sex« and the matter of its »naturalness.« Participants often refer to popular literature that cites repeatedly rehashed conclusions of biological research which have long since been criticized for their lack of methodological soundness. Those researches of sex themselves begin by grouping people as »women« and »men.« Further methodological endeavors then follow this binary classification. The result is the difference between »woman« and »man.« *But how should they come to any other conclusion when proceeding that way?*

Often, and moreover, conclusions are drawn from researches dealing with no more than twenty, ten, six or even one single individual yet, they lead to far-reaching conclusions for the »female« and »male« sex. Even the emancipatory gender studies and politically interested young people far too often rely on conclusions of biology or medicine, without looking at the tasks of research, methodology, or the resulting conclusions of current research.

This book is intended to spark an informed debate and broaden the horizon: the biological-medical theories dealing with the sex are historically and currently so multifarious that it does not even touch reality when stating the simple assertion »modern« biology has never discussed anything else than dichotomic differences of the sexes« – as done following the works of Thomas Laqueur, Claudia Honegger, or Londa Schiebinger. Topics touched are not only the differences, but also sameness, of »woman« and »man«, and the woman-and-man-being of every person. Current biological and medical research arrive at so many factors which are sup-

posed to play a role for the development of sexual characteristics – and they require moving beyond the confinement of a dichotomic sex.

The keen eye is of essence: the *argument of pre-determination and irreversibility* – either based on »God« or »nature« – seems the guiding theme for discussing »sex.« This position was often voiced by those profiting from a social structure who did (or do) not wish to understand that the inequality of the people's opportunities is the result of society's inequal treatment. Karl Marx and Simone de Beauvoir start with the situation of the socially under-privileged, the huddled masses; Donna Haraway suggests we join in solidarity with their perspective.

One of the theoretical and practical approaches of this book is that social criticism and that of sex are brought together. Economic conditions determine all facets of society, including contemporary society. Thus, we are no longer aware just how fundamentally »sex« is the result of society. *A just social order and just relations of the sexes, which are not to the disadvantage of any, are both sides of the same coin.*

This book is not the result of working in seclusion, rather it has a history: it is the result of debate, and the interaction of people. In short, it is marked by life with its many facets. To a great extent, it is the result of studying biology, being involved with queer-feminist contexts, battling racism and hatred, as well as the many discussions about sex and biology following the publication of my dissertation and in seminars. This book would have been impossible without many dear people. Some of whom I would like to mention by name: Waltraud Voss, Ralf Buchterkirchen, Salih Alexander Wolter, Dean Cáceres. I am particularly grateful to Rüdiger Lautmann, Sigrid Schmitz, Volker Hess, Johannes Ungelenk and Florian Mildenberger who offered invaluable reason for continuous thought. The involvement of the Rosa Luxemburg Foundation and the Schmetterling-Verlag made this book possible. Thank you very much!

Have an inspiring read. I am looking forward to the arguments and (ex-)change we will have. *We* will make a *just* society a reality!

Heinz-Jürgen Voß, Hanover, October 2010

Introduction

The concern of this book is a practical one. »Sex/gender« is a matter that has moved many people throughout history, and still inspires change. Our own stance on sex does not matter. Whether it is an important subject for us because we scandalize through our own position on sex, or whether we do feel secure and unassuming with our sex: the fact that so many people seek a social change in the understanding of »sex« deserves recognition. Their reasons must be understood, their demands must be supported whenever they merit support.

Discussing »sex« – given sensitivity – is particularly necessary as it is an important principle of contemporary social structure. It has also played such a great role in the history of Western societies. Many seem to take for granted the existence of »sex« and the resulting classification. People are treated differently based on their »sex« – day in and day out. It begins with restrooms and department stores, which likely become problematic only for those who cannot be assigned a specific sex, or who are unwilling to be subjected to such assignment. Such classification becomes graver at those individuals' workplaces. Some jobs are deemed »male«, others as »female« – with less pay and reputation often inherent to the latter.

Few women, if any, can be found in the most prestigious and lucrative strata of economy, science, politics, religion, and medicine – while very few men are involved with taking care of children, the sick and/or the old. »Privately« taking care of the »own« children is often in the realm of women. Men who seek to participate in (the German) paternal leave often meet being stigmatized – sometimes in a positive way, most often in

a negative one, though.[4] As of 2010, only man and woman were allowed to get married; the combination of woman-woman or man-man had been subjected to a civil partnership that was legally inferior to marriage and had been in effect in the Federal Republic of Germany from 2001 onward.[5] It is quite clear: when so much depends on personal sex in a society, it seems essential to assign each individual one sex, but also is too complicate changing the society in which it is lived.

Every individual in Germany is assigned to one of two options immediately after birth. The Civil Status Act requires such assignment within a short period after birth, providing the child with undoubtedly female or male first names. Moving from that indisputable assignment after birth, we learn to be girls or boys, but also to recognize the sex in other people whether small or grown. Parents, caregivers, or the person themselves will immediately correct us if we misidentify the sex of a person. Given time, we learn to identify *with certainty* the sex of others in such a way. »With certainty« does refer to our own perception as we just do not know if the perceived sex corresponds to the felt one or those in the person's documents.

To identify *a person's sex distinctly and with certainty* we refer to clothes, bodily features such as body hair and its distribution, how clothes are bulged which may help recognize breasts or genitalia underneath the fabric. We refer to smell, facial traits and expressions, gestures, movements. Whether we keep our legs apart or crossed when sitting, whether preferring our hair long or short (and the way we arrange it in front of the mirror), whether or not we shave which part the remaining body hair, which perfume we choose or whether we may or must do without it in

4 The German system of parental leave, called *Elternzeit*, allows parents of newborn children to take a leave of absence for up to three years. The state provides the salary for the first 14 months (which includes a minimum of 2 months to be taken by either parent). Employees seizing on that opportunity enjoy dismissal protection (as pregnant employees also do throughout their term). Typically, the mother opts for twelve months, and the father either for those additional two or for none. Depending on the German region, the infants may subsequently enter a daycare following their first birthday (or even at a younger age). The translator.

5 In 2017, however, the German government introduced the *Ehe für alle* [Marriage for All], thus eradicating the discriminatory differences of same-sex marriages as civil partnerships. The translator.

our peer group to be accepted, etc. It is obvious that we create and train ourselves. We apply characteristics that younger children learn to read *distinctly and with certainty* as »female« or »male.«

We expect a solid core of sex at the same time as children at birth are hardly clean-shaven, wear perfume or are dressed appropriate to their gender. For this reason, medical personnel and parents read »genitalia.« They are recognized as penis or clitoris. The size of the mound allows recognizing testicles or labia. Such recognition is not too easy as clitoris and penis develop from the same origin and are differentiated according to their size at birth. A longer clitoris might be mistaken for a penis, a small penis as a clitoris. The fact that these parts – genitalia – are often swollen after birth complicates such differentiation. It is therefore quite convenient that the appearance of genitalia is merely observed fleetingly. Pre-natal examinations of the embryo and the amniotic fluid already revealed the sex *with certainty*.

We know sex as apparent, necessary, and unavoidable – regardless of the definitive classification of a particular individual. Penis and testicles, as well as labia, clitoris (and vagina) are the first connotations for the classification according to sex – as they are »externally visible.« Penis and vagina are described as fitting one another perfectly in their shape. Along with testicles and ovaries (and the sperm cells and eggs they produce) they form the necessary features which ensure the continued existence of humans as a species. These features, together with the concept of fecundity, are thus not only the first connotations of sex, but also the last arguments proving the certainty of a binary understanding of sex.

This monograph is dedicated to this alleged certainty, to biology, and the »naturalness« of sex, with a clear focus on the perspective of »naturalness« in all chapters. I will discuss three aspects specifically:

1. The »naturalness« of sex – and especially where it differed – has been an important point of application for criticism against the exclusion of women from education, science, politics, and the economy. The main argument there has been the understanding that the social differences of the sexes are a product of society, upbringing and socialization themselves. Following this notion, the first part of the book is particularly devoted to the situation of women and the call for their emancipation.

2. When theories discussing social conditions and how people are embedded in society, as Karl Marx and – referring to »sex« – Judith Butler devised them, they necessarily must be brought to their conclusion. Then, »sex« – including the biological concept of it – must be seen as society-made and thus not as »natural.«
3. When considering historic and especially current biological theories of sex-classification and development it is apparent that the organic structures which are commonly believed to be specifically female or male are not so specific at all. They rather take shape in individual and varied forms. This is one leitmotif of historical as well as current biological-medical theories of sex. They have often doubted the binary nature of sex, but rather emphasized the variety of »sexes« through a female-male- or male-female-existence of every person – or, alternatively, their unique manifestation of sex.

Women and some Men against Naturalness

History and Topicality: Simone de Beauvoir and Judith Butler

Simone de Beauvoir is one of the more colorful personalities to denounce the social limitations for women and demanded equal rights for men and women in the twentieth century. Her *Le Deuxieme Sex* (1949, English as *The Second Sex*) is a monument of feminist literature. There, she also radically argued against notions of »naturalness« which warranted the discrimination against women in society. Beauvoir's assertions in this context are rather well-known: »No biological [...] classification determines the shape of a female human in society« (Beauvoir 2008 [1949]: 334; The English translation follows the German one). In *The Second Sex*, she repeatedly questions that biological factors – she specifically refers to gonads and hormones – shape women and predefine their position in society. Beauvoir emphasized her stance again in an interview with German feminist Alice Schwarzer in 1976:

»Female« qualities are thus not inherent but rather the result of our suppression. Yet we may preserve them following liberation – and men would have to acquire them. One must not resort to the other extreme, though: say, woman had a special connection to the soil, felt in her blood the lunar rhythm and flood and tide, and all of that ... She had more soul, less destructive by nature et cetera. No! All of that is not incorrect, but it is not our nature. It is the outcome of our living conditions. These utterly »female« little girls have been created, not born that way. Many researches have proven that! A woman does not have any special value

just because she is a woman! This would be darkest biologism, and in stark contrast to everything I believe in« (Beauvoir in: Schwarzer: 1986 [1983]: 77).

Beauvoir questions seemingly unquestionable differences of sex, as well as their »naturalness« and timelessness. She does not question the current presence of two sexes as a social reality, though:

> »All it takes is to wander with open eyes to see that people are divided into two categories of individuals – distinctly distinguished by their clothes, faces, bodies, smiles, walk, interests, and activities. *These differences may be superficial; they may be destined to vanish. One thing is sure, though, they obviously do exist today*« (Beauvoir 2008 [1949]: 11; emphasis by HV).

Arguing against the current existence of »woman« and »man« as social subjects would not contribute to the liberation of women, as Beauvoir states. »Rejecting the concepts of the eternal feminine, the black soul, or the Jewish character just does not entail denying the existence of Jews, blacks, or women today: such denial would not mean liberation for those it affects, but *unfair subterfuge*« (Beauvoir 2008 [1949]: 10; emphasis according to the more accessible first translation into German: Beauvoir 1989 [1949, German 1951]: vol. I, 8).

Beauvoir is surprisingly up to date. We currently do witness heated debates between proponents of the factual, real existence of women and men and those of a deconstructionist criticism of assuming the existence of an »eternal feminine« and »eternal masculine.« The most current debate followed the publications of Judith Butler. In her Gender Trouble (1990), she outlined that society interprets bodily features as well. A sexual body thus is not pre-defined as well, but first read, interpreted, and valued by society. Reading, interpretation, and valuation follow modes the society largely agrees upon, but which also require being brought up to date. This, in turn, is achieved by constantly reciting – seizing and repeating – these modes. Modern interpretations are based on traditions but also innovations. The fact that they are brought up to date essentially harbors the potential for change.

Butler questions the existence of such timeless and ubiquitous categories of »woman« and men, thus a common basis for all women. In

consequence, she was criticized for her stance that allegedly renders it impossible to effectively fight the suppression of women in society. Returning to Beauvoir helps. She proves the opposite in a different way: on the one hand, and very practically, her book fueled the fight for the equality of women and men. Fundamentally doubting the existence of a »natural« – pre-determined, unchangeable, and timeless – basis of sex, on the other hand, the book does not disqualify the factual existence of and reality for women and men in this society. It also does not disqualify the necessity of constant aggressive quarrel to end the discrimination and violence against women. Bringing those two perspectives together is therefore essential if the goal is to have regard for the needs of people today (and thus fight against today's discrimination and violence) but also to strive for a brighter future in which patriarchal and capitalist power structures will be overcome.

Excursus 1: Introduction – Woman as Other

The first pages of the introduction to Simone de Beauvoir's *The Second Sex*[6]*:*

> »FOR a long time, I have hesitated to write a book on woman. The subject is irritating, especially to women; and it is not new. Enough ink has been spilled in quarrelling over feminism, and perhaps we should say no more about it. It is still talked about, however, for the voluminous nonsense uttered during the last century seems to have done little to illuminate the problem. After all, is there a problem? And if so, what is it? Are there women, really? Most assuredly the theory of the eternal feminine still has its adherents who will whisper in your ear: ›Even in Russia women still are women‹; and other erudite persons – sometimes the very same – say with a sigh: ›Woman is losing her way, woman is lost‹. One wonders if women still exist, if they will always exist, whether or not it is desirable that they should, what place they occupy in this world, what their place

6 1949; the English translation is taken from Simone de Beauvoir, »Introduction«, in *The Second Sex*, Philosophy Archive @ marxists.org, https://www.marxists.org/reference/subject/ethics/de-beauvoir/2nd-sex/introduction.htm (accessed July 14, 2020).

should be. >What has become of women?<, was asked recently in an ephemeral magazine.

But first we must ask: what is a woman? >Tota mulier in utero<, says one, >woman is a womb<. But in speaking of certain women, connoisseurs declare that they are not women, although they are equipped with a uterus like the rest. All agree in recognising the fact that females exist in the human species; today as always they make up about one half of humanity. And yet we are told that femininity is in danger; we are exhorted to be women, remain women, become women. It would appear, then, that every female human being is not necessarily a woman; to be so considered she must share in that mysterious and threatened reality known as femininity. Is this attribute something secreted by the ovaries? Or is it a Platonic essence, a product of the philosophic imagination? Is a rustling petticoat enough to bring it down to earth? Although some women try zealously to incarnate this essence, it is hardly patentable. It is frequently described in vague and dazzling terms that seem to have been borrowed from the vocabulary of the seers, and indeed in the times of St Thomas it was considered an essence as certainly defined as the somniferous virtue of the poppy.

But conceptualism has lost ground. The biological and social sciences no longer admit the existence of unchangeably fixed entities that determine given characteristics, such as those ascribed to woman, the Jew, or the Negro. Science regards any characteristic as a reaction dependent in part upon a situation. If today femininity no longer exists, then it never existed. But does the word woman, then, have no specific content? This is stoutly affirmed by those who hold to the philosophy of the enlightenment, of rationalism, of nominalism; women, to them, are merely the human beings arbitrarily designated by the word woman. Many American women particularly are prepared to think that there is no longer any place for woman as such; if a backward individual still takes herself for a woman, her friends advise her to be psychoanalysed and thus get rid of this obsession. In regard to a work, Modern Woman: The Lost Sex, which in other respects has its irritating features, Dorothy Parker has written: >I cannot be just to books which treat of wom-

an as woman ... My idea is that all of us, men as well as women, should be regarded as human beings‹. But nominalism is a rather inadequate doctrine, and the antifeminists have had no trouble in showing that women simply are not men. Surely woman is, like man, a human being; but such a declaration is abstract. The fact is that every concrete human being is always a singular, separate individual. To decline to accept such notions as the eternal feminine, the black soul, the Jewish character, is not to deny that Jews, Negroes, women exist today – this denial does not represent a liberation for those concerned, but rather a flight from reality. Some years ago, a well-known woman writer refused to permit her portrait to appear in a series of photographs especially devoted to women writers; she wished to be counted among the men. But in order to gain this privilege she made use of her husband's influence! Women who assert that they are men lay claim none the less to masculine consideration and respect. I recall also a young Trotskyite standing on a platform at a boisterous meeting and getting ready to use her fists, in spite of her evident fragility. She was denying her feminine weakness; but it was for love of a militant male whose equal she wished to be. The attitude of defiance of many American women proves that they are haunted by a sense of their femininity. In truth, to go for a walk with one's eyes open is enough to demonstrate that humanity is divided into two classes of individuals whose clothes, faces, bodies, smiles, gaits, interests, and occupations are manifestly different. Perhaps these differences are superficial, perhaps they are destined to disappear. What is certain is that they do most obviously exist.

If her functioning as a female is not enough to define woman, if we decline also to explain her through ›the eternal feminine‹, and if nevertheless we admit, provisionally, that women do exist, then we must face the question ›what is a woman‹?«

Why considering »Naturalness«?

The dissimilar positioning of people within society as based on »naturalness« has been justified for a long time now. It is currently presented

as »natural« that some people enjoy better opportunities for access to education or to influential and profitable positions in various segments of society. It is presented as equally »natural« that others are limited to gloomy economic conditions which only provide for bad food, less education, or sometimes not even dwellings.

»God's« mighty authority was used in the past to justify the people's position in society, their class, their sex, their access to or exclusion from education as »god-given« and irreversible. Today, more emphasis is put on some theories of »biology« (see Lewontin 1988 [1984]). »Biology«, allegedly predetermines genetic information and thus the connotation of a »human's blueprint« which makes some more suitable for certain jobs, important positions, but more basically also for education at school or universities. It is rather moot to consider whether »God« or »biology« are the mighty authorities that determine an individual's opportunities for development (and thus limits society's influence over it). The curious fact, however, that an authority beyond the reach of mankind is stipulated is much more important. Because neither the individual nor society could possibly control those authorities, they »naturally«, and thus in a predetermined and irreversible way, limit the opportunities of individuals.

There is a heated debate going on in Germany whether the differences of abilities that mark the classes of people are »natural.« Members of the German state assemblies keep criticizing the current three-tier school system of *Gymnasium* (the most prestigious academic-track high school), *Realschule* (comparable to junior high school), and *Hauptschule* (lower and least prestigious secondary education). The system benefits children from more privileged strata.

Children of economically less advantaged parents are less likely to enter a *Gymnasium*. The other two types, *Real-* and *Hauptschule*, are less funded, and opportunities to learn or being educationally stimulated are lower than at a Gymnasium. The »permeability« between those types of schools is also limited. Far from compensating for the limited learning conditions of children from poorer classes, the school system further amplifies those disadvantages. Poorer living conditions, for instance, entails limited space which also limits options for concentrated work. Children of more affluent classes have working material at their disposal that those of poorer ones lack. There is also an imbalance when it comes to super-

vision such as paid and professional support when doing homework, or fee-based leisure activities. Whereas financially well-endowed conservative politicians refer to their children's higher aptitude as reason for better educational achievements in that system, leftists and left-liberal ones refer to these dissimilar learning conditions. They further argue that an education in togetherness were for the benefit of all learners as it would boost the skills and social interactions of all involved. International research studies such as PISA support this claim. They have shown for Germany, that there is a more pronounced connection between the children's social background and the diplomas they receive.

The debates concerning »sex« are of a different nature. Here, even leftist and left-liberal circles rarely seriously question the biological basis of differences. While there are reservations concerning a difference in the mental abilities of the sexes – that girls are »naturally« better in the languages, or boys in logical thinking – the same difference in the physical abilities is largely postulated. Girls and women seemingly perform worse in sports than boys and men; at the very least do they seem to be better suited for different kind of sports. This must be rejected, too. It should be emphasized once more in accordance with Beauvoir: it is irrelevant if current differences between »woman« and »man« are detectable. What is relevant is the assumption that these differences are »natural.«

Anne Fausto-Sterling, for instance, provided some indications that differences in physical performance, too, are the product of social treatment. Referring to several types of sports, she points out that similar or the same performance result when given the same training. When (the American) Gertrude Ederle, for example, swam the English Channel as the first woman in 1926, the world was perplexed not only by the fact that she managed to do so at all. The people were astounded that she did it in 14 hours and 31 minutes – thus two hours faster than the (male) world champion then. Ederle learned how to swim at the early age of eight. By the age of twelve, she set world records for shorter distances, and collected medallions.[7]

7 See the obituary, for instance: Richard Severo, »Gertrude Ederle, the First Woman to Swim Across the English Channel, Dies at 98«, December 1, 2003, The New York Times, https://www.nytimes.com/2003/12/01/sports/gertrude-ederle-the-first-woman-to-swim-across-the-english-channel-dies-at-98.html (accessed July 14, 2020).

The marathon is another of Fausto-Sterling's examples. Whereas the marathon as a discipline was introduced for males with the inception of the new Olympic Games in 1896, women were barred from officially taking part until the 1960s. Although women in general were excluded from participation, individual ones were accepted from 1964 onward. It was opened to all women later. Since then, however, the differences between the »best male« and »best female« times grew smaller until they virtually have become non-existent (Fausto-Sterling 1988 [Engl. 1985]: 300 et seqq.). Back in 1964, the difference was more than an hour – and was perceived as proof of a »natural« difference between the sexes. Today, it is closer to ten minutes.

These examples demonstrate practically what may have seemed theoretical above: the differences in performance between defined groups – women and men in high-performance sports in this case – are based in society. Women in general were perceived as incapable of competing with or even superseding men in sports. Some types of sport were allegedly too dangerous for them. Thus, girls were rarely encouraged to begin training in these, which led to inferior performance results. When living and training conditions of men and women became more and more comparable, so did their performances.

Excluding women from sports' competitions is not a matter of a dark past, by the way. Ski jumping for women entered a world championship as late as 2009. Soccer for women still remains beneath the shadow of its male counterpart. Female soccer players enjoy considerably less prestige, income, numbers of spectators, and time on the air – especially on professional TV-programs. The support of girls in many types of sports still begins at a later point than that for boys. Scouting is rather rare, also because there are hardly opportunities for women to pursue a lucrative career in professional sports. This, again, is in stark contrast to their male peers.

It is worth considering »naturalness« from a historically and epistemologically motivated perspective as well. Thomas Laqueur and Claudia Honegger have presented noteworthy and well-received works on the subject. They outline that arguments of »naturalness« – based in nature, biology, but not on a »god« – have been strongly infused into the justification of the social order according to sex from the enlightenment onward, particularly after the late 1700s.

Since the eighteenth century, bodily features apparently became the defining factors for presenting the differences between woman and man. Those seeking them found differences in and described them for all parts of the body: organs, bones, musculature, etc. Woman and man appeared as radically different on the basis of anatomy, physiology – as rooted »in their nature.« Differences were most often explained through the function of procreation. They were hardly limited to the act of procreation, though, meaning the »required« organs as well as possibly carrying the embryo and bringing it to term. No, they were rather assigned to be lifelong principles of being »women« and »men.« The purpose of women was to bear and take care of the offspring. By tending to the family, she was supposed to run interferences for the husband so he could turn to public activities, thinking, and possibly earning an income.

Let us tie in with Laqueur's and Honegger's views at this point. They offer much potential for approximating the »modern« order of sex, meaning since the beginning of the nineteenth century. Nevertheless, supplementing their views is essential, as further discussion here proves: the biological-medical considerations of the sexes did not merely focus on differences. There were also central considerations of the similarities, as well as the woman-man-being of every individual. Let us come back to that at a later point.

Jean-Jacques Rousseau is one important authority of the perspective that emphasizes the difference of the sexes. He is also considered, even today, as the author who founded modern pedagogics. Rousseau argued against showering children with dogmata and restraints as they would merely cause opposition. He rather favored a form of education which would bring to fruit the »natural aptitudes« of children. In *Émile ou de l'éducation* (1762, Englisch: *Emile, or on Education*), Rousseau's important contribution to pedagogics, he is specifically concerned with male children whose individual, »natural« strengths required refinement. There is no more one chapter that discusses the education of girls and women – Rousseau rather explicitly includes them. The chapter is also rather well hidden in the back of the book.

There, Rousseau assigns the girls/women with the tasks of bearing and raising children, taking care of the husband, homemaking and housekeeping. Girls/women require a certain education: as very important proxies

for the education of the children. They were supposed to develop their own mind for the sake of the children and the husband, but also to understand the »dangers of the city« and being spared a life in debauchery.

Rousseau clearly defines and limits the role of girls/women. Those references to their »natural tasks« are quite interesting. In his pedagogical discussion of boys/men, he, too, refers to fostering »natural traits and skills« to completion, if possible.

More remarkable, however, is Rousseau's ardent opposition to any endeavors which seek the equality of women and men. He writes, for instance, vehemently against the

> »vanity of the disputes concerning preferences or the equality of the sexes. As if each sex, pursuing the path marked out for it by nature, were not more perfect in that very divergence than if it more closely resembled the other! In those things which the sexes have in common they are equal; where they differ, they are not comparable« (Rousseau 1762, Engl.).[8]

He further assures that,

> »[S]uch are the reasons that put appearance on the list of the duties of women and make honor and reputation no less indispensable to them than chastity. Along with the moral differences between the sexes these principles give rise to a new motive for duty and convenience, one that prescribes especially for women the most scrupulous attention to their conduct, to their manners, to their behavior. *To maintain vaguely that the two sexes are equal and that their duties are the same is to get lost in vain speeches. One hardly need to respond to all that*« (ibid., emphasis by HV).

Rousseau apparently sought answering to current developments that argued for the equality of women and men. They appear to have been strong enough to be recognized in writings rejecting such emancipatory strife of women. The emphasis on rejecting the emancipation of women will be a constant motive in the chapters to come. Whereas Rousseau's opinion was

8 For an English translation, see http://www.woldww.net/classes/General_Philosophy/Rousseau_on_women.htm

not singular in his times – as many women and men supported his theses – other perspectives emphasized the similarities of woman and man, and thus argued for altering the order of the sexes accordingly. With a keen eye on those perspectives, we will see that they referred to *the development and reversibility* of features (particularly the mind, and rationality versus ignorance) rather than construing »naturalness« beyond the control of society.

Contra »Naturalness« – Emancipatory Arguing for the Education of Women

According to Rousseau, girls and women are supposed to receive a simple education to be the safekeepers of their own morals, and because of their important role in the upbringing of children. Yet Rousseau indeed referred to simple education – he vehemently rejected the notion of women's higher education and subsequently becoming a competition for males for positions of the state, economy, clergy, or military. This was a rather widespread understanding in enlightened circles: the binary order of the sexes with its separate tasks for women and men were widely accepted as the basis for a working society. A limited education of women was nevertheless championed just to guard her against immorality as it was identified in the nobility. Such education, however, was not supposed to transcend pre-defined limits which were set to the women's »natural« tasks: needlework, housekeeping, and raising children.

The debate about women's education was not a recent development, not even in Rousseau's period. Women and men had repeatedly challenged those social limitations of women. Their criticism initially targeted the development of the mind: they demanded for girls the same quality of education and upbringing that boys enjoyed. They saw the existing ignorance and gullibility of some women as the result of social conditions. (In this, Beauvoir might be recalled: simply because there are »women« and »men« as well as differences between them, it neither means they are predetermined nor eternal.) Some proponents of the perspective then did not simply call for a proper education and upbringing for women, but also for granting them access to all important positions in society.

Christine de Pizan (ca. 1365–1430) penned some of the most remarkable treatises on better opportunities for women. At the turn of the fifteenth century, she answered previous misogynist writings which emphasized that education was harmful to girls and women. Boys and man, however, were the only ones capable of a higher, scholarly education. Wielding an analytical and conceptual clarity, Pizan conclusively presented social inequality as the basis for the educational one. She assumed that every human has a »natural predisposition« to education – they are not limited by a »natural predisposition« to the *capability* for education. Even social discrimination could not cover such predisposition completely.

Destitution forced Pizan to write. Following the death of her father (1387) and her husband (1389), she found herself and her three children in a financial quagmire. She began writing to alleviate the situation, had some success and found influential benefactors.

In her *Livre de la Cité des Dames* (1405, English: *The Book of the City of Ladies*), Pizan addresses the capability of women for education in the form of a dialog:

> »›Do you know why women know less?‹ – ›Not unless you tell me, my lady.‹ – ›Without the slightest doubt, it is because they are not involved in many different things, but stay at home, where it is enough for them to run the household, and there is nothing which so instructs a reasonable creature as the exercise and experience of many different things.‹ – ›My lady, since they have minds skilled in conceptualizing and learning, just like men, why don't women learn more?‹ – She replied, ›Because, my daughter, the public does not require them to get involved in the affairs which men are commissioned to execute, just as I told you before. It is enough for women to perform the usual duties to which they are ordained. As for judging from experience, since one sees that women usually know less than men, that therefore their capacity for understanding is less, look at men who farm the flatlands or who live in the mountains. You will find that in many countries they seem completely savage because they are so simple-minded. All the same, there is no doubt that Nature provided them with the qualities of body and mind found in the wisest and most learned men. All of this stems from a failure to learn, though just as I told you, among men and women, some possess better minds than others. Let me tell you

> about women who have possessed great learning and profound understanding and treat the question of the similarity of women's minds to men's‹ « (Pizan 1982 [1405]: 63–64).[9]

She later explains:

> »Thus, not all men (and especially the wise) share the opinion that it is bad for women to be educated. But it is very true that many foolish men have claimed this because it displeased them that women knew more than they did. Your father, who was a great scientist and philosopher, did not believe that women were worth less by knowing science; rather, as you know, he took great pleasure from seeing your inclination to learning. The feminine opinion of your mother, however, who wished to keep you busy with spinning and silly girlishness, following the common custom of women, was the major obstacle to you being more involved in the sciences. But just as the proverb already mentioned above says, ›No one can take away what Nature has given,‹ your mother could not hinder in you the feeling for the sciences which you, through natural inclination, had nevertheless gathered together in little droplets. I am sure that, on account of these things, you do not think you are worth less but rather that you consider it a great treasure for yourself; and you doubtless have reason to« (Pizan 1982 [1405]: 154–55).

Christine de Pizan's references to nature are as obvious as are Rousseau's, yet with an utterly dissimilar intention. For Pizan, »nature« endows every individual, man and women (in the city and in the »flatlands«) with gifts such as the capability for education; it is the upbringing which helps or hinders using those gifts. For the individual, as Pizan states, is it impossible to suppress such a »nature-given« property completely. She rather seeks presenting »the similarity of women's minds to men's« (Pizan 1982 [1405]: 63–64).

Another example of writers championing the women's right to education in their works was Moderata Fonte (the pseudonym of Modesta Pozzo d'I Zorzi, 1555–92). From Italy, she died when giving birth to her

9 The English translation is taken from Christine de Pizan, *The Book of the City of Ladies,* trans. by Earl Jeffrey Richards (New York: Persea, 1982).

fourth child. Her family published *Il Merito delle Donne* (1600, Engl. *The Worth of Women*) several years after her death, possibly to answer a misogynist pamphlet that had appeared a year before.

Moderata Fonte emphasized the differences of women and men which, among others, she based on different temperaments (there following the four temperament or theory of humorism, respectively). Men were supposedly influenced by a hot and dry temperament, and thus under the control of savagery. Their anger, scorn, and rage were the result of it. Women, on the other hand, had a cold and wet temperament, rendering them passionate, naïve, gentle, and gullible. While describing the male and female »nature« as problematic, Fonte nevertheless calls to women explicitly to seek an education and train the mind, in order to control those problematic »natural« features and turn them into a strength. She writes:

> »[...] where our natural disposition is at fault, we should bring our intellect into play and use the torch of reason to light our way to recognizing these lovers' masks and protecting ourselves against them. In fact, we should pay about as much attention to them and give them about as much credence as the sensible little lamb gave to the wolf when it was imitating its mother's voice and begging it to open the gate« (Fonte 1997 [1600]: 83).[10]

Women – as well as men – appear capable of intellect and reason according to Fonte. For her, reason is important inasmuch it guards against the dangers of immorality for women and men, as Fonte perceives them. Reason, but also bodily strength, has to be trained through upbringing:

> »[...] for if women do not bear arms, that isn't because of any deficiency on their part, rather, the fault lies with the way they were brought up. Because it's quite clear that those who have been trained in military discipline have turned out to excel in valor and skill, aided by that peculiarly feminine talent of quick thinking, which has often led them to outshine men in the field. And, as proof, just think of Camilla, of Penthesilea, the inventor

10 English translation: Moderata Fonte, *The Worth of Women: Wherein is Clearly Revealed Their Nobility and Their Superiority to Men*, ed. and trans. by Virginia Cox (Chicago: University of Chicago Press, 1997).

> of battle-axes, of Hippolyta, Orithya, and all those other warlike women whose memory not even history written by men has been able to suppress. And where letters are concerned – well, that's obvious: it was a woman, Carmenta, who first invented the alphabet, and poems are called *carmina* after her« (Fonte 1997 [1600]: 100–01).

Marie le Jars de Gournay (1565–1645) was a Paris-born contemporary of Fonte. Her mother, too, installed in her the notion that women merely needed to learn the basics, meaning running the household and needlework. De Gournay acquired skills in the languages and in several branches of the sciences on her own. She became famous for repeatedly (and posthumously) publishing the *Essais* of Michel Evquem de Montaigne. She did so quite critically as an editor and included some remarks on the limited opportunities of women in society into her first edition of the reprints. She intensified her criticism in her own writings, dated 1594 and especially those of 1622 and 1626. Thus, she took part in a heated debate that had followed the publication of a misogynist treatise in 1617. Tying in with her foreword to the *Essais* of 1595, she states in her *Grief des Dames* (1626, Engl. *The Ladies' Grievance*):

> »You are fortunate, dear reader, if you are not of the feminine sex who is forbidden from all properties by denying freedom, well, who is even forbidden from all virtues, by denying all rights and duties and public offices: in short, by excluding her from power[. E]xercising moderate power, however, shape most virtues. She is rather assigned the following virtues as her highest and only happiness: ignorance, subservience, and the ability to present herself as a fool – if she is willing to participate in this game. You are fortunate, too, as your education goes unpunished, as your being a man entitles to you every action with a higher purpose, every noble verdict, and uttering equisite theory – just as much as it is denied to women« (Gournay 1997 [1626]: 75).[11]

Gournay criticized the bad education and upbringing women received, but also their socially limited opportunities. She does not line up the mer-

11 The English translation follows this German edition.

its of women in history, as Fonte did, for instance, but argues through an analysis of society. Neither does she accept the differences of the sexes the way Fonte did. Gournay rather emphasizes the equality of the sexes in all features, and only left room for the minor difference dedicated to procreation:

> »To be precise, the human being is neither male nor female. The different sexes are not supposed to lead to differences in their manifestation. They just serve procreation. The only feature that essential is the rational soul. If a small joke is permitted: there is nothing that resembles the tomcat on the windowsill than – a cat. Humans were created as man and woman. Men and women are but one« (Gournay 1997 [1622]: 55).

The role of women (and men) in society has been disputed. France alone produced some 900 treatises in the fifteenth and sixteenth century. The rest of Europe equally saw numerous writings on the position of women in society. The debates continued, became virulent and reached new peaks. As the three representatives mention above prove: female authors argued on a sound basis and against any »natural« differences between the sexes in matter of reason. They demanded education to alleviate a social and social ill. It is also quite clear, that those works appeared in a direct or indirect context of explicitly misogynist publications of their time. They also had a voice in the debate. Those publications are specifically referred to a »misogynist« here – they did not merely counter the women's strife for emancipation, but rather rants to degrade and insult them. Yet those publications provoked swift and vehement opposition – such as the opposition of Pizan, Fonte, or Gournay.

Works in favor of the emancipation of women, and strongly criticizing the bad education and upbringing of girls, appeared in France (e. g. by Francois Poullain de La Barre, 1670s), England (Mary Astell, 1690s), or Spain (Benito Jerònimo Feijóo y Montenegro, 1720s/30s). The struggle for the order of the sexes reached a peak with the French Revolution. Then, people expected the revolutionary calls were intended for all and thus bring the equality of women and men. Mary Wollstonecraft sought helping to stir the French Revolution into that direction when she published *A Vindication of the Rights of Women* in 1792. It was polemic

publication demanding, among others, education for women. Equally often-quotes is also the *Dèclaration des Droits de la Femme et de la Citoyenne* by Olympe des Gouges, 1791: the *Declarations of the Rights of Woman and Citizeness*, as a reaction to the iconic *Déclaration des Droits de l'homme et du Citoyen* of 1789. She demanded the equal human and civil rights for men and women.

The events of the French Revolution also inspired the latent debates concerning the social positions of men and women in the neighboring German states, and supported the call for equality. Mary Wollstonecraft's publication appeared in German merely one year after the first print (in 1793). Theodor Gottlieb (von) Hippel also revised his considerations on the social order of the sexes. In the 1770s, they had been far from an emancipatory character. When publishing his *Über die bürgerliche Verbesserung der Weiber* (1793, Engl. *On Improving the Status of Women*), he now championed the equality of women and men, as well as equal civil rights for both.

Although the French Revolution did not live up to those demands, and in later stages even saw the revocation of opportunities for women which have been hard-won by women, these demands had reached a new intensity of struggle with the order of the sexes.

The notion of an equality for all humans, thus also of women and men, had entered the utopia of striving for a future, better social order with a vengeance. It had come to stay. Several publications appeared which broadened the thinkable framework of theories. They became the pillar on which rested later works on the emancipation of women.

The way women participated in the French Revolution was likely more important than those publications. Women played an especially important role in mass protests and hunger strikes. Thousands of women ventured from Paris to Versailles on October 5, 1789, following the increase of prices at the bakeries that morning. Women demanded that the king ensured stable prices for grain and flour – which he granted under duress. They were equally successful with their second demand: the decree abolishing feudalism and acknowledging the Declaration of Human Rights as it was passed in the National Assembly. The royal family had to accompany those women back to Paris to guarantee the demands were met (Petersen 1990; Stübig 1990).

Excursus 2: Some biographical glimpses at the families of those mentioned

Christine de Pizan was born in 1365. Her father held the chair for astrology in Venice, and later entered an influential political career. He was called to the court in Paris the year Christine was born, the family followed in 1368. There, Christine received a good education, and was married at the age of fifteen. Following the death of King Charles V, her own father's death in 1387, as well as her husband's two years later, led to her financial destitution. In order to raise money in support of herself and the three children, she began writing.

Moderata Fonte was born in 1555. Her father was in the legal professions, her mother had been born into an influential upper-class family. Upon her parents' early death, she came to relatives, later into a convent where she was quick and eager to learn. When she was nine years old, her relatives took her in once more. She was supported by the family – particularly her uncle – to further her education in poetry and Latin. She married an official representative and died at birth of their fourth child

Marie le Jars de Gournay was born in Paris in 1565 and grew up in the capital's vicinity. Her father died early, prompting her mother to go into debt and Gournay to live in the conditions of the impoverished nobility. Whereas her mother foresaw nothing more than a basic education »suitable for women«, Gournay acquired Latin and other languages, as well as subjects, as an autodidact. She came into contact with Montaigne who became a friend and whose *Essais* she repeatedly published upon his death.

Jean-Jacques Rousseau was born in Geneva in 1712. His mother passed away shortly after giving birth to him. He initially grew up with his father, later an uncle who provided for his nephew's education at a vicarage. Rousseau became the apprentice of a clerk of the court in 1724; a position he soon left. He escaped from another apprenticeship. Madame de Warens first became Rousseau's benefactress, later his lover although she dissolved the relationship in 1738. In 1768, Rousseau married his long-term consort, Thérèse Lavasseur. Their five children were all sent to the orphanage. While

initially being interested in musicology, Rousseau turned to social matters from the 1760s onward. The French kingdom banned his works soon after publication – such as his *Du contrat social*, 1762, Engl. *The Social Contract*. Protestants in Geneva burnt his *Emile, or on Education*, which also appeared in 1762. During the French Revolution, Rousseau was celebrated posthumously.

For biographical overviews of noteworthy women and continued reading, refer especially to *The Internet Encyclopedia of Philosophy*, https://iep.utm.edu.

Another noteworthy reference is *www.lesbengeschichte.de*. The website is German but accessible in several languages, including English.

Differences as the Product of Society: The Human Being as a Social One

The discourse above left us with a mental mélange which deserves being unscrambled and structured to come to practical and tangible conclusions. The following aspects are rather interesting:

1. The brief excursion to the French Revolution made it apparent that active debate is essential for changing society, toppling existing social conditions, and replacing them with more just ones. Fundamentally speaking, terrible – yet actual – living conditions prompted the protests. Crop failures and inflation worsened an already bad situation. Those who had command over grain and flour, often stockpiled them in expectation of even higher prices and thus maximizing profits. Taking into consideration the living conditions of the large part of the population is also beneficial when discussing »sex.« One aspect is very noteworthy: publications such as Rousseau's, or those championing a better social situation for women, were usually directed towards the privileged layers of society. They were the audience of identifying and criticizing the apparent separation of female and male spheres in society. Particularly male (only rarely female) members of the upper society worked on living conditions but also matters of the order of the sexes – for their own peer group.
2. Publications on the social conditions of women are also a reservoir for deducing questions for creating a better society for the future. The French Revolution, for instance, saw women as very important actresses of events, which in turn became the background for numerous publications that demanded the equality of women and men. The writings of Gouges, Wollstonecraft, and Hippel are indicative for that: they all

referred directly to the French Revolution. It is important that practice and theory go hand in hand: theories are indeed devised – and publications are written – within society. They are part of the society, are developed in the framework of social conditions, and social developments are integrated. The individual, personal living conditions affect all mental creativity, too. It seems like a truism, of course, that theories are perceived against the background of social conditions. Yet it is rarely taken into account. Laqueur and Honegger, for instance, could conclude that biology and medicine from the late 1700s onward were almost exclusively concerned with describing the differences of the sexes. Yet how could that be possible in light of the constant struggle over the roles of women and men in society that took place in those very same societies, and which increasingly generated demands for equality? Such struggles also likely entered the considerations of the biological-medical sciences. And they did indeed, as will be demonstrated.

3. Considering the fundamental change in the scholarly theories is equally revealing. The French Revolution (and, on a smaller scale, the English Glorious Revolution of 1688) proved that social structures were not »god-given« but changed and renegotiated by rational people. Pizan, Fonte, Gournay, and for that matter Rousseau too, unquestionably expected the mind and reason to develop with the right upbringing and education. Just like them, proponents of the scholarly fields moved away from the concept of an irreversible predetermination and towards concepts of development. Changeability, emergence, the interaction of forces: they all became guiding principles. Human beings were not understood anymore as being predetermined in all their features, but social conditions were identified as important influences over their development. Understanding the importance of development also broke the confinements of mind and reason. Europeans rather began seeing all other features of a human – physical and physiological ones – under the concept of development as well. As will be shown, the concept of development has been the basis for discontinuing the classification of human beings as sexually either female or male, but rather all human beings as both female and male at the same time. This chapter will present the evolutionary framework on which later considerations of sex will rest.

Poverty and Limiting Recent Gender Research to the Privileged Classes

When evaluating the historical situation, the more recent gender research faces the same basic problem of all historical research: written sources were left by those able to do so, thus they were almost exclusively representatives of the upper classes who actually could write. The sources they leave give insights into their experiences, interests, and issues of their own specific class. Interests and problems of others – poorer – classes are merely present through the perspective of the writers' socialization. Even when they turned to the more disadvantaged people in their descriptions, they merely represented their own perspectives on them. Representatives of poorer classes left little material to work with as they often lacked the education to compose written material. They also, and more importantly, often lacked both the money to purchase writing material, but also the time for doing so after a hard day of labor. Thus, any research looking into the conditions of the poor are more complicated than into those of the privileged. The debate over the order of the sexes symbolizes this fact of representing the privileged ones' perspectives in the sources, as it was shown through Pizan, Fonte, Gournay, and Rousseau (see Excursus 2). It is important to consider this fact when discussing the biological-medical theories of sex. Only people from more privileged circles were able to participate.

For this reason, both feminist writers Lily Braun (1979 [1901]) and later Simone de Beauvoir (1949) stipulated that bourgeois women rarely met the problematic conditions of poorer women – in fact the majority of the population. Braun states, with an eye on the French Revolution:

> »Pre-1789 bourgeois women seemed afflicted with blindness toward the plight and demands of the working women; they dreamt of liberty and equality, of a peaceful life in nature, for brotherhood and little more than the equality of their sex in matters of education and political rights. Yet like the entire bourgeoisie of the period, they were far from crossing – or even looking beyond – the gap that separated them from the proletariat. The memoirs of even the most prominent among them do not describe, nay, even mention, the plight of their poorest peers in sex. As curious as this may

> seem, it does not prove any conscious callousness. Prominent people even of today, hesitate emotionally transgressing the limits of their own class so that there is no reason left for class-based selfishness. It was not easier for the people of one hundred and ten years ago, when the classes inner and outer restrictions were much graver« (Braun 1979 [1901]: 77).

Writing in 1949, Beauvoir moves a step further. She sees an interest among the bourgeois women not to seek the solidarity with poorer ones on purpose, but rather to turn against the emancipation of women in general:

> »Bourgeois women cherish their chains, as they cherish their privileges of class. She is told over and over again, and knows it very well, that the emancipation of women weakens the bourgeois society: she would be forced to work if freed from the man. She may regret having secondary property rights – secondary to her husband – yet she would regret more if that property were taken away. She does not harbor solidarity with the women of the working class: she is much closer to her husband than to female textile workers. She internalizes his interests as her own« (Beauvoir 2008 [1949]: 155).

What were those special interests of proletarian women that bourgeoise women – and men – did not comprehend, even perceived as threats, or simply largely ignored in the debate for the emancipation of women? It is safe to say that the living conditions of the great majority of the people were horrific at the end of the 1700s. It is also very important to keep that fact in mind as the recent *largely very theoretical discussion* of writings and social practice barely include the experiences and realities of life for people as an important aspect of discourses – which they are, of course. The following quotes deal with the lives of a majority of the population from the 1700s to the early 1900s. They paint a picture of what »horrific living conditions« were.

The mass demonstrations particularly of women in October of 1789 were not unfounded:

> »Twenty year prior to the outbreak of the revolution, there were 50.000 beggars in France. Although punishable by three years of forced service

> on a galley, the number grew to 1.5 million over the course of ten years. In Lyon, the capital of silk production, 300.000 workers relied on alms in 1787. Among the 680.000 residents of Paris were 116.000 beggars. The women among them were often incarcerated in narrow and dirty workhouses for years. There, they were afflicted with the most terrible diseases and, as if their own misfortune had not tortured them enough, they were whipped. St. Antoine and du Temple, Paris' proletarian quarters witnessed the gravest despair. Hardship grew into hatred, and it was not only directed against absolutism, feudalism, and the regime of the clergy – the targets of bourgeois hatred – but especially against those who exploited and inflated prices through the shortage of grain. They who even took the bread out of the politically impotent mouths, or poisoned them with spoilt flour, allowing scurvy and dysentery to claim huge numbers of their children« (Braun 1979 [1901]).

The French Revolution did not »merely« break out because of demanding equal political participation. It was the result of existential needs of large parts of the population. Thousands of women went to Versailles because of empty bakeries and the rampant inflation for staple food. Their mass protest succeeded at least temporarily: the king accepted price restrictions but also certain political rights. The situation of the proletariat dramatically worsened again when the bourgeoisie coopted the revolution. The previous restrictions on prices were lifted, and those for staple goods increased considerably. The bourgeois victors of the revolution now quelled the resulting hunger revolts in blood (Petersen 1990; Stübig 1990).

The poor's gloomy living conditions did not come to an end. They were terrible for large parts of the French but also the English and German populations throughout the nineteenth and up to the early twentieth century.

> »Just how commonly did the female worker returned home after a week of hard labor, without anything to allay her children's hunger! She waited for the return of her husband in vain – as he was sitting in his boss' cheap store and accepted liquor as payment. Maybe he brought a loaf of bread back home, for double the price he would have paid with money. The open

> truck system, i. e. payment in goods, was rather common in the mid-1800s. [The system] gradually crept behind the doors of the stores that were run by the owner of the factory, or his subordinates. The poor workers were forced to buy there if they did not wish risking being fired« (Braun 1979 [1901]: 231).
>
> »It would take writing a book to describe in detail the outcome of this exploitation. [Its images] would be so horrific that they easily surpassed the imagination of how [painter Pieter] Breughel envisioned hell. Let us look into the apartments of those slaves of industry: in one working class neighborhood of London, one of its epicenters, 12.000 people live in 1.400 cottages in 1844. Entire families, well, whole generations, had but one little room to live and work at the same time. There rarely was any furniture; a pile of rags was the bed for all. And yet they were the fortunate ones, as no less than 50.000 people were homeless. During the night, they huddled in the boarding houses as far as they could – men, women, old, young, sick and healthy, sober and drunk, all of them mixed and in one bed in groups of five or six ...« (Braun 1979 [1901]: 231 et seqq.).

The working-class neighborhoods in France just looked the same: in Lille, the buildings were separated by narrow streets that barely allowed two people to walk side by side. All waste flowed into the gutter; to save money, the windows could not be opened. Thus, the overcrowded rooms – furnished with little more than straw and rags – reeked of pestilence. Geriatric children with their swollen limps and eaten alive by vermin stared with empty eyes at the stranger who took the wrong turn into this hell. How lucky they were that death almost always spared them the damnation of surviving: 20.700 out of 21.000 died before their fifth birthday. The conditions had not changed one bit twenty years later (Braun 1979 [1901]: 231 et seqq.).

Lily Braun was not alone in describing the living conditions of large parts of the population so vividly in her socio-critical analysis of 1901. Bettina von Arnim in her *Dies Buch gehört dem König* (1843, Engl. *This Book Belongs to the King*) interwove the demand for the freedom of mind and political participation for all with descriptions of the living conditions of poor weavers. With a focus on German authors, there is insightful

material available for the period from the eighteenth to well into the early twentieth century: *The Communist Manifesto* by Karl Marx and Friedrich Engels (1848), or *Die Frau und der Sozialismus* (1879, *Woman and Socialism*) by August Bebel. Later discussions include Jürgen Kuczynski's *Die Geschichte der Lage der Arbeiter in England* (1949, *History of the Working Class in England*) and *Die Geschichte der Lage der Arbeiter in Deutschland* (1947, *History of the Working Class in Germany*). Until the beginning of the twentieth century, it was common to witness an infant mortality of more than fifty percent in the first year, widespread diseases (between one third and one half of the children in London and Berlin suffered from rickets), malnutrition, contaminated drinking water, or from ill-equipped and overcrowded lodgings (or homelessness). It is no wonder, that the life expectancy barely reached thirty years.

It was worse for women in these conditions. Of course, they contributed to earning a living for the family, as all members older than twelve did (but often also as young as five, six, or seven). With the progress of industrialization, women likely worked in factories. They were otherwise employed in commerce, domestic service (as maid or farmgirl) or at home. The women's wages were considerably below those of men. When working at home – in those cramped quarters – wages were even lower. Jürgen Kuczynski states for England:

> »The wages of women and children should rather be referred to as allowance. Women often earned fifty to eighty percent less than men. Such low wages symbolized the general position of women who were below men in all respects: in matters of payment as much as in mattered of education, in politics, and all other areas of public life« (Kuczynski 1949: 102).

After presenting the living conditions of large parts of the population from the eighteenth to the early twentieth century (for more detail, refer to the noted and noteworthy publications above) one conclusion is very apparent: we need some changes in the current perception of history. Michel Foucault, for instance, identifies a »social medicine« from the late 1700s onward, or to the mid-1800s at the latest. It apparently affected large parts of the population in the shape of a »[German] state, [French] urban, and [English] labor medicine.« It factually did not happen, as outlined above.

The living conditions of the large body of the population remained precarious, the infant mortality remained high and life expectancy low. The living conditions even worsened during times of economic distress and the higher unemployment that goes with them, but also during harsh winters and bad harvests.

Foucault seeks to understand just how the great importance medicine enjoys today – itself almost a »medicalization« of the human being – itself developed. He rests in many cases on the descriptions of the 1700s and the 1800s. And, indeed: the plight of large parts of the population – the poor – were described there particularly because their disease threatened the more privileged circles, too, in their mutual and increasingly urbanizing environment. Such debates, though, initially did not affect the practical living conditions of the proletariat at all, later only haltingly. They barely had their daily bread or dwellings; drinkable water was equally rare. They simply could not afford to consult a physician. It is important to emphasize Foucault's rather fleeting, but nevertheless limiting, addendum to his observations: »Poor people's medicine, labor force or worker's medicine, was not the first but the last objective of social medicine« (Foucault 2000 [1974], 151).[12]

Thus, it is important to let go of a rather romantic idea: it was not a growing compassion from capitalists or the state that helped make changes, which in turn alleviated the plight of large parts of the population. Not even fearing the diseases of the poor seems reason enough. Alleviations, such as decreasing child labor, were simply the result of changes in production. The machinery became more complicated by the end of the nineteenth century; therefore we are dealing with an increasingly intensive exploitation of the individual worker. For this, better skilled laborers were essential (see, among others, Kuczynski 1947: 134).

The state, on the other hand, was more interested in the suitability of young men for military service. At the turn of the twentieth century, young men's health and nutrition often were so poor that they were unfit for military service (see, among others, Bebel 1950 [1879]: 309 et seqq.).

12 The English translation is taken from: Michel Foucault, *Essential Works of Foucault (1954–1984), vol 3: Power*, ed. by James D. Faubion and trans. by Robert Hurley (New Press, 2000).

Profound social changes, however, require social renegotiations such as the ones of the revolutions in 1789 or 1848. For the German states especially, those renegotiations were social-democratic ones that were inspired by *The Communist Manifesto* (1848), as well as the proletarian women's movement.

As already demonstrated, this is an especially important starting point for any discussion: written sources do not suffice. Theoretical assumptions must be connected to the factual living conditions of people. Nobody could turn to the fine arts if he/she is un- or undereducated, works twelve to fifteen hours a day for truly little food, or who drink putrid water. Someone, who watches their own children die in droves until dying themselves at an early age, will not be interested in the fine arts.

This brings us to a second important point of gender studies: the concepts of gender and sex. Barbara Duden, for instance, in *Geschichte unter der Haut* (1987, *History Under the Skin*) based her assumptions on the perception of women's bodies ca. 1730 on the writings of a (male) physician. Most often, these women turned to the physician for »flows« and »hot flashes.« These terms appear as rather general ones. Duden quotes them as such to assert that »modernity« and new terms – from the natural and medical sciences – which brought forth a change in the perception of the body. As important and interesting as these observations are, they only apply to privileged women. Duden omits this fact. Those women could actually afford to consult a physician. Duden never addresses their belonging to one specific class of people. As a side note, she states that »the lack of solid indications of income, tax on pharmaceutical products and gifts preclude a more thorough socio-historical analysis« (Duden 1987: 84).

Living conditions also affect the »perception of the body«, of course. Karl Marx wrote in his *Grundrisse der Kritik der politischen Ökonomie* (1857/8, Engl. *Fundamentals of Political Economy Criticism*): »Hunger is hunger, but the hunger gratified by cooked meat eaten with a knife and fork is a different hunger from that which bolts down raw meat with the aid of hand, nail and tooth« (Marx 2020 [1857/8]: 15).[13] It was a

13 The English Translation is taken from: Karl Marx, *Foundations of the Critique of Political Economy (Rough Draft)*, annotated by Ben Fowkes and trans. by Martin Nicolaus (Pen-

rare occasion for poor people to satisfy their hunger through meat until the beginning twentieth century. Following more detailed descriptions of those living conditions, working women apparently had a drove of other problems which kept them from contemplating their »flows« and »hot flashes.«

Thus, it is also important to turn away from the privileged ones and towards the actual and practical living conditions of the population's majority when considering the historical dimensions for gender studies. It is necessary to approach written sources with that in mind. They also had been written by the privileged ones and do represent their class-based insights. Poor people and their afflictions appeared as *the other*, from whom the more privileged ones sought to distance themselves. All historical studies are thus limited in their significance – including the often-quoted ones of Thomas Laqueur and Claudia Honegger. They deal with the situation of the privileged ones, not with the majority of the people. The writings on historical debates over the emancipation of women, as quoted above, are of equal limited historical significance – as are those writings on biological-medical descriptions below.

A side note. Being limited on written sources – and valuating them much higher than pictural or oral sources – bedevil epistemological discussions not only in respect to being limited to a certain class only. Societies in which written sources are unknown, or where the humid and warm climate claims those sources written on paper are underrepresented in historical considerations (see, for instance, Brentjes 1963). Even when discussing societies that did transmit written sources, it should be noted that they represent but a fraction. Other writings may have been lost or destroyed because they contradicted religious dogma, or because the relations of power might have shifted. We only have a glimpse at the social meaning of »sex« or »gender« in Greek antiquity, for instance, through extraordinarily little material from some of those »city states.« The sources of the Arab-Muslim middle-ages dealing with »sex« and »gender« are largely unexplored in their context to the Latin middle-ages or compared to modern European sources. Yet, they had a strong influence on those

guin Books, 1997). It is available online through https://www.marxists.org/archive/marx/works/1857/grundrisse/index.htm.

writings of the European enlightenment that are dedicated to human reason (see, as an introduction, Ley 1953; Brentjes 1972; Kügelgen 1994).

Understanding the limited validity of historical sources is essential for a thorough study pertaining to the history of science. One's own position, however, must also be considered for any contemplation as it already narrows the perspective. Thus, not only the supply of sources limits the focus on poor people. One's own position also limits the contemplation because of the erroneous assumption that beginning with »modernity« theories have known nothing but two sexes/genders. This assumption, however, rather reflect the perspective of those researchers of today. They are the ones who are embedded in their own socialization and current debates. Considering and contemplating the current society and one's own position might broaden the view. It thus allows us to integrate at least some notion of diverse current views. When doing so, it is possible to check one's own research results whether they conform to the factual experiences and qualities of life of the people in question. That way, it may be possible to limit contaminating the view on the past by the modern perspective in historiography and related subjects. Even reflecting the current society and position requires considering poor and marginalized groups of people, as they, once again, seem to remain without voice in social as well as scholarly debates and considerations:

As mentioned above, the international PISA-studies attest strong social barriers which still define the current educational system in Germany. Also, with the historic criticism of Braun and de Beauvoir, bourgeois women still are willingly or unwillingly incapable of arguing for the necessities of proletarian women. This holds true for the past and now. Individuals have their own socialization and experiences – they do not apply to others. The closer the socialization and experience of others is to the own, the easier it is to show compassion.

In modern German society, growing up in a financially weak home, or having an immigrant background, are the two main obstacles for receiving a good education, or to obtaining well-paid or prestigious positions. At the beginning of the 2000s, police habitually took the children of refugees out of the school classes when they reached the age of 16. The police argued that their good education would foster integration and thus complicate deportation.

For those with a steady income it is exceedingly difficult to grasp the angsts and lack of prospects of those living off of *Hartz IV*, the German minimal welfare with the least social standing.[14] For both groups, those living on a steady income but also of Hartz IV, it is, in turn, difficult to relate to the plight of refugees. They are often compelled to live in the country illegally, and have to take up work that is dangerous or hazardous to their health – just to make ends meet. When doing so, they are often equally deprived of their rights as employees, but also of health care. Tthis does not include those people who must bord crowded and unsafe boats to reach Europe, but who are most often forced back to Northern Africa. They must do so as their chance of a legal status of asylum is dwindling because of the European Union's ever-tighter border controls and ever-growing obstacles. The gravest of obstacles is the German-championed legislation of denying passage into other member-states of the Union once European soil is reached and asylum granted. Because of these conditions, many refugees perish, or are pushed into Libya's detention centers pending deportation. There, the conditions are even worse than in their European counterparts. How could any well-fed and secure Central European citizen truly take the perspective of those huddled masses of today?

Excursus 3: *The Marx Family Saga*

Initially appearing in Spanish, Juan Goytisolo describes in his novel *The Marx Family Saga* the landing of a ship full of refugees. The bathers' reaction might serve as an illustration of fear but also of isolation. It may equally symbolize the diminished capacity of reflecting other people's perspective (also in a scholarly context).[15]

14 Hartz IV is the colloquial term for the German »Grundsicherungsleistung für erwerbsfähige Leistungsberechtigte«, a combination of unemployment benefits for long-term unemployed and welfare benefits. It is the minimal sum the German administration pays its citizens to sustain themselves if incapable of doing so. As of 2020, *Hartz IV* entails a monthly payment of EUR 432 plus minimal rent, after personal savings have been exhausted. The recipient generally is subjected to stipulations that are often perceived as degrading. The translator.

15 The English translation is taken from: Juan Goytisolo, The Marx Family Saga, trans. by Peter Bush (San Francisco: City Lights Publisher, 1996), 8–9.

»the beach had filled up with hairy-faced, sopping wet Albanians, some smiled and kissed the ground, closed in on the appalled families and sought out a tangential, semilogical relationship, with children and dogs, unable in their euphoria to grasp the frowns and reproving looks from those svelte, well-fed forms, consumers of the exact quantity of proteins required by their weight and height, surprised by the hurried flight of their more wide-awake brethren and by the impotent, outnumbered beach staff's vociferous insults, an out-of-control, patently explosive situation, a catastrophe, they muttered, absolutely unheard of when would the forces of law and order turn up? The proprietor had given them a call?

the bathers listened out for the wail of car sirens, breathing a sigh of relief as soon as their deafening concert turned the corner, it was an invasion, an invasion no more no less, and the State should adopt immediate defensive measures, protect its citizens, round up, arrest, deport the ragamuffin rabble, isn't that what the Community laws and statutes were for or were they just so much paper and ink put there for show?

(the man rabbiting on was a respectable arms dealer enriched by the providential outbreak of crises in the Balkans)

but the Albanians seemed unaware of the danger and pursued their futile attempts at fraternizing with families, mums, kids and dogs, smiled half-wittedly at those upbraiding their uncivilized behaviour, gesticulated, looked lovingly and longingly at the counter replete with cold drinks and rolls, now into their third day of a meagre diet, looking for food and help, not daring even to run their fingertips over the tempting fare, at most begging humbly, movingly, for a glass of water to slake their consuming thirst

the sudden arrival of truncheon-waving helmeted police literally stunned them

had they come to look after them, to take them to reception and welfare centers set up for refugees?

a few went to welcome them with open arms, but the from faces and unbending manner of the men in uniform halted them in their tracks, made them keep together, hold back, visibly upset, wanting to explain their odyssey they pointed at the liner where they had

been cooped up on the journey from the country of idols and false prophets, apparently railing against communism, and they showed off medals bearing likenesses of the Desert Lion, their notions of geography being somewhat hazy, one hat taken the wet photocopy of a dollar out of his pants and was repeating an almost unrecognizable God bless America!

much to the relief of those present they allowed themselves to be shepherded to the lorries, and, having discounted the use of force, the police and the military lined them up before escorting them to the parking area towards which army vehicles were now rumbling, keep calm, just keep calm! an interpreter bellowed through a megaphone, they would soon enjoy shelter and food, would get refugee status, would benefit from the right to obtain with the fruits of their labour all the goods they had just glimpsed on the select beach, would be able to apply for visas and set up home in Texas, sweet honey-dewed promises, to cheat and pacify them.

The most wary, the cleverest had tried to scarper, but lifeguards and emboldened paterfamilias grabbed their threadbare clothes and held furiously on till the police arrived

only the archduke showed any interest, wrapping a sumptuous, imperially tasselled dressing-gown round his abundant rolls of flabby flesh, he welcomed two of the lads, no less well-endowed for being on the skinny side, into the inner sanctum of his beach hut, keep your hands off these two, he warned, they're mine and from now on they will devote themselves to servicing my distinguished self, as he draped his mantle of power around them, drooled over their damp breeches, as if trying to weigh up their attributes, their cocks' normal size and potential for expansion«

It is not about retreating into a compassionate lethargy. It is not about constantly opening a book or article by apologizing for coming »from a privileged, white home that follows educated middle-class principles«, or being raised in this or that sex. Often, this is done and the author continues with observations which have no relevance to the factual realities of people. No, this is about dealing with factual realities of people of a

different background in the first place. It is about accepting perspectives and voices that barely played any role in science – on merely that of »victims.« Science must be accepted as part of a political action that so far has most often dealt with the needs of the privileged ones only. Most often, it separated and excluded thus far – and ignored (or refused) the voices of the marginalized ones. Science must not be understood as a haven of seemingly objective understanding but as deeply rooted in social conditions. It is about voicing one's own partial and limited perspective that makes a clear stance, but also to find solidarity with the voices of marginalized and subjected people (see Haraway 1988).

Whether to call it queer-feminist, deconstruction or intersectionality: it is vital – apart from concrete political action – to at least try to harmonize one's scholarly assumptions with possible different perspectives and factual, practical living conditions. It is vital to constantly re-evaluate and challenge one's assumptions and publications. Such »new eyes« when tackling with different positions may bear fruit as new scholarly perspectives that were informed by different works and angles. These might generate new angles on, for instance, the concept of »sex.« It has been severely limited by experiencing the constant reality of two sexes in the Federal Republic of Germany.

The Human Being as a Social One

Individual traits of people, as it becomes apparent, are just as little »natural« as are education, food, or feeling. They are one product of social circumstances which determine the opportunities and the reality of every individual. The factors are socialization, upbringing, experience; worrying about the family, access to sustenance, housing; but also access to being educated at schools or universities, prospects of social appreciation and success while receiving sufficient economic means. The personal perceptions of every human being, the way they behave, cannot be understood without understanding these conditions.

Typically, such notion is generally accepted in matters of skill: those who never learned how to read, write, or do math just cannot do it. It is more complicated for some to understand the same in features like »feel-

ing«, »tasting«, or »the experience of pain«, or pleasure, for that matter. It is more complicated to understand the imprint society has in those experiences. Even otherwise emancipated individuals rarely do not question the social imprint on physical of physiological features. They often understand such features as »natural«, i. e., they should be developed without the influence of society. This, however, is factually equal to jumping to conclusions.

Nothing that is human is also beyond the reach of society; nothing humans can perceive is imaginable beyond the limits of social conditions or conditioning. Arguing this way is often met with the criticism of being radical or »constructivist«, today. Yet for feminist and Marxist work this has been essential to recognize human beings as social creatures within a net of relations to other human beings. As mentioned above, Rousseau and – with their keen eye on the development of girls and the opportunities women enjoy in society – Pizan, Fonte, and Gouges proved just how much mental development relied on social conditions. Beauvoir ardently spoke against the existence of the pre-determined and irreversible »eternal female.«

In *The Second Sex*, Beauvoir's attempt at understanding why women play such a subservient role in society, Beauvoir draws from the (then) latest scholarly findings of the natural sciences and historiography, psychology, and sociology. She did not perceive »women« as a constant then, as little as she understood scholarly findings as eternally true. She rather outlined just how specific social conditions shaped »women.« Karl Marx understood through his earlier works – and made it the basis of his later ones such as his *Capital* – all relations of the individual to the world have always been »human«, thus social, ones. According to Marx, this covers everything perceived through »seeing, hearing, smelling, tasting, feeling, thinking, observing, experiencing, wanting, acting, loving« (Marx 2000 [1844]).[16]

Physical traits are obviously not »natural«; it is important to see them, too, as created by society. This is easiest to seen in nourishment: the West-

16 The English Translation is taken from: Karl Marx, *Economic & Philosophic Manuscripts of 1844*, trans. by Martin Milligan (2000), *Marxists.org*, marxists.org/archive/marx/works/1844/manuscripts/preface.htm, 45 [of pdf]. Accessed July 23, 2020.

ern European bathers, »those svelte, well-fed forms, consumers of the exact quantity of proteins required«, Juan Goytisolo describes (see Excursus 3) look down upon those famished people who arrived at the beach, and who barely dared begging for »refreshing beverages.« The undernourishment of African children manifests in bloated stomachs, slow gain of weight in the children's development, but also in being perceptible for acquiring and spreading diseases. Poverty in Western European children (given there are even some means of sustenance left) often manifests in obesity. Here the cheapest food is full of sugar and fat, and compensating leisure activities are financially out of reach. Anyway, the bodily features differ from the exactly formed bodies of the wealthier ones who may watch their diet, or who may pamper their bodies with beauty products or at the gym (even their own private gym).

Historical descriptions know the direct impact of living conditions through rickets in proletarian children, which was caused by the insufficient supply of calcium and sunlight. The most drastic manifestation of social conditions as a factor of the development of physical and physiological features was death. Undernourishment and insufficient medical treatment claimed the lives of tens of thousands of individuals – every single day.

The German Social-Democrat August Bebel knew how living conditions had a permanent imprint on the physical feature of people. He wrote »Just why is it that children of the better-off class of people typically differ from children of poor people in the development of their faces and bodies, but also in certain features of the mind? Because of the difference in the conditions of life and upbringing« (Bebel 1950 [1879], 322).[17] Mary Wollstonecraft, too, was aware of the connection of living conditions and the formation of mental as well as bodily features: »To preserve personal beauty, woman's glory! The limbs and faculties are cramped with worse than Chinese bands, and the sedentary life which they are condemned to live, while boys frolic in the open air, weakens the muscles and relaxes the nerves« (Wollstonecraft 1796 [1792], 84).[18] More currently speak-

17 The translation into English follows the German original.

18 The English original is accessed through Mary Wollstonecraft, *A Vindication of the Rights of Woman: with Strictures on Political and Moral Subjects* (London: Johnson, 1796); digi-

ing, these historic findings still hold true for today as Pierre Bourdieu describes it as »habitus« or Anne Fausto-Sterling as »embodiment« (see Excursus 4).

Excursus 4: The definitions of »Habitus«, and »Embodiment«

»Habitus« according to Pierre Bourdieu: The sociological theory of »habitus« recognizes the imprint of living conditions, i. e., social status and gender/sex, on the individual's behavior, emotions, and perception. The »habitus« of a person represents their »congealed life story.« Social origin and sex particularly have an impact on »habitus« and are represented in the language and speech, values, and cultural codes. A person acquires the »habitus« from early childhood onward through their processes of experience and learning. Among those aspects that influence the »habitus« are the size (or narrowness) of the living quarters, their facilities, as well as the interaction with as well as habits of the people around.

»Embodiment« according to Anne Fausto-Sterling: This concept, mostly employed in critical reflections of neurobiology, considers a person's socialization, living conditions and experiences as leaving a mark on their psychological, physical, and physiological features. Learning a foreign language at an early age, for instance, or using both hands synchronously when playing an instrument, change the brain pattern. Nourishment, training, and access to (pre-emptive) medicine have an impact on psychological, physical, and physiological features. The concept of »embodiment« contradicts essentialist approaches that see differences in the brain patterns as »natural« – as hereditary and irreversible.

It has been made clear, that living conditions, experience and upbringing do not only affect the capacities of the mind, but also physical and physiological features. The explanation is pending, however, just why a person

tized version accessed through https://archive.org/details/avindicationrig01wollgoog/page/n4/mode/2up

is always the outcome of society – why everything a person perceives is always social. There is no »nature« conceivable for any thought or attitude of a person if they are beyond society. Karl Marx' writings are an early and excellent reading for this idea – and they should be given their due in the following.

Well, trying to understand an organism without considering its environmental factors (or a person without the influence of other people on them) is virtually impossible. Even the development of an embryo does not happen in a vacuum. It requires signals from the mother's organism which are supplemented by further exterior signals (those from beyond the mother's organism). The development of the embryo *would not happen* without them.

Newborns cannot survive without the help of other human beings. They, in turn, react to the baby's signals, say, its cries, and nourish it – and thus send signals back to the newborn. This is communication: sending, receiving, and processing signals. This does not mean, however, that a young human being would be little more than a »recipient of signals«, therefore facing and merely absorbing an abstract society. No, the young human being (and the embryo they were before) actively take part in the communication. They are thus actors.

> »Above all we must avoid postulating ›society‹ again as an abstraction vis-à-vis the individual. The individual *is the social being*. His manifestations of life – even if they may not appear in the direct form of *communal* manifestations of life carried out in association with others – are therefore an expression and confirmation of *social life*« (Marx 2000 [1844]: 45; emphasis in the original).

Thus it is clear: We are not only social when you and I are together and communicate. We are already social, even when you and I are alone, or when nobody else is around. This is the case as the present situation (the being-alone) was preceded by the social interaction with other people, and even if it was no one else but the mother.

People are usually part of a community from birth. Therefore, it is possible to consider specific social interactions. One important tool of human interaction is language. Marx writes,

> »[f]rom the start the ›spirit‹ is afflicted with the curse of being ›burdened‹ with matter, which here makes its appearance in the form of agitated layers of air, sounds, in short, of language. Language is as old as consciousness, language *is* practical consciousness that exists also for other men, and for that reason alone it really exists for me personally as well; language, like consciousness, only arises from the need, the necessity, of intercourse with other man« (Marx 2004 [1845]: 50–51).[19]

Language is a social product of human beings. It itself refers to traditions, and it contains a repertoire of terms allowing for clearly naming some things and describing other. For still other things, there are no terms yet, and thus they remain unreferenced and often not even perceived. Human beings are compelled to acquire language as a tool of social communication, just as much as the other means of receiving and producing signals. They must also acquire the perception of emotions and other expressions of life by learning and experiencing them. The mode of communication with others determine, for example, if or how important hearing is. If somebody does not hear, only the reaction of others will show it. If somebody hears, it depends on the environmental circumstances which noises are heard and how finely they are differentiated. Social learning raises acute awareness for noises that signify danger according to social norms (see Marx 2000 [1844]).

Because the individual's ability to perceive (and produce) signals develops through society, and the great importance of language with all its traditions, terms, and limitations, demonstrate that all perceptions of a person are already social ones. Without other human beings, the embryo would not receive signals to develop, eat or drink. Language would be a ridiculous concept without interaction among people. Without communication, no social division of responsibilities would make sense.

As stated above: even if you and I are on our own, you and I, respectively, are social. Scholarly interpretation is the same. It is a social endeavor. Even when pursuing it alone, it is never detachable from the interaction

19 The English translation is taken from: Karl Marx and Frederick Engels, *German Ideology*, Part I, ed. by C.J. Arthur and trans. by Lawrence & Wishart (New York: International Publishers, 2004).

with others, from learned content, from the traditions of language. Or, as Marx writes:

> »But also when I am active *scientifically*, etc. – an activity which I can seldom perform in direct community with others – then my activity is *social*, because I perform it as a *man*. Not only is the material of my activity given to me as a social product (as is even the language in which the thinker is active): my *own* existence *is* social activity, and therefore that which I make of myself, I make of myself for society and with the consciousness of myself as a social being« (Marx 2000 [1844]: 44, emphasis in the original).

Marx presupposes such considerations of social development for his economic studies as well. He takes it a step further, though, and explains that people are hardly aware of the sociality of their actions under the capitalist system. People in a system of production – that is factually aligned with their own needs and those close to them – are aware of the interrelation of work, sweat, pain, hunger, joy. They are not in a system that is specialized and focused on exploitation. Every- and anybody who ever witnessed debates concerning the theories of Marx or Marxists is familiar with the term of »estrangement.«

»Estrangement« does not have to be anything bad. Any work rather materializes as an object. If somebody speaks a sentence, the act of speaking turns into something said. If creating a piece of art, the material receives a meaning that is detached from the action of transforming it. The spoken word, or the piece of art, is separated from the person creating them as an object with a value of its own. »Alienation«, when seen this way, always happens when people are active.

It is something problematic for Marx when capitalism becomes normative. Consider, somebody comes along and sees the cultivated soil, or a produced object, and cries out »This is all mine! If you want a share, continue cultivating the soil, make more objects!« Then, this person possesses the moving action – the productivity – of those people who cultivate the soil or make objects. Under these conditions of production, the active, transforming person is estranged from the work and its products in a negative way. They become »abstract.« Rather than producing objects with their »own value«, meaning a factual one, for themselves and

those dear to them, they now have to create »VALUE« that benefits others in order to sustain themselves – or reproduce. See, as an introduction into Marx' theories, including »estrangement«, Heinrich (2012 [2004]).

In his earlier works, Marx often employed a »strictly philosophical«, a-historiographical terminology. He does so when writing that »In creating a *world of objects* [...] man proves himself a conscious species-being [...] Through this production, nature appears as *his* work and his reality« (Marx 2000 [1844]: 31–32, emphasis in the original). Yet my limiting oneself to merely one task, the production of large amounts of the same product that cannot be consumed by those creating them, the personal relation of the people to their products fades into non-existence. Capitalism also brought forth compensating people through money, thus ending the – increasingly unbalanced – barter trade. It also completed assigning a specific »value« to the productivity of people. It took away the people's connection between their own activities and what they created. Marx writes in his Capital (1867):

> »whenever, by an exchange, we equate *as values* our different *products*, by that very act, we also equate, as human labour, the different kinds of labour expended upon them. We are not aware of this, nevertheless we *do* it. [...] It is value, rather, that converts every product into a social hieroglyphic. Later on, we try to decipher the hieroglyphic, to get behind the secret of our own social products; for to stamp an object of utility as *a value*, is just as much a *social product* as language« (Marx 2015 [1867]: 49 [of pdf], emphasis by the translator, following the German original).[20]

Yet, this very same sociality becomes virtually invisible in capitalism. The gap between economic production and the factual lived world of people increased with ever-growing productivity that left behind the »equival-

20 Karl Marx, *Capital A Critique of Political Economy*, Vol. I, Book One: The Process of Production of Capital, ed. by Frederick Engels and trans. by Samuel Moore and Edward Aveling, 1st English translation of 1887. Digital edition, 2015, accessed through https://www.marxists.org/archive/marx/works/1867-c1/index.htm. Page numbers refer to the pdf.

ent« development of compensation. It likely still holds true for every salary-dependent person that »The power of his *money* declines in inverse proportion to the increase in the volume of production« (Marx 2000 [1844]: 49, emphasis in the original). Often, that person cannot even afford the product they produce.

As it is known, Marx did not limit his »estrangement« to the production based on the division of labor, thus cooperation. Along with Friedrich Engels,[21] he soon mocks the philosophers who understood those individuals who were not subsumed according to the division of work as the ideal under the term »Man.« It was »shown as the motive force of history [and] conceived as a process of self-estrangement of ›Man‹« (see Marx 2004 [1845]: 93–4).

In contrast to that, Marx and Engels refer to the determining contradiction between the developing productive force and the overcome conditions of production requiring a binary division of society. The owners of the means of production are opposite to the people who have to work for them in order to reproduce. As long as the latter are unaware of this fact, thus, have no »class conscience«, it holds true that:

> »The social power, i. e. the multiplied productive force, which arises through the co-operation of different individuals as it is determined by the division of labour, appears to these individuals, since their co-operation is not voluntary but has come about naturally, not as their own united power, but as an alien force existing outside them, of the origin and goal of which they are ignorant, which they thus cannot conrol which on the contrary passes through a peculiar series of phases and stages independent of the will and the action of man, nay even being the prime governor of these« (Marx 2004 [1845]: 54).

But also those people who profit from the work of many other people in the capitalist way of production, or gain through betting at the financial market, are not closer to their surrounding lived environment. They, too, do not see the correlation between the consumed products and their own

21 The endonymic German *Friedrich* Engels is preferred over the exonymic Frederick. The translator.

work (see, among others, Marx 2000 [1844], Marx 2020 [1857/58]: introduction).

Thus, human beings find it hard to see the correlation between their own activities and the world around them. They perceive things and consume things that they come across as already made things. (The act of consumption alone demonstrates that the individual in question is not, of course, the »passive enduring one« but an »active actor.«)The direct correlation between action and reaction, as a young person experiences by receiving food when crying, for instance, is very difficult to comprehend when buying a chair, getting on the train, or enjoying works of art. What holds true for the way of production of consumer goods, also holds true for other segments of society: »[r]eligion, family, state, law, morality, science, art, etc., are only *particular* modes of production, and fall under its general law« (Marx 2000 [1844]: 44, emphasis in the original). How they came into being through society is largely secluded from the eyes of the individual. People accept them as given, and participate in their existence and development through consumption and production: they take part in religion, family, state, etc. They get in line, take up, repeat, change.

A person's perception of things as »just being there« in a given order makes them very susceptible for concepts of »irreversibility« or »naturalness.« That person faces in awe – and impotence – a solid *something*. Rather than being able or even willing to comprehend it, it is declared »natural« or even »holy.« The most apparent results of such impotence are the separation of »nature« from »culture«, of the »body« from the »mind«, »matter« from »idea.« Individuals who are socialized that way will hardly comprehend becoming and change (thus the development), the impact society has, and the social human being's own actions.

Thus, in conclusion:

1. Every person becomes an individual in society – they have always been in society, and society is in them. The person is therefore always a social being already, and all their perceptions are already social.
2. »Negative estrangement« is an important factor of the person's *limited comprehension* of 1).

The ideas Marx outlines for the economic means of production, but also briefly touches on »religion, family, state, law, morality, science, art, etc.«

equally hold true for »sex«, of course. Sex is one important category in western society for the differentiation of people. It is interwoven in an institutionalized way in religion, family, state, law, morality, science, art, etc. Differentiating according to sex seems »natural« because it is already a part of the individual's socialization. The fact that »sex« is also a social creation thus seems difficult to grasp as it is an ever-present concept. You and I draw from the socially acquired repertoire of the features and meanings of sex. We interpret those features, repeat them, and add our own by interpretation. No matter how we behave, even if we reject the binary classification of human sex, we still draw upon the social repertoire concerning sex. And, thus, perpetuate it.

This takes us back to Beauvoir's observations: she identified the current reality of sex – female and male. She understood that within society discrimination, inequality and violence happen along the lines of sex, and that women are more often discriminated against and more often directly violated than men. Liberation means to act in a concrete way against violence, inequality, and discrimination. It does not mean, however, to declare women and men as something eternal. Just as much as Marx' analyses of the ways of production may/should be used for bettering society and the lives of people, so may/should the category of »sex« be analyzed thoroughly. The findings may/should lead to changes allowing for a proper life for all. The social development of both will take perseverance. It should not lead to giving in to barriers of thought or a notion of having no alternative but to carry on, because that perseverance seems unbearable.

Simone de Beauvoir saw the relations of production and the sexes as being intricately connected. *The Second Sex* concludes with a reference to Karl Marx:

> »›The direct, natural, necessary relation of human creatures is *the relation of man to woman*‹, Marx has said. ›The nature of this relation determines to what point man himself is to be considered as a *generic being*, as mankind; the relation of man to woman is the most natural relation of human being to human being. By it is shown, therefore, to what point the natural behaviour of man has become human or to what point the human being has become his *natural* being, to what point his human nature has become his *nature*‹.

> The case could not be better stated. It is for man to establish the reign of liberty in the midst of the world of the given. To gain the supreme victory, it is necessary, for one thing, that by and through their natural differentiation men and women unequivocally affirm their *relationship as siblings*« (Beauvoir 2020 [1949], emphasis in the original; the underlined wording was changed according to intentions of Beauvoir. The term »natural« in the quote is used differently as elsewhere – it does not refer to something that is pre-determined and irreversible, but rather that the »naturalness« of human beings is sociality.)[22]

As presented in the beginning, Beauvoir had always emphasized that the »natural differences« between women and men are not biological predeterminations of an »eternal female« or »eternal male.« Women and men, as they do exist in our current society, are supposed to come together as *siblings*, meaning as *humans* (meaning *socially* meaning *naturally*). The relations between women and men as well as handling sex in society, are Beauvoir's indicators of 1) the »negative estrangement« has been lifted *and* that 2) man, in the sense of human being, has become human(e) to themselves. In *The Second Sex*, Beauvoir repeatedly emphasizes – by a reference to Marx – that the liberation from patriarchal and capitalist oppression may only succeed when going hand in hand. Furthermore, the liberation from oppression will not materialize out of thin air, but rests on the constant and continuous *molding of society*.

As Karl Marx focuses on the economic means of production, moving beyond that subject is difficult for an analogy of the social determination of sex. Simone de Beauvoir's works, on the other hand, present excellent starting points for discussing the sexes. Even more so, as well as more current and direct discussions of the concept of binary sexes, are the works of Judith Butler. She exhaustively argues against the idea of a solid, »natural« (meaning pre-determined and irreversible) core of sex that exists beyond the reach of social influence.

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22 The English translation is taken from de Beauvoir, »Conclusion«, in *The Second Sex*, Philosophy Archive @ marxists.org, https://www.marxists.org/reference/subject/ethics/de-beauvoir/2nd-sex/introduction.htm [accessed July 23, 2020]), https://www.marxists.org/reference/subject/ethics/de-beauvoir/2nd-sex/ch04.htm

The turn of the twentieth century witnessed the rise in the belief in heredity as an early understanding of genetics. More simplistic concepts of sexuality then moved into the focus of biology – not least because theoreticians of more nuanced concepts were also persecuted and murdered by the Nazis in the 1930s and 40s (see Satzinger 2009). When the structure of DNA was described as a double helix in the 1950s, heredity and the idea of »genetic material« raised expectations of having found the key to the understanding of life. Initially, feminist advocates saw the benefit in not debating a »natural« core of the sexes as a strategy. It may have taken away an option for further reflection.

Those advocates of the emancipation of women rather argued in the 1960s and 70s that the lower position of women in society (thus the better status for men) was rooted in social discrimination – regardless of »natural«, pre-determined factors. Even if there (»naturally!«) was a difference in the sexes, it could not serve the justification for discriminating against women in society. Elements of such argument can be found in Beauvoir's *The Second Sex*, too. It brought forth the distinction between *»sex«* and *»gender«*.

Sex, the alleged »natural« core beyond the reach of society, moved into the focus of feminists again in the 1980s. The first half of that decade saw the discussion of androcentrism and biased researchers in the historic and then current research on sex, as well as the impact it had on the resulting theoretical concepts. Scholars who questioned long-held theories on that basis were Lynda Birke, Ruth Bleier, Ruth Hubbard. Evelyn Fox Keller, Londa Schiebinger, Thomas Laqueur, Anne Fausto-Sterling, or Donna Haraway (see, as an introduction, Palm 2010, Voß 2008). Building on this understanding, Judith Butler complements the notion by outlining that – just like social *gender* – the biological *sex* is also the outcome of creation within society. It is society which reads bodily features and bestows meaning upon them through constant repetition, quotation, relentless cultural (self-)appropriation, and rejection. Every individual within society takes an active role in this (see Butler 1993; Butler 1990, Jagose 2001).

Such observations are not meant as an end in themselves. The scholars mentioned above, and more, as well as the thorough debate of Butler's work have rather broken up an ossified thinking concerning sex – broken

up, that is to say, not overcome. It is important to take it a step further: Butler, for instance, discusses »testicles«, »penis«, »vagina«, »clitoris«, »ovaries«, and »uterus« as social terms for seemingly factual organs that, in turn, call out for a binary differentiation according to sex. They are not and they do not. Marx, for instance, employed the evolutionary perspectives for his observations on the ways of production. They are normative, today, for any enlightened considerations in the sciences such as geography, physics, or biology. Evolutionary perspectives, too, necessarily raise doubts about the terminology of those organs for a differentiation according to the sexes. Such considerations always emphasize the development, differentiation, and processuality. The process in this is always open for influences of all kinds; those influences differ from individual to individual, and the outcome is never fixed.

This consideration will be discussed and outlined in respect to biological theories of the sexes but also alternatives to a binary concept of sex on the following pages. Before doing so, however, it is imperative to consider the development and importance of evolutionary thinking.

Evolutionary Thinking and its Potential for Social Change

Considering the world through the lens of evolution, i. e., constant change, was one of the most crucial innovations of the sciences and society in general around 1800. It is striking, for instance, that the revolutionary period saw the rise and success of theories of *development* in the liberal and natural sciences. The great German thinkers – one random example – of their times all followed ideas of development: Gotthold Ephraim Lessing, Johann Wolfgang von Goethe, Johann Gottfried Herder, Georg Friedrich Wilhelm Hegel, Friedrich Wilhelm Joseph Schelling, and others.

Moreover, they all followed the theories of Baruch de Spinoza, the great thinker of the 1600s. Yet, at the beginning of the 1700s Spinoza's followers still risked exile as enemies of the state and of religion. Spinoza did not perceive »God« as a creator, after all, who brought everything into existence on one singular act of will. For Spinoza, »God« was inherent to every and any being itself – as a productive driving force of development from what exists now to a future state of existence. He also rejected the

existence of an »eternal soul« next to a short-lived matter. »Soul« and »body«, according to Spinoza, were rather two core characteristics of the »one substance«, and also subjected to development (the so-called theory of monism). Such understanding tied in with the works of the Arab-Muslim middle-ages – a fact the thinkers around 1800 honored. Johann Wolfgang von Goethe, otherwise predominantly known as the German »Prince of Poets«, devoted more than a fraction of his time to studying Islam. Bettina von Arnim specifically dedicated one of her works to the »spirit of Islam.«

In order to grasp the importance of evolutionary thinking, it is sufficient to bear in mind that well into the 1700s, the order of society – state, religion, the classes, the plundering of the population through feudalism and serfdom – was generally accepted as divinely ordained (and created). It was thus considered an eternal order. The French Revolution proved that the order of society was not eternal or irreversible but changeable through enlightened human beings. The evolution of societies moved into the focus of considerations. Karl Marx, again, theorized on the evolution and processuality of the economic means of production in the 1800s. Their driving force was the discrepancy between productive force and the relations of production – thus, class conflicts were the result of this class antagonism.

Just as an explanation: contemporary productivity would allow the supply of sufficient food and medicine to all people – if the relations of production were not subjected only to maximizing profit. Marx thus demonstrated that the social order was not eternal and irreversible but rather outlined a concept of social development. The discrepancy between productive force and the relations of production alone would not generate changes »just like that.« They had to be achieved through practical action, uprising, revolution. (Thus, such a social evolution would not be a slow and gradual one, in the sense of Charles Darwin's concept, but rather dialectic, meaning characterized by leaps and bounds. It would be a revolutionary development, triggered by the discrepancy, and characterized by »abandoning gradualness«, thus turning quantity into quality of change.)

In his writings, Marx refers to a number of natural-scientific aspects – biological ones included. He does so when writing:

> »The creation of the earth has received a mighty blow from *geognosy* – i. e., from the science which presents the formation of the earth, the development of the earth, as a process, as a self-generation. *Generatio aequivoca* [the sponaneous creation and self-creation, respectively, of organisms out of anorganic compnents, HV] is the only practical refutation of the theory of creation« (Marx 2000 [1844]: 48).

The idea of evolution plays into the theories of the natural sciences as well as society. This indicates an important aspect which should be mentioned: conclusions of the natural sciences do not stand in the way of seeking the development towards a better society, as it is sometimes claimed. There is no conflict between an allegedly »evil« biology – that dictates the existence of two sexes – and the social sciences that fight a binary concept of the sexes in itself (see Katrin Kämpf, *L. Mag – Das Magazin für Lesben [L. Mag – The Magazine for Lesbians]*, 7/8, 2010: 76). Both fields present at the same time concepts to require a strict distinction into two sexes, as well as concepts leaving room for turning away from it. As a preview of this book's conclusion: evolutionary considerations offer very much room for breaking with the concept of pre-determined binary sexes.

Since the 1800s, theories gained momentum that discussed the development of the earth through cooling off over a longer period, the emergence of species and organs, the development and differentiation of organisms etc. (those theories have existed before, but had been socially and scholarly marginalized). They went well together with ideas which saw the small and smallest elements as the basis for everything (the atomism or chemism) and as the forces of every change. Such forces, in whatever form, were described, for instance, in the theories of electricity, magnetism or gravitation. Theories included the development of the organism and its organs as well.

The development of the embryo, as it was understood, began with shapeless matter (a cluster of undifferentiated cells in our modern concept). Forces acted upon that matter, triggered its development and differentiation, and thus turned shapeless matter into a defined and differentiated organism. The development would continue after birth and manifest itself in changes of the organs (and the capability of healing wounds, for instance). The school and consecutive educations, but also acquiring and

executing tasks might be added as representing the development of the human being.

Evolutionary, or to employ the other word developmental, thinking had a strong impact on many theories of the nineteenth century. In this, »development« was wide open to a number of influences, but also for argumentations such as for the emancipation of women. Earlier publications – like Pizan's, Fonte's, or Gournay's mentioned above – emphasized the impact society had on the development of the mind – and thus fenced the understanding against the realm of pre-determination through a higher power. Just as much as social conditions could be an obstacle for the mental development of many people, they could have been altered to foster the mental development of all people.

Such considerations gave ground for debates which sought identifying features that were capable of development, and those that were predetermined and unchangeable. As mentioned above, Rousseau focused on the capability of developing the mind and other features of boys/men. Wollstonecraft did the same for girls/women as well as representatives of lower classes. Human features lost their »pre-determination« through evolutionary thinking. In concept, they became changeable – in reality, they did, too.

Historical Biological Theories of Sex – Theories of Two or More Sexes

So far, we can appreciate that human beings cannot be understood independently from society – as they already and always are social. They are in society and society is in them. Therefore, the existence of a human »naturalness« free from social influences is impossible. Human embryos are already influenced by other humans in the womb. They are affected, for instance, by the mother's nutrition, other intake or mood, of course, but also by external factors such as temperature, light, noise or even tone of voice spoken to mother and child. After birth, every human being grows up in society. And, of course, all biological theories concerning sex are scholarly theories after all – thus always also the result of the social order in which they were perceived.

Western societies, for a long time, foresaw the existence of two different sexes. They were subjected to a hierarchy, and women and men therefore were granted different opportunities within society. Even researchers who are otherwise not restrained by economic considerations, are embedded in the social reality of the existence of two sexes. When trying to understand the sexes, they must always have with the presupposition of two sexes. Moreover, considerations that do not follow the currently presupposed difference between the (no more than) two sexes, meet obstacles. They are required to face the reality of two sexes that live differently – and have different opportunities in society – and argue against that as the basis for all theory. Such considerations move equally in rough waters in regard to language which simply does not foresee the existence of anything but binary descriptions and concepts (German even more so than English, one might add).

Today's situation might lead to short-sighted conclusions, as the one Andrea Trumann presented in her *Feministische Theorien [Feminist Theories]* (*theorie.org,* in German): »Nobody has ever questioned the natural difference of the sexes until the end of the 20th century« (Trumann 2002 [German original]: 107). The discussion above itself proves this to be a misconception. Marx and Beauvoir described human beings as a social species. They argued that abolishing the enslavement of mankind by capitalism, or that of women by men, the human = sibling-like relationship toward one another would present itself as the actual feature of the species homo sapiens sapiens. Neither Beauvoir nor Marx demonstrate sex and the concept of the binary sexes as pre-determined, eternal, or a-social components.

The following pages are dedicated to explicitly biological theories of the sexes. Those theories will be critically evaluated for the way they discuss the »natural difference of the sexes.« It may be assumed that biological theories, too, have entered numerous discussions about the sexes, and the (in-)equality of women and men. It is difficult to conceive those discussions otherwise as the biological sciences, and their representatives, are/were also deeply embedded in their social orders as well as the heated discussions over the position of the sexes – especially the position of women in society.

More recent conclusions of gender studies research – like the ones Trumann ties into – must be rejected as too short-sighted and simplistic when taking into consideration those debates within the field of biology. Let us begin by summarizing the state of research and continue with discussing *more in detail* the differentiation of *modern* biological theories of the sexes and the debates they provoke.

Too Simplistic: The Current State of Research in Gender Studies Concerning the *Biological Theories of the Sexes*

The research of the sexes, particularly in the social and cultural studies, largely follows the few works dedicated to the genesis of the biological-medical differentiation of the sexes. The works of Thomas Laqueur (1986; 1990), Claudia Honegger (1991), and Londa Schiebinger (1986, 1989) are virtually canonical for the field.

Thomas Laqueur's study is most influential, when he contrasts the ancient understanding of a »one-sex model« with our »two-sexes model« which evolved only with the dawn of enlightenment. The ancient societies, according to Laqueur, largely perceived sex and the corresponding roles in society as society made as natural philosophy and science appreciated the human being through one single model. It merely differed in the degree of perfection: man was understood to be the perfect model of a human being, woman as an imperfect version of it, i. e., man/the human being. Laqueur succeeded in identifying this concept from the antiquity to well into the Renaissance period, when it was – slowly – replaced by the »two-sexes model« of our times.

Claudia Honegger and Londa Schiebinger concur with Laqueur's findings. In their works, they particularly cover the beginnings of the »modern« biological-medical sciences. According to them, the concept of two physical and physiological sexes replaced in the »one-sex model« in the eighteenth century. Anatomy and physiology proved the inequality of the bodies (of men and women) and then turned that proof into a social model for sexually differentiated relationships (of inequality). From the early 1800s onward, this biological concept of the binary sexes had provided the scientific/rational arguments for stabilizing man's position in society during the formation period of a bourgeoise and industrialized world. Those arguments also fended off the intrusion of women in hitherto male segments of society by the end of the century. Researchers of the sexes rather simplistically see biology and medicine as safeguards of male dominance in society. Claudia Honnegger's even considers a *Sonderanthropologie der Frau [a special anthropology of woman]*, a term that most poignantly boils down the concept of »naturalizing« the inferior position of women in society (see Honegger 1991: 6, 126 et seqq.).

The empirical core of the concept has been challenged on occasions. Katherine Park, Robert A. Nye (1991), as well as Michael Stolberg (2003) have convincingly argued that the two-sexes differentiation had already existed as early as the 1500s. In Germany, Brita Rang (1986) argued at an early point against the notion of the sex-related characters having developed in the eighteenth and nineteenth century.

What is correct, though, – and Laqueur, Honegger, and Schiebinger contributed greatly to this understanding – is the fact that biology and

medicine in their theories of the sexes must be understood in the context of their societies. Those scholars discussed exceedingly well the primacy of society even beyond the formation of such theories. Or, put differently, the biological-medical theories of the sexes reflect the relationships of the sexes as they were lived in society. This, in turn, also means that the social debates over the roles of men and women in society entered the scholarly fields of biology and medicine as well. The researcher must identify and evaluate such discussions in biology and medicine, but also whether and how some theories were (and are) utilized for the arguments over emancipation. Just as much: it will be quite clear that the classification of a »one-sex« and »two-sexes model« – as well as a radical supersession in specific eras – does not make too much sense. Laqueur sees the idea of an ancient »one-sex model«, meaning the understanding of (male) perfection and (female) imperfection, respectively, with its relative differences between two sexes. It might be argued, though, that this model still holds true for »modernity.«

Antiquity – The »One-Sex« and »Two-Sex« Models

Laqueur's hypothesis of a »one-sex model« is largely founded on the descriptions of genitalia. Galen of Pergamon, for instance, was a physician in the second century CE. He largely understood the male and female genitalia as being identical and differing only in their position. While male genitalia were turned outward, female remained within the body. The internal vagina, cervix, (female) testicles, or uterus merely were the counterparts of the external foreskin, penis, (male) testicles, and scrotum. The fundamental reason for those genitalia's position was »heat«, which should be understood as a physiological element. Man possessed more »heat« than woman – therefore, he was more perfect than she.

Perfection was not just limited to the position of the genitalia. Ancient natural philosophers further utilized the idea of perfection also in regard to the effect the individual contributions to procreation had, but also to the position of women and men within society. Aristotle in the fourth century BCE, of course, considered woman to be incapable of contributing to procreation through her own seed, but merely provided catamenia

(a precursor of semen). When male semen met female catamenia, according to Aristotle, male »heat« would turn the latter into semen. Only then could they add to the act of procreation. Even then, however, would the female involvement be a limited one, as they merely provided one material contribution, whereas the man would provide the alleged critical moving principle.

Aristotle painted a vivid picture of that concept: the female contribution to procreation resembled a raw rock (thus it was *material*). The male contribution, on the other hand, resembled the artist who turned the rock into a sculpture (thus it was the *moving principle*). Man was »perfect«, for Aristotle, and »perfection« presents itself in the similarities to man. Woman was, for him, the first »deformity« of the human being. Limited »heat« denied her to turn her genitalia outward and producing full-value seed. She was, moreover, light-minded and susceptible to immorality for that reason. For Aristotle, this was enough to put women under constant guardianship.

There were other ancient natural philosophers who rather saw an equal contribution of seed from women and men. The Hippocratic Corpus – written roughly from the fourth century BCE until the first CE – argued in such a way. The value of the female seed (or the comparable quality to the male one) was discussed in them as well, but its existence never doubted. Galen of Pergamon also concluded there were equal male and female contributions of seed for procreation. Yet he also described the female counterpart as »colder« and »moister«, and thus as more imperfect than the male seed (see, also for a more thorough discussion of differentiating the concepts of seed, Lesky 1950).

It is difficult to subsume such concepts as a »one-sex model.« It would not do justice to the number of natural philosophical considerations of the sexes in antiquity – whether they were brought together with the idea of »heat.« Even more so, such »one-sex model« would ignore ancient descriptions of the differences between the sexes of women and men. Galen, for instance, assigned masculinizing properties to the male testicles; removing them would »emasculate« the man. Galen saw the outcome, the castrated man, as loosely resembling woman, respectively does he consider the outcome to be a third option next to man and woman. Galen also described other differences of the sexes for the chest,

arteries, and the flesh. Aristotle emphasized physical and physiological differences. They covered the bodies' differences in the degree of being sinewy, defined, or hairy, but also in »moister flesh« and a smaller female brain.

The idea of a »one-sex model« also ignores the many ancient tractates on »women's illnesses (read: gynecological disorder)« for which exist no corresponding texts for the male sex. Those tractates focused on the uterus as the seat of the »female illnesses« – this itself contradicts reducing the ancient concepts of the sexes merely to a »being turned inward« or »outward« nature of the genitalia. The scrotum, for instance, was seen as the outward counterpart of the uterus. Thus, one would expect similar ancient considerations of the scrotum as the seat of »male illnesses.« It just did not happen.

In conclusion: the ancient natural philosophical considerations of the sexes must be appreciated as differentiating ones. There were discussions then, whether women and men both (and equally) possess seed, and just how the seeds developed into an embryo. Those theories must also be seen before the backdrop of an oligarchic – the rule of some privileged ones – as well as paternalistic society. They were influenced by the actually lived order of the sexes. The only ancient natural philosophical writings on matters of the sexes we have at our command today, it should be remembered, were written by men.

The Middle-Ages – Not Just Reducing but Creative

Historiography often describes medieval Europe as somewhat »semi-conscious.« Thomas Laqueur does, too. Moreover, he describes the natural philosophical concepts of the sexes as continuously valid from antiquity to the Renaissance, well even into the eighteenth century – thus over a period of 1500 years of numerous social changes.

It is, of course, not as simple as that. During the Arab-Muslim middle-ages hitherto gained knowledge, the ancient one, was subjected to syntheses and additions of new observations. Not only the ancient knowledge became part of the process, but also other traditions such as the Indian and Persian ones. The Latin (Western European) middle-ages drew from

that systematization as well as many ancient writings were not utilized in the form of the Greek or Latin originals, but through Arabic translations and syntheses. For our modern understanding of the antiquity, well, for our European heritage of ancient knowledge, we matter-of-factly owe tremendous gratitude to Arabic thoroughness in contrast to European carelessness.

The works of the Arabic-Muslim middle-ages as well as their impact on Latin Europe are hardly more than glimpsed at when it comes to theories of the sexes – including the natural philosophical ones. That glimpse, however, indicates their value for understanding the considerations of the sexes. The Persian physician and philosopher Abū Alī al-Husain ibn Abdullāh ibn Sīnā (980–1037), Latinized to Avicenna, likely brought Galen's theory of the four temperament, the theory of humorism, respectively, to full fruition. We also have (some of) his writings on natural philosophy regarding the sexes and sexuality. When reading those Latin texts, as did Eberhard Kirsch for his *Avicennas Lehren von der Sexualmedizin [Avicenna's Teachings on Sexual Medicine]* (2005 [1964]), it is clear that Ibn Sīnā did not merely translate and edit those texts, but also provided new considerations such as the one for the concept of seeds.

Ibn Sīnā considered two kinds of seed – a male and a female one – and explained them by combining several concepts. He also accepted the idea of the genitalia as being similar but »turned to the inside« or »outside.« Yet he also described some explicit anatomical differences between women and men. His understanding becomes clearer in the following excerpts (which follow Kirsch's German translation of the Persian original):

> »I say, the organ of procreation for women is the uterus, which is analogous to the male organ of procreation in the original formation, meaning the penis and the attached parts; one of those organs is completed, though, and turned outward, whereas the other is incomplete, held back in the interior of the body, and quasi the inversion of the male organs. The scrotum corresponds to the membrane of the uterus, the penis to the cervix. Women and men have two testicles each. Yet they are large, on the exterior and elongated, while the female ones are small, round, strongly flattened, and situated near the cervix« (Ibn Sīnā, following the translation of Kirsch 2005 [1964]: 60).

> »Men have four muscles of the testicles. They protect the testicles and draw them upward to prevent their limpness. Every testicle has its own pair of them. Women make do with just one pair combined, thus one muscle per testicle as theirs are not attached on the outside of the body as the men's are« (ibid: 100).

Ibn Sīnā's description of the male and female testicles found their way into European thought through the medical texts from the late 1600s onward. Here and there, female testicles are »small, round, strongly flattened«, the other as »on the exterior and elongated«, and both as possessing a dissimilar number of muscles. Yet Ibn Sīnā emphasized the analogies while presenting the differences as superficial and negligible. In Europe from the 1600s onward, on the other hand, it is much more important to distinguish between the places of origin of »eggs« and »semen« – »ovaries« and »testicles« – but also to emphasize the differences. Linguistically, too, we see a change in terminology as the Europeans discontinued speaking of male and female »testicles.« More thorough research is needed. It also seems worthwhile to discuss the traditions and changes in the descriptions of the sexes for their analogies and differences (see also Cadden 1996; Thomasset 1993).

Humorism and the Theory of the Temperaments

Moderata Fonte already mentioned the humors and the theory of the temperaments. In her *The Worth of Women* she discussed the differences between women and men through them and called for strengthening the mind to alleviate temperamental disadvantages. It is explicitly stated in one of Fonte's dialogues:

> »›Tell me, my dear, sweet Corinna‹, said Helena. ›Why is it that women, as Leonora says, are kinder and more innocent and trusting than men?‹
>
> ›In my view‹, Corinna replied, ›the explanation for this lies in women's natural disposition and complexion, which is, as all learned men agree, cold and phlegmatic. This makes us calmer than men, weaker and more apprehensive by nature, more credulous and easily swayed, so that when some

> lovely prospect opens up before us, some enticing vista, we immediately drink in the image as though it were true, when it [sic] fact it is false. [...]‹
>
> ›That makes good sense to me‹, said Helena. ›For women's nature is such that ferocity cannot dominate in it, since choler and blood make up a relatively minor part of our constitution. And that makes us kinder and gentler than men and less prone to carry out our desires, while men, by contrast, being of a hot and dry complexion, dominated by choler – all flame and fire – are more likely to go astray and can scarcely contain their tempestuous appetites. And that is the reason for the fierceness, waywardness, and fury of their anger, and the urgency and excessiveness of their burning, intemperate desires, carnal and otherwise‹ « (Fonte 1997 [1600]: 83–84).

Humorism, also humoral theory, humoralism or humoral pathology, refers to the teachings of the humors (body fluids), and can be found in the Hippocratic Corpus. There are four humors: blood, phlegm, yellow and black bile. There are two primary qualities assigned to each of the four humors: »hot«, »cold«, »moist«, and »dry.« Blood is »hot and moist«, yellow bile is »hot and dry«, black bile »cold and dry«, and phlegm is »cold and moist« (see Figure 1). There is further assigned: blood – spring; yellow bile – summer; black bile – autumn, phlegm – winter. This »medical« theory must be distinguished from the natural philosophical one of the Macrocosm. There, the four elements of air, fire, earth, and water were also assigned two primary qualities. Galen combined these two approaches and argued that the elements of the Macrocosm were represented in the body through humors (see Thomasset 1993; Jahn 2004 [1998]): 54 et seqq., 64).

Galen's contextualization turned the world into a complex concept as everything was categorized accordingly: everything in the Macrocosm as well as in the human body, but also food, drinks, or stages in life. Based on this system, a complex medicine was devised which provided suggestions for keeping healthy and treating illnesses. Today, the best-known treatments of their times are likely blood-letting and dietary recommendations. The balance of the humors, diet, lifestyle – all in respect to the seasons and age – allegedly determined the »temperaments«, i. e., the character of a person. The human temperaments were sanguine, choleric, melancholic, and phlegmatic. We have already seen for the ancient times,

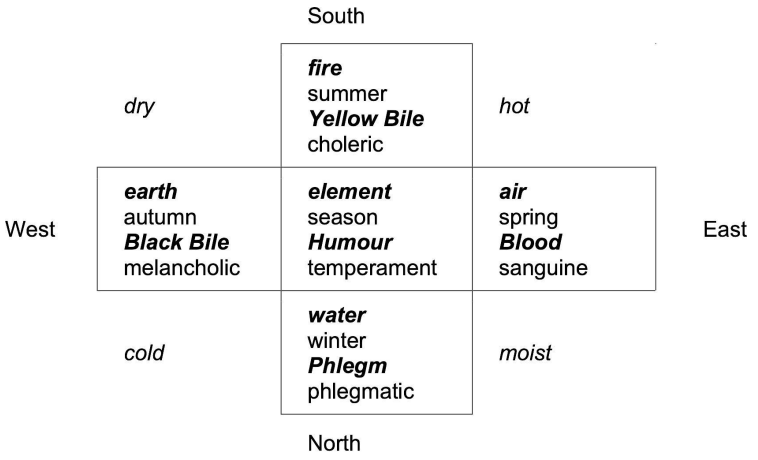

Figure 1: Humorism, or Theory of the Temperaments, as classified in a complex and quadrinomial worldview according to Galen of Pergamon (taken and translated from: Thomasset 1993: 62, emphasis by HV).

that concepts of »heat« (or »warmth«), »moistness«, and »dryness« were assigned to women and men according to their sexes. The theory of the humors/temperaments also had a great impact on the respective recommendations for preserving a healthy body. The Hippocratic Canon, for instance, provides some recommendations that specifically discuss the »illnesses of women.« They are soundly committed to the theory of the humors.

The theory of the humors/temperaments had a strong impact on the Latin Middle-Ages as it offered a comprehensive understanding of the world. There, Galen's ideas had been transmitted through the Arab-Muslim preservations and subsequent developments. The theories made it possible to understand individual abilities, but also how to provide just the right medical treatment, food, or drink. Hildegard von Bingen (1098–1179), the German Christian theologian and expert in naturopathy, was an ardent follower of the theory of the temperaments as her writings show – and the large space she dedicated in them to the concept. They are a fascinating source for the discussion of concepts that emphasize the differences of the sexes.

The theory of the temperaments also had a great impact on societies from the sixteenth to the eighteenth century. The passage by Fonte quoted above is but one example. Fonte considered women (and men) capable of controlling »their nature« through reason. Other authors merely noted the features of the sexes that were allegedly rooted in the different temperaments. They saw them as the reason why women's access to education or social positions of influence were limited. Still other authors, however, argued against the idea of different temperaments of the sexes.

In 1742, Dorothea Christiane Leporin (1715–62, better known by her married name Erxleben but especially for being the first female physician in Germany who held a doctorate) wrote her *Gründliche Untersuchung der Ursachen, die das weibliche Geschlecht vom Studiren abhalten* [*Thorough Inquiry into the Reasons that Prevent the Female Sex from Studying*]. There, she strongly rejected the existence of a temperament just for women which might prevent them from studying. Such a »bad« temperament was to be found in women *and* men, just as there were »good« temperaments to be found in women *and* men. Yet, as she wrote, such a »bad« temperament never prevented men from taking up their studies. Therefore, why should not women study with such a »bad« temperament.

Theories of Preformation in the Seventeenth Century – Describing Differences of the Sexes

The ideas of procreation and heredity were important ones for natural philosophical and biological discussions of sex as we have seen in the little excursion on ancient concepts. The debates over procreation mainly focused on the contributions of women and men, i. e., whether their contributions were of equal value or differed from one another. The idea of hereditary features was an important one, as the child's resemblance of the father's was considered a sign of the offspring's legitimacy. The concepts of procreation and heredity, however, were subject to dramatic changes. They were also more or less compatible with theories of the differences or sameness of the sexes – depending on their stage of development.

The so-called »theories of preformation« gained momentum as concepts of procreation by the end of the seventeenth century. They described

the individual human being as fully pre-formed in either the eggs (Lat. *ovo*, which gave the ovaries their name) or in the semen. Adherents to the former theory were *ovists*, to the latter *animalculists* (from Latin *animalculi* for semen or semen-animal). Put differently: a tiny full-fledged human being was supposed to be huddled in either the egg or the sperm. Only the size was to change during the development of the embryo and later until reaching maturity. The term »development« should actually be read as »expansion«, when following the idea. Figure 2 shows the concept of preformation for the male semen according to the Dutch Nicolas Hartsoeker (1656–1725).

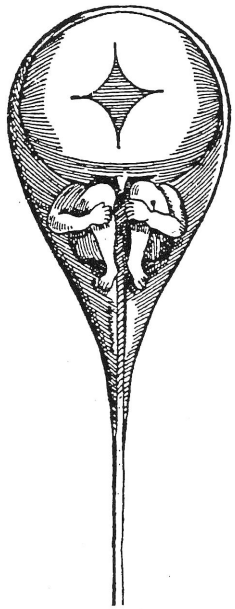

Figure 2: The preformation in the male semen according to Nicolas Hartsoeker, 1694. The human being was allegedly fully formed in the semen. Head, arms and legs are clearly identifiable (detail taken and adapted from: http://www.hps.cam.ac.uk/visibleembryos/s1_4.html [accessed: July 31, 2020]).

The theories of preformation fit very well into the world of Christian-clerical doctrines according to which »God« created humans. Those preformed individuals were thus traced back to Adam and Eve, respectively. Adam and Eve, according to the idea, had in his sperm and in her eggs all future generations preformed and placed one inside the other. To put it crudely, they resembled gonadal nesting dolls: like in a Russian nesting

dolls, a very large number of humans – at least several million – were supposedly placed one inside the other. The huge outer hull were Adam's semen and Eve's eggs.

It would be a mistake to understand women and men as basically equal according to this concept – with the female contribution to procreation sometimes being more important than the male one, and less important at others. Ovists and animalcule alike diminished the female contribution to procreation. The ovists focused on the egg but considered the male contribution as more crucial as it contained the initiating, active principle. Without it, the expansion of the human being would be impossible. The animalculists, on the other hand, diminished the female contribution even further. According to them, women would merely host the embryo, meaning house and feed it. This concept, too, fit well into the Christian-clerical understanding of the times: »God« created woman and man in complete perfection to one another. The parts and contributions of procreation of both were considered different but fitting each other.

Such an idea of procreation was hardly a new one. It could recurse to traditional concepts. The ancient theory of pangenesis, for instance, argued that all body parts would extract the best component parts (basically emit small organic particles), and male and female (!) seed would already entail the fully developed body parts on a very small scale. The adherents of pangenesis, however, considered the extracts of the woman's and the man's body parts equally essential for procreation. Thus, women and men both contributed »their share of heredity« to procreation (both »seeds« were only differentiated according to their quality; see Lesky 1950). This is an important difference to the preformation theorists of the seventeenth century. Then, it was understood that there was a wide gap between the male and female contributions to procreation. The distinguishing terms of »egg« and »semen« were introduced and replaced the one word »seed« for both the male and female contributions.

Different »material« of procreation – egg and semen – now gave grounds for describing the differences for other bodily features. The different raw material of procreation required a different place in the body to be stored. Moreover, it seemed important to distinguish the afferent from efferent vessels. Eggs were now stored in female »ovaries«, semen

in male »testicles.« There had been no such distinction until the end of the seventeenth century, even if some differences had been described. New terminology also began describing the blood vessels that supplied the ovaries and testicles, but also the efferent vessels for the eggs and the semen. Still other descriptions focused on the pelvis and the breasts which apparently »God« had created in perfection, but also in different sizes and functions for women and men.

The theories of preformation were rooted in empirical studies. The ovists referred to the observation of birds, which was transferred onto humans. The animalculists looked through a microscope when they recognized a fully developed human being in the semen. As amusing as those theories of tiny people in the eggs and semen may sound today, they were *the result of empirical studies and personal observations*. This demonstrates vividly, and as an example, that it *was objectively observed what was to be socially expected and what fit the social reality then.*

Concepts of preformation still exist – yet in a different form and under a different name. In genetics, for instance, argues that the smallest molecular structure already entails all information for the development of human features. The cells and the organism would develop those features upon receiving the information. Genetics thus understand all features of an organism as preformed in the »genes.« Let us come back to a more thorough discussion of current theories and their ancestors at a later point.

The Transition to the Developmental Concept (Epigenesis) – Descriptions of Sameness May Tie In

The eighteenth century saw a criticism of the theories of preformation. Among other aspects, they could not – or only awkwardly – explain a child's resemblance to both parents. Regeneration (of wounds) was also difficult to understand under those theories. Some experiments then showed that polyps (»simple« multicellular animals that belong to the phylum of cnidaria) possess a remarkable capability for regeneration. When cut in half, both halves developed into full individuals. There was simply no way to harmonize this discovery with the idea of nesting dolls that were cre-

ated by »God« – those fully developed individuals that are placed into each other.

This observation was one among many which led to debate (and sometimes rejection of) the theories of preformation. There were also other traditions which seemed promising: Aristotle, for instance, described the formation of the semen differently than the idea of pangenesis mentioned above. He did not consider the pangenetic understanding of the semen/seed as a conglomeration of the most valuable extracts of all body parts. He rather proposed that semen was transformed out of blood (the »hematogenous theory of semen/seed«). Under the physiological element of heat, blood would allegedly be transformed into semen and then be available for procreation. Aristotle's hematogenous theory of semen thus did not foresee preformed features, but rather described a process of development. Here, it was tied to the physiological element of »heat.«

Such *theories of process and development* were seized from the second half of the eighteenth century onward. John Tuberville Needham (1713–81), a British natural scientific and Catholic cleric who worked with a methodology based on the use of microscopes, penned some important writings – as did the French natural scientist Georges Louis Leclerc de Buffon (1707–88). Buffon was the one who explained the development of earth through cooling down over a long period. He also argued against the theories of preformation. He considered two seeds (a male and a female one) that consisted of organic matter. *The organization of that matter would increase during the embryo's development.*

The German physician Caspar Friedrich Wolff (1734–94) wrote up the theory of »epigenesis« with his doctoral thesis in 1759. He demonstrated that during the development of the embryo, *initially unformed matter was formed through the processes of development and differentiation into the fully shaped organism*. This was an important achievement: the »epigenesis« did not consider eggs or semen to entail a fully preformed organism. No, the organism with all its body parts and organs was now understood to be the outcome of developmental processes of *unformed matter*.

There seem to be some opportunities to tie in with the theories of social and (natural) scientific developments that came into existence around 1800 and which were described above. The theory of epigenesis, for

instance, worked very well with the understanding of God not as a »creator« but as an all-present force and action (it might be recalled, that the concept dated back to Spinoza). The theory also harmonized with the physical description of energy and electricity. Seizing on those other theories, epigenesis could explain that the initially unformed matter was developed and differentiated through an affecting force, action, energy, and electricity.

Johann Friedrich Blumenbach (1752–1840) was a physician and anthropologist from Göttingen. He might be best remembered for his notorious classification of humans into races. Yet he also described the action that initiates and propagates the development of the organism as a »formative drive.« According to Blumenbach, this »formative drive« was reserved for living matter only – and was not inherent to all matter, as Wolff assumed in his theory of development. Refined in such a way, the theory of epigenesis became convincing to many contemporaries – and even became the definitive theory of natural philosophy and biology around 1800. Today, it is still one important basis for developmental biology.

In respect to considering sex: it is, on the one hand, important to note that epigenesis does not consider human features as pre-determined but as the result of development under varying influences. It is also important, on the other hand, that the »raw material of procreation«, egg or semen, was not discussed for their considerable differences, but largely for their sameness. Accordingly, proponents of epigenesis used the same term for male and female material of procreation: »seed.« Yet, even when the differentiating terminology of »egg« and »semen« was chosen and became normative at a later point, the contribution to procreation was (largely) considered as equal. When researchers described the differences between male and female seeds, those descriptions moved between poles of »more« and »less« rather than between poles of fundamental opposites.

The preformationists' descriptions of differences led to discussing the *differences* between the places in the body where the material for procreation was stored, the afferent and efferent vessels, and many more body features. The epigenists, with their conclusion of the same male and female material of procreation, equally entered debates but now under the idea

of *sameness*. It is interesting to see, that many writings appeared around 1800 which discussed women and men for their *similarities, analogies, the sameness of their procreational material as well as the inner and outer sexual characteristics*. Such considerations strongly influenced those of developmental biology in the nineteenth century.

Analogy and Sameness, as Tied in With Developmental Theories

The theory of epigenesis and the consideration of the (more or less) sameness of female and male procreational material generated more descriptions of the sameness of genitalia.

Gotthilf Heinrich von Schubert (1780–1860), a natural philosopher and historian who was educated in theology and medicine, wrote for example:

> »Thus there is nothing reserved as unique to the sexes. The opinion does not seem to withstand scrutiny that in the individuals of the different sexes would exist utterly opposite forces, contrary organs or efforts [...] The physicists of the past century were wise and careful when they expressed the difference between the matters of the different sexes as a more or less, + and – of the same force, the same features« (Schubert 1806: 208).

Schubert writes elsewhere that »[...] and it was not a mere joke to the great dividers of the past when they assigned to woman the same parts as to man, just hidden on the inside« (ibid: 199).

Schubert thus argued against the understanding of »female« and »male« being fundamentally different, as the preformists did. He emphasized that there was nothing one sex had over the other. Schubert referred to genitalia but also covered the plumage and antlers of animals. Even breasts with mammary glands and menstruation allegedly were not reserved to one sex.

The ideas of the »physicists of the past century«, Schubert mentioned, were the understanding of »heat« as a physiological element as described above. They also referred to the understanding of genitalia as

basically being similar with the exception of their position within the body or outside of it. Such a tradition does not see a fundamental difference between the sexes (as it really did in the preformation theories with their terminology of »eggs« and »semen«). They appeared in the sense of »more« or »less«, and thus were *relative* concepts. It is safe to say that Schubert assumed *relative* to the sexes, meaning between a »female« and a »male« one. Those differences only appear after birth and do not necessarily have to be pronounced: »It seems that the actual difference of the sexes only appears clearly after birth. There are cases when nature gets stuck halfway, or, put differently, in between the two« (Schubert 1806: 201).

Ignaz Döllinger (1799–1890) was a physician and natural philosopher. He took a similar position, when he also emphasized that there initially were no differences of the sexes, and that they developed at a later point. He saw »testicles«, and »ovaries« as the greatest means of distinction, although they were also rather similar to each other. For some humans, he argued and referred to hermaphrodites, such an ambiguity of the sexes would remain. He wrote in an essay from 1816 that:

> »9th [...] Just as much as an embryo can only be human, not female or male, their budding genitalia have no disposition to a [specific] sex. Hermaphrodites possess this non-difference permanently. 10th Human genitalia are not absolutely male but male-female; they are not absolutely female but female-male. Therefore, they profess to a harmony of structure and the option of forming transitory ones. 11th The genitalia of a man are the prostate and the testicles, those of a woman are the uterus and the ovaries. [...] It is self-evident that the prostate is parallel to the uterus and the testicle to the ovaries [...]« (Döllinger 1816: 390).

At the beginning of the 1800s, Schubert and Döllinger are far from being alone with their ideas. There are several more descriptions like these. Both should be understood as representatives of the research of nature and speculative natural philosophy in the Romantic period, true, but the concepts they outlined were more than that. They could also be found in empirical studies. Jacob Fidelis Ackermann (1765–1815), for instance, was a German physician, professor of anatomy, and proponent of a chemi-

cal perspective. He wrote in 1805: »Every individual may have the tools of procreation [genitalia] of both sexes.« He elaborates elsewhere that

> »[a]s we can see through these descriptions of the tools of procreation [genitalia]: every individual has [a disposition to] both genitalia but only one is fully developed. [We also see] that the penis is analogous to the clitoris, the prostate to the uterus, the male urethra to the vagina, the testicles to the ovaries *ductus deferens* [seminal duct] to the [Fallopian] tubes, and the scrotum to the outer labia« (Ackermann [1805]: 136).

Just like Schubert, Ackermann also does not understand the similarities between male and female features a limited to the embryonic stage. He also considered human beings who possess both male and female features after birth and as adults. This apparently held true for genitalia as well as other bodily features, according to Ackermann. In his doctoral thesis (originally written in Latin) he focused on the skeleton and bone structure. Yet he asserted once more that »it is an eternal truth, and I feel obligated to remind the reader, that even the individual limbs of both sexes differ; well, there are male bodies whose structure resemble that of a female one, and the other way around: there are female bodies that resemble male ones« (Ackermann 1788: 5). Among others, Ackermann considered the following origins of the differences of the sexes: lifestyle enabled men to manual labor. A life spent sitting down (he considered the more privileged classes) enabled women to pursue the sciences (Ackermann 1788: 148).

Johann Christian Rosenmüller (1771–1821), a fellow German physician, concurred to Ackermann's theory. In his 1810-essay *Analogie der männlichen und weiblichen Geschlechtstheile* [*Analogy of the male and female genitalia*] he agreed that »in the earliest stages of development, genitalia are neither male nor female« (Rosenmüller 1810: 47). To prove his understanding, he studied the similarities of male and female genitalia. He found many of them and suggested even further research.

As a side note on the contemporary German terminology Ackermann and Rosenmüller used (and which was translated into English accordingly): »analogous« (Ackermann) and »analogy« (Rosenmüller) should be understood in the meaning of our modern »homologous.« Then, around

1800, there was no terminological distinction between »analogy« and »homology.«

Throughout the nineteenth century, scholars described the sameness of genitalia in early embryonic development. Heinrich Rathke (1793–1860), a physician, zoologist and natural historian, wrote in 1825: »The individuals of the same species of all mammals show in their earliest developments the sameness not only their internal but also their external genitalia« (Rathke 1825: 136). Rudolf Leuckart (1822–98) was, like Rathke, also a physician and dedicated to anatomy and developmental history in the mid-1800s. He discussed this hypothesis repeatedly and stated: »Viewing nature without bias or prejudice demonstrates that there is no other difference between male and female genitalia as there is between any two organs or groups of organs that support and complement each other in their function« (Leuckart 1853: 742 et seq.).

Heinrich Wilhelm Gottfried Waldeyer (1836–1921) came to similar conclusions but found a broader audience. He discussed *two different theories of the sameness of the sexual disposition*. In summary, he rejected the one (of sexual neutrality of the embryo) and followed the other which understood the embryo possessing hermaphroditic features. Thus, Waldeyer assumed, too, that male and female features exist side by side in one individual embryo at an early stage of development. Typically, only one feature would develop further from there. He concluded that

> »[t]here is no doubt that the *most primal disposition of even the highest vertebrae is a hermaphroditic one.* Until now, scholars have sought to explain the peculiar behavior of the genitalia in the initial stages of development by an alleged common, so to say neutral primal condition. The one or the other sex supposedly develops out of this until sometimes a male or a female individual comes into being. Yet, scholars have put far too much put emphasis on the behavior of irrelevant side issues such as the outer genitalia. There is indeed an undifferentiated, well neutral primal condition which develops either into male or female. This is not surprising, though, as the external genitalia of men and women are anatomically indeed the same constructs that merely develop into different directions for the different individuals. [...] When considering the development of those constructs, however, that constitute the essence of both sexes, the gonads [hitherto

> differentiated and better known as ›testicles‹, and ›ovaries‹, HV] it is exceedingly hard to see an undifferentiated, virtually neutral primal disposition. [...] put differently: every individual is a true hermaphrodite on a certain stage of development« (Waldeyer 1870: 152 et seq.; emphasis in the German original).

Within the canon of biological writings of the nineteenth century, it was the dominant consideration that the disposition of all individuals according to sex was not classifiable as »male« or »female.« As Waldeyer demonstrates there were even several theories available to explain such a sameness of the dispositions to sex. They were further debated. The theories ought to be outlined as well:

1. Waldeyer presents one explanation with the existence of »an undifferentiated, well neutral primal condition« – a *neutral disposition of sex*. This theory thus outlined the inexistence of any sex in an embryo. Sex and differences of the sexes thus developed at a later stage of the embryo (see figure 3).

   Depending on the point the development according to sex was assumed to diverge, the developing genitalia could be either described for their similarities or differences. Some authors also pointed out the similarities of the genitalia of adults: »testicles«, for instance, would correspond to the »ovaries«, the »prostate« to the »uterus.« Other scholars argued that the disposition was initially neutral, differences according to the sexes, however, would manifest at the initial stages of development.

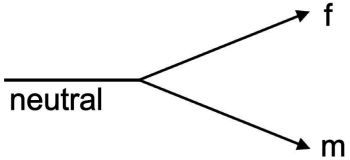

Figure 3: Schematic of the development according to sex from a sexless, neutral starting point toward a »female« (f) or »male« (m) genital tract.

2. Waldeyer describes a second theory, the one of a *hermaphroditical sexual disposition*. This is the one he himself followed. It assumes the possibility of distinguishing between male and female dispositions at an early stage of the embryonic development, but also that all individuals possess both female and male dispositions then. Typically, one or the other disposition would develop further and reach completion. The other one would not disappear but continue to exist in its underdeveloped stage. In some cases, it was possible for the second disposition to continue its development so that its resulting genitalia would be clearly identifiable in the individual (see figure 4).

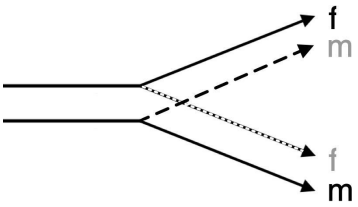

Figure 4: Schematic of the development according to sex from a sexual disposition as starting and which always contains »female« (f) and »male« (m) features. Further development shows the clear dominance of one disposition over the other (bold). The other, however, does not disappear (faint).

3. These two theories as described above were not the only ones, though. A third one saw the *sexual disposition as a differentiated one* from the beginning of the embryonic development. Proponents argued that the embryo appeared neutral, thus sexless, but already possessed a clear sex – female *or* male (see figure 5). Theodor Ludwig Wilhelm von Bischoff (1807–82), also one of the German physicians, physiologists and anatomists, was one of the proponents of

the third theory. He considered the differences of the male and female sexes as too profound to assume a sexless, neutral disposition. Bischoff is otherwise remembered as vehemently opposing the acceptance of women to the studies of medicine (»vehemently«, by the way, even for his times).

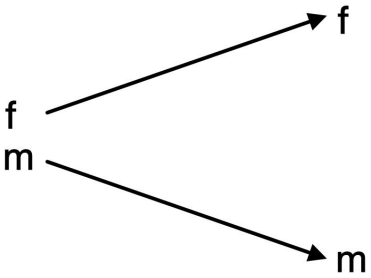

Figure 5: Schematic of the development according to sex from a sexual disposition from the beginning. Such disposition would be either »female« (f) or »male« (m). The genital tract would therefore develop unambiguously and to one sex only.

The theory of the clearly differentiated disposition according to sex was not the dominant one, though. It was considered more likely that the embryo – at least in the first stages of its development – had the organic potential to develop both female and male genitalia. Today, this is also the dominant understanding in the biological and medical studies and writings on the development of the sexes.

As demonstrated, there were different positions within biology when it came to the similarities or differences of genitalia. Then, in the nineteenth century, too, considerations of similarity, correspondence, and sameness did play a greater role. Some of the scholars even considered them to play a crucial one. Several authors understood the disposition of the genitalia to offer the opportunity to develop into female but also into male ones. The developed features would thus not present fundamental opposites,

but relative differences that were based in time. Even after birth and with adults, the fully developed features of the human being did not necessarily have to be clearly »female« or »male.« They could be present side by side in different stages of formation.

Human Beings are Paired in Themselves – Being Adult »Female-Males« and »Male-Females«

In another tradition of theory, *every* human being – even in new-borns and into adulthood – was described as female and male at the same time. Wilhelm von Humboldt (1767–1835) is otherwise known for his linguistic theoretical work but also for his efforts in modernizing the education in Prussia. He was a co-founder of the elder of the two universities in Berlin which was named *Humboldt Universität* in his honor. Humboldt wrote about the distinctive differences between »female« and »male«, yet mostly in an appreciative way. He also considered »female« and »male« as *ideal-typical principles* that depended on each other and could only reach perfection in their combination. He also doubted the validity of the idea there were only one sex present in any given human being. The features of one sex would dominate in a person, but the traits of the other would still be present. In his article *Über die männliche und weibliche Form [On the Male and Female Shape]* (1795), Humboldt wrote:

> »Yet the highest and most perfect degree of beauty is not merely based on bringing shape and substance together but doing so in *an utterly balanced way* with the right artistry, liberty, as well as mental and sensual unity. The highest and most perfect degree of beauty theoretically requires bringing the characteristics of both sexes together in an utmost union of pure maleness with pure femaleness forming humanness. But, even finding such pure maleness and femaleness is exceedingly difficult and, if experience is any indication, virtually impossible …« (Humboldt 1959b [1795]: 81; emphasis in the original).

Humboldt wrote elsewhere that »of these two characteristics of the human form, whose peculiar differences disappear in the one-ness of the

ideal, one is preferred in every sense while the other is merely just not missed« (ibid: 102).

When Humboldt was writing his essays *Ueber den Geschlechtsunterschied und dessen Einfluss auf die organische Natur [On the Difference of the Sexes and its Influence on the Organic Nature as well as On the Male and Female Shape]*, the natural philosophical lectures he attended in Jena, Thuringia, had shaped his assumptions (see Rosenstrauch 2009: 107 et seq.).

Long standing traditions in the history of thought equally provided grounds for such perspectives. They may go back to ancient sources. In the Chinese concept of the »yin and yang«, for instance, »female« and »male« are sometimes described as residing in one human individual in an intertwined way. Plato, in his ancient Greek *Symposium*, has Aristophanes speak of »globular people.« Initially, »female« and »male« had been joint in them, until they were cut in halves. Since then, according to Plato's Aristophanes, every person is one half of a »globular« past in search for the lost other half (on those traditions in the history of thought, see Römer 1903; Neuer Berliner Kunstverein 1986).

These are the historical assumptions into which the natural historic theories of a common embryonic disposition as undifferentiated according to the sexes could connect. They understood a presence of female and male features in every individual and a woman-man-nature of every person, respectively. While it had been propagated widely and also forms the basis for modern developmental biology, some researchers moved beyond the understanding of embryonic sexual characteristics as being undifferentiated: *every human being* should be considered both female and male after birth and even into adulthood. Thus, everybody harmonizes female and male features in one body.

More recent research into the historical understanding of the female-male-nature of every human individual is basically focused on the period around 1900. Then, those theories were often labeled with terminology such as »constitutional bisexuality« or »interstage theory.« Their proponents, such as Otto Weininger, Wilhelm Fließ, Magnus Hirschfeld or Sigmund Freud, often found themselves in the center of attention. Scholarly works thoroughly discussed the situation of around 1900, when priorities concerning the theory of the »constitutional bisexuality« were

heatedly debated. When discussing physical and psychological features, Weininger, Fließ and Hirschfeld described ideal forms of »female« and »male«, »woman« and »men.« Yet, they would never (or, depending on the interpretation of Hirschfeld's work, rarely) appear in a pure form. Every person was supposed to be a combination of female and male components in their specific quantities.

The »interstage theory«, presented the notion in such a sense that there was a vast number of possible »interstages« between the (extreme) poles of purely »female« and »male« (which in reality did not exist in their purity). Those »interstages« allegedly presented some »female« and some »male« features in a person. Hirschfeld calculated more than forty-three million possibilities of such interstages (see Hirschfeld 1926–30, vol. I, 595 et seq.). Freud, on the other hand, limited himself to discussing the psychological nature of the bisexual constitution.

There is a limited amount of research into such theories for the time before 1900. It might be based on the modern assumption that then, in the 19th century, scholars merely described the differences of the sexes and thus did not raise further questions. Notes in Magnus Hirschfeld's and Otto Weininger's works, however, indicate a difference picture. Apparently, the 19th century, too, referred to historical and wide-spread concepts of a male-female-being of every human individual.

Rather recently, Manfred Herzer studied that century when preparing for a debate with J. Edgar Bauer. Herzer outlined the understanding of a »constitutional bisexuality« as rather common among middle-class intellectuals around 1900. He argues in favor of a tradition that had existed throughout the previous century and went all the way back to the period around 1800. Humboldt's discussions outlined above may prove Herzer's argument.

The German sexologist Karl Heinrich Ulrichs (1825–95) presents further contemporary evidence for Herzer's assumption. In a letter, which was written in 1862 and published in the *Jahrbuch für sexuelle Zwischenstufen [Yearbook for Sexual Interstages]* in 1899, Ulrichs referred to the embryonic stages and – in varying degrees – to the adult human. Then he wrote that

> »the sexual dualism exists in a seminal stage in every human individual without exception. It is only pronounced *to a higher degree* in hermaphro-

> dites and Uranians than in the ordinary man and the ordinary woman. It manifests in a different way in a Uranian than in a hermaphrodite« (Ulrichs [1862], as quoted in Herzer 1998, emphasis by HV; see also Ulrichs 1994 [1862]).

In this quote, Ulrichs described »hermaphrodites« as people possessing both female and male physical features – especially genitals. »Uranians« referred to people whose desires are projected onto the same sex and who have sex accordingly.[23]

Such considerations of undifferentiated or hermaphroditic dispositions of sex, but also the understanding of a woman-and-man-nature of every human being, made it possible for emancipation movements to connect. Ulrichs himself was involved in the strife for ending the culpability of same-sex intercourse, and was influential in the foundation of the movement for sexual reform. He himself admitted being attracted to the same sex and argued for the »naturalness« of homosexual attraction, and against its perversity. Every human being carries in them – as outlined above – female and male characteristics. »Uranians« and »hermaphrodites« merely do so in a more balanced way than other »women« and »men.« While »hermaphrodites« manifest that combination especially in their physical features, »Uranians« present the psychological constitutions of another sex than their physical ones. Ulrichs worked with ideas such as »female desires in a male body«, and »male desires in a female body« (Ulrichs 1994 [1862]).

Magnus Hirschfeld's writings, too, may serve as important and often quoted proof that the biological-medical argument of undifferentiated or hermaphroditical embryonic dispositions (thus the woman-and-man-nature of every individual) influenced emancipatory reform movements – especially of sexual reform. J. Edgar Bauer (2002) outlined that

> »it becomes apparent Hirschfeld's biologism – which was repeatedly criticized – aimed at deducing theoretical tools from a scientifically understood

23 »Uranian« as a term describing a homosexual male was coined by Ulrichs around the same time »homosexual« was introduced into the (German) language by Karl-Maria Kertbeny. The translator.

> nature in order to contribute to the erosion of an ideological fixation on the seemingly natural. A scientifically based insight into the immeasurable plurality of nature thus leads to lifting the rigidly categorical sexual-dimorphism as well as the classification of the human species according to races« (Bauer 2002).

Texts that appeared around 1900 and aimed at emancipation did not merely contain references to the biological-medical understanding so summarily – as mere catchphrases so to say. Some writings factually employed the considerations for their *substance* and developed them further, as it had also been done in writings aiming at the emancipation of women. Johanna Elberskirchen (1864–1943), for instance, referred in her essay *Feminismus und Wissenschaft [Feminism and Science]* (1903) to the undifferentiated or hermaphroditical embryonic disposition before drawing conclusions to physical features. She wrote that

> »there is no substantial difference; there is no disposition of a fundamentally male or fundamentally female sex [...] Man and woman thus have the same genitalia in their dispositions. Only later does a sexual differentiation set in in such a way that women develop the specifically female organs, and men the specifically male ones, respectively. The specifically male and specifically female ones then either halt in their development or devolve. One example is the female uterus which does not develop further in males, but is kept preserved as ›uterus masculinus.‹ Man thus has a uterus, too!« (Elberskirchen 1903: 9 et seq.)

After Elberskirchen recalled the state of research then, she assigned those organs the status of »auxiliary organs.« They were not the sexual »main organs« and therefore had no fundamental importance. She considered the sexual »main organs« – the gonads (testicals and ovaries) were understood as the most important sexual features then – as such:

> »Speaking of the gonad, thus the most fundamental aspect of the male and female sexual apparatus, is in its disposition *uniform, unisexual, not bisexual*. There is no specifically female sexual gland in the disposition, and which would develop just as the auxiliary organs do merely in a woman

> or a man, and which would remain rudimentary or devolved in the other sex. The gonad is the one organ in the sexual apparatus (and the only one) which develops in both man and woman, *and which is and remains one and the same in both sexes in shape and function* « (Elberskirchen 1903; emphasis in the original).

Johanna Elberskirchen was a dedicated Social-Democrat who initially studied medicine before publishing her works and getting involved in the sexual reform movement and the emancipation of women (see www.fembio.org). She also based her demands for emancipation on the biological-medical argument of similarity and equality of the assumed sexual features, and the woman-and-man-being of every individual. This indicates, of course, that some current biological-medical theories then allowed their employability for emancipatory debate. Other theories indubitably were unsuitable for being used for this purpose, as they cemented the undisputed and unsurmountable »naturalness« of two sexes with distinct abilities and, according to those, different positions in society.

»Activity«, »Advancement«, »Lag« – Descriptions of the Differences of the Sexes Which Tie in with Developmental Theories

On the one hand, some scholars took the undifferentiated dispositions (or hermaphroditic one) to the conclusion that all human beings harbored female and male features at the same time. Thus, they considered a binary differentiation as too simplistic. On the other hand, other scholars concluded the opposite of far-reaching differences of the sexes from that observation. From an initial state of sameness, individuals would develop into a clearly female or male direction in their view. They could thus build upon far-reaching differences that explained different physical constitutions, and from there the different opportunities for women and men in society. Individuals who were unable to present such clear-cut differences in their sex were subjected to an understanding of their non-normative (and therefore pathologic) development.

The German philosopher Georg Friedrich Wihelm Hegel (1770–1831) in his natural philosophical writings concurred with Schubert's and Ackermann's assumptions: there was an initial phase of a common embryonic disposition of the sex. Yet, Hegel further emphasized the differences of the sexes at a later point of development:

> »Identifying the uterus among the male body parts was most difficult. Rather clumsily, the counterpart was believed to be recognized in the scrotum (Hegel refers to one of Schubert's footnotes, HV). This was done merely because the testicles appeared to be the counterpart of the ovaries. The female uterus, however, more closely corresponds to the male prostate as the uterus sinks into a mere gland within the man, thus into irrelevant commonness. Ackermann has proved that fact very well through his hermaphrodite who possessed a uterus together with all other male features [...] As the uterus degenerates in a male to a mere gland, the male testicle is locked into the female ovaries and does not present itself in any counterpart [...] Because of this fact, the man is thus the active part in this difference, the female, however, the receiving one as she remains in her unadvanced unity« (Hegel 1983 [1830]: 518 et seq.).

Hegel had presented this assumption as early as 1805/06, albeit in a less elaborate way. Presenting the matter in such a way makes it clear that it was possible (and in what way) to consider the differences of the sexes under the light of theories of development. The conceptions of »advancement« and »activity« essentially dictated the individuality – and thus also sexuality. The individual apparently moved away from the species through advancement – and only returned to it through procreation. In order to find their way back to the species, human men and women required one another, and their differences levelled. Hegel's natural philosophical considerations found their way into his social writings when discussing the cohabitation of women and men in society. Here, too, they depended on one another while acquiring different functions – women had to confine themselves to the realm of family and morality, men to that of science and politics.

While Hegel remained a little fuzzy as to which of both sexes (and in what feature) developed away from a condition of commonness –

therefore *advanced* – the work of others established a remarkable and consequential characteristic of the differentiation of the sexes. The male one is presented as the more initiative and active sex. Therefore he advanced away from the species toward more individuality. The female sex, as it was perceived, presented less of an advancement and was therefore tied closer to the species. She possessed less opportunity for individual maturity. »The female sex« and »woman« was, in comparison to the »male sex« and »man«, considered an »inferior stage of development.«

Dietrich Wilhelm Heinrich Busch (1788–1858) was a German gynecologist. In his first volume of *Das Geschlechtsleben des Weibes in physiologischer, pathologischer und therapeutischer Hinsicht [The Female Sexual Life in Matters of Physiology, Pathology, and Therapy]* (1839) he concluded a sexually indifferent embryonic disposition. He saw the reasons for the extensive differences of the sexes in the woman's developmental lag when compared to the man. Busch wrote that

> »the body of the woman therefore appears less sturdy than the man's. His outer features are more pronounced and indicate a meaningful prowess. Because woman lags behind man in matters of the body and all of her tissue remain on a lower level of development, she cannot produce the same manifestations of strength man can. Yet, she demonstrates a higher degree of endurance in the exertions her constitution allows, and more easily replaces all suffered losses. In this, she resembles lower animals« (Busch 1839: 46 et seq.; emphasis by HV).

In their development, according to Busch, women were on a lower level than men. When considering genitalia, some scholars interpret such understanding as proof that the originally undifferentiated dispositions of the sex actually must be female ones. Male genitalia would develop from this – female – basis. Friedrich Tiedemann (1781–1861), the German anatomist, zoologist and physician, wrote in his *Anatomie der kopflosen Missgeburten [The Anatomy of Headless Miss-Formed Neonates]* (1813): »that all human embryos only possess female genitalia during the first months« (Tiedemann 1813: 80). He added: »When comparing the physique of men and women with those of fetuses, it is apparent that

women resemble the fetus more closely than men. Therefore, women are on a lower level of development than men« (Tiedemann 1813: 87).

Such assumptions were not unique to Tiedemann, though. Other scholars shared them as did Johann Friedrich Meckel (the younger), Lorenz Oken, and Johannes Japetus Smith Steenstrup. Heinrich Rathke and Rudolf Leuckart, whose stance we discussed above, argued against it.

Theirs were voices of a minority, though. The theory of women's limited evolution in comparison to men's found more and more supporters. It became rather common in brain research, for instance, to emphasize the similarities between the brains and skulls of children and women. The brain and skull of a man apparently developed significantly further away from those of children. Charles Darwin outlines in his theory of evolution, which is based on the constant change of the species, that it is the male individuals who constantly compete in order to mate with the female ones. Therefore, certain features had evolved: more muscles, stronger tusks or fangs, more and more colorfulness.

Such understanding is most poignant in the works of the Italian »father« of criminal anthropology Cesare Lombroso (1835–1909), and his later son-in-law, legal historian and Socialist Guglielmo Ferrero (1871–1942). In their co-authored *La donna delinquente* (1893, Engl. *The Female Offender*),[24] they wrote that »the male thus is little more than a female which has become perfect and more variable through a special development of the secondary characteristics of the sex.«[25] In respect to the development of physical and physiological features, Lambroso and Ferrero concluded that »it is this inferiority, i. e., the woman's remaining on a childlike stage of development, which we proved for height, weight, the developments of the skull and brains, that we also find in other bodily functions such as pulse [...]« (Lombroso 1894 [1893]: 40) At the end, they also discuss the »female inferiority in matters of intelligence« and defend themselves against any assumption those were society-made (Lombroso 1894 [1893]: 170 et seq.).

24 The German title is more revealing: *Das Weib als Verbrecherin und Prostituierte [Woman as Criminal and Prostitute]*. The translator.

25 The English translation follows the German one.

Such argumentation was not merely misogynous. They were equally employed when presenting the racist idea of an inferiority of people from other continents or countries. They were most often attributed with inferiority when originating elsewhere than the own, European country of the authors. Cultures were classified as »progressed« ones, »civilized«, »retrogressive«, or »uncivilized.« The more advanced a culture was perceived, the more pronounced were the differences of the sexes. A closer similarity between men and women of one culture was taken as a sign of savagery. European peoples – men and women – were characterized as »developed«, »advanced«, and »civilized.« People of a different background – men and women alike – were presented as backward and therefore inferior.

It is virtually impossible to do justice to a critical discussion of racist diminishment here. May it suffice to point out those excellent and critical works of Gould (1981), Becker (2005) and – with a keen eye on the current racism in biology – *AG gegen Rassismus in den Lebenswissenschaften* (2009, Project Group against Racism in the Life Sciences). Thomas Becker (2005) also clearly indicates that the discriminating assumptions on the basis of sex were not comparable to those based on race. In the nineteenth century, for instance, »European women«, too, were granted an evolutionary and hierarchically higher standing than »non-European men and women.«

Typically, participants in the debates assigned to women a developmental lag which corresponded to their »natural function«, meaning parity. She was supposed to take care of the offspring and everything else within the family.

People who lacked a clear sex (so-called »hermaphrodites«) were considered under the idea of a basic and pathological deficiency. Following developmental theories, they were diagnosed with an »abnormal development« preventing them from turning into fully male or fully female. People without a distinctive sex were subjected to special examination, their pictures were taken. They were subjected to surgery and used – or better abused – for biological and medical research. They were (and are) considered as breathing research objects in the quest for the »normal« development of the sexes – their »disorders« supposedly help(ed) identifying crucial factors in the »normal« process of developing the female and male sexes.

This problematic consideration of people as »objects to study« and »proof« for research, for instance, foresaw simple rules of development which were to be understood as all humans (and even all living organisms, respectively) apparently conformed to them. Those rules have proven considerably more complex since, by the way. Yet, bearing in mind such an approach makes it clearer that epigenesis was also crucial in the formation of the »science of congenital malformations« (See, among others, Zürcher 2004).

Detailed Descriptions of Differences

Scholars of the nineteenth century described in detail the differences of the sexes. Their findings have been repeated in the more recent decades – see Honegger, for instance (1991). It is important to consider them in more detail, too, in order to facilitate an argumentation closer to the texts and to emphasize references to developmental considerations.

Pierre Roussel (1742–1802) is one of the protagonists Claudia Honegger presents for her discussion of far-reaching descriptions of differences. A philosopher and physician, he earned his doctorate in medicine and his money with sporadic publications. His *Système physique et moral de la femme [Physiology and Morality of Women]* (1775, 1786 in the German translation as *Physiologie des weiblichen Geschlechts*) presents him as a supporter of the developmental historical considerations. He rejected theories of preformation and referred to the Hippocratic Corpus and Buffon when re-affirming that there was indeed a female seed. According to Roussel, women thus also contributed a seed to procreation (Roussel 1786 [1775]: 175–205). He did, at the same time, also believed in an utter dissimilarity of women and men in all parts of their bodies. Yet, his closeness to developmental historical considerations presents itself once more: Roussel sees no or hardly any differences between girls and boys in childhood. Those differences would only manifest themselves at a more progressed age. For this, Roussel concludes that the female sex was closer to the stage of children than the male was – which in turn would develop (Roussel 1786 [1775]: 3–7, 57–72).

He saw differences in all parts of the body: veins, nerves, bones, muscles: »All of these [...] parts are thinner, smaller, more delicate, and less flex-

ible [in a female body, HV] than they are in a male body« (Roussel 1786 [1775]: 14, the English translation follows the German one).

Yet he did not stop with this observation. Roussel rather drew conclusions about morality. He based them on his understanding of physical and other differences and connected them to the theory of humorism/the temperaments. Women were supposedly »more gentle«, »more passionate«, and »emotionally more irritable« than men. They were »volatile« and incapable of any activity which would require prolonged concentration. Women apparently possessed a mind, but it was more accurate to describe their minds through »sensitivity« and »passion« – a fact enlightenment itself could not change (Roussel 1786 [1775]: 21–41).

As drastic as these differences may appear, it is worthwhile considering them. Roussel begins by assuming two, largely equal contributions to conception. While, as described, he does not consider any (or only a few) differences of the sexes in childhood, he does so for a later age in classifications of »more« and »less.« This ties in very well with the previous theories of development as described above: at this point, he does not see *fundamental* differences, but rather presents *relative* ones. His assumptions for the physical/outward features of the sexes diverges from this fact drastically. Roussel explicitly rejected the idea of the sexes' genitalia being similar to one another, and only turned inwards in one case (women) and outwards in the other (men). He emphasized a fundamental difference in whether something is »given in« or »taken in«, whether something is at the providing or receiving end. Therefore, such features had to be different, and uterus as well as breasts were the most significant sexual features of females (Roussel 1786 [1775]: 108 et seq.).

In her own discussion, Honnegger refers to Jacob Fidelis Ackermann (1765–1815), whom we met above, as another representative when outlining just how the considerations of differences were established. As mentioned, Ackermann did not describe genitalia to be as different from one another the way Roussel did. He rather emphasized the common disposition for the genitalia of the female and male sexes. Moroever he characterized their features through terms of similarity and correspondence. Yet his dissertation is more telling when it comes to differences.

Ackermann in detail turned to the differences of the male and female sexes in his *Ueber die körperliche Verschiedenheit des Mannes vom Weibe*

außer den Geschlechtstheilen [On the Physical Differences of Man and Woman Beyond their Genitalia] (1788). He particularly focused on the skeleton as it had hitherto been rather neglected for the discussion of the differences of the sexes, but also because this »internal basic framework« would determine the shape – and thus also the differences – of the features building upon it.

Ackermann did find differences in almost all parts of the skeleton indeed although he stood in opposition to other discussions of the differences at the same time. Most fundamentaly he observed that »even at first glance, the male skeleton differs from the female one: the latter is indeed constructed more delicately, less strongly, and even the combination of the bones seems to be marked by female features« (Ackermann 1788: 20). The bones of male skeletons were »heavier«, »larger«, and »rougher« than those of female ones. Besides the differences of the bones, Ackermann also concluded women to have »more tissue«, a »softer skin« than men, and differences in their body hair.

Thus, there are many differences to be observed. Yet, delving a little deeper into Ackermann's work might shed some additional light. Right at the beginning, Ackermann himself limited the applicability of his observations and emphasized that all human beings differ more or less from others from others in their own individual and variegated ways. His discussion was intended to refer only to women who had a »perfect female shape.« Just how women could conform to such »perfection« was something Ackermann also described at the beginning of his discussion – thus he presupposed it as the basis for his work. He wrote,

> »*§III. The Perfect Female Shape*. Although it is true (and important to remember that it is) that even the single features of all sexes differ from others; well, yes, there are male bodies which correspond to female ones in their shape, and the other way around: female bodies which are closer to male ones. Yet there are also people of the fair sex whose perfection of their specific shape can be referred to as completely female. The completely harmonize everything I will present in the course of this discussion. Yes, this specific shape is most perfect in those female bodies in which the parts dedicated to executing the main duties of the female sex are most perfectly shaped. I have observed, for instance, that those female bodies in all their

> parts are built most beautifully, most female when their pelvises were in a greater relation to the rest of the bodies than in others« (Ackermann 1788: 5–7, emphasis in the original).

Ackermann did not consider those differences of the sexes as fundamentally »predetermined by nature« at all. He rather (also) understood the importance of the lifestyle for the women's and men's aptitude for different activities:

> »The female sex largely leads a sitting-down lifestyle and does not occupy herself with those tasks requiring ongoing strength of the body and the muscles. Besides, her bones (§8.) and muscles are weaker (§50.) and the nerve fibers are thinner (§67.). It is no wonder that she is, on the average, more apt for intellectual endeavors than men who, in the majority, are more so for bodily work« (Ackermann 1788: 148 et seq.).

This understandings, which Ackermann shared with his own doctoral advisor, Samuel Thomas von Soemmerring (1755–1830), was the basis for one side of the scholarly discussion then. It was influential enough not to be disregarded in the general scholarly debate over skull and/or brain and the sexes in the nineteenth century. They emphasized, for instance, that the skulls of women generally were smaller than those of men when seen for themselves, comparatively, however they were were equally larger than male skulls when seen in relation to the body as a whole. Ackermann and Soemmerring concluded the same for the brain.

Ackermann as well a Roussel made clear that they described *relative* differences between men and women, not *absolute* ones. The former also presents the opportunity to argue for women's aptitude for study as based on biological-medical findings then. Some of those biological-medical theories were apparently inviting enough to connect with the demand of women's education.

Busch, the gynecologist we met above, saw the necessity to limit the validity of his generalizations as they otherwise might have contradicted the individual differences among women which he found: »*The perfect and normally built* woman differs in her outer shape and body from the man, but also by her different organization and structure of the internal

organs« (Busch 1839: 46; emphasis by HV). He particularly added *(relative)* descriptions of the differences:

> »The physical character of the female sex consists of a reduced height of the body, in lesser-defined outer parts – which are generally shaped differently – in heightened delicacy and softness of the firmer parts, in a stronger development of the lower organic tissue, such as the cellular one, in a larger looseness of the body in general, and a peculiar formation of the genitalia which are more pushed back than a man's. The female body in general seems less strongly shaped as the man's whose outer features are more pronounced and refer to a significant strength« (Busch 1839: 46).

A few more pages into his discussion, Busch outlines that the woman's outer appearance is more in accordance with »the laws of beauty« than the man's. She is, supposedly, more »pleasant«, »pleasing«, »gracious«, and »better-rounded« in comparison to a man. He is described in terms like »edgy« and »repelling.« The female head was »rounder«, and presented »less protrusions«, with a forehead »less high«, a »smaller« nose, and a »less pointy« chin. The larynx was less prominent as were its muscles (like those of the torso) than the man's.

Busch continues making similar observations for several body parts. Eventually, he identifies in women cellular tissue to exist in »greater quantity« than in male bodies and relative differences in the blood vessel system – although he did so in a less pronounced way than other authors. In matters of the brain, Busch follows the conclusions of Ackermann and Soemmerring. In relation to her body, and compared with a man, the size of a woman's brain was »remarkable.« Yet, he draws another conclusion which is based less in a peculiar female talent for study, than the way the other two researchers did.

For Busch (and in a true Rousseauian fashion), the female brain size supported the woman's duty to care for the family and other aspects of domestic life:

> »[The] brain of a woman is more independent in matters of the system of blood vessels as well as the nervous system, autarchic, and more inde-

> pendent in general. Changes in the blood have less an effect on her brain than on the male one. The brain functions are less variegated and less pronounced, but rather directed to the inside. Her thought is, as we discussed in our presentation of the psychological nature of women, less subjected to change, too. In matters of mind, women present a more pronounced calmness and self-compliance; for this, their lives are more harmonious. The remaining nervous system, however, is weaker, more fragile and delicate. Woman therefore is more sensible and presents a greater susceptibility toward outer influences …« (Busch 1839: 53).

There are greater differences between women and men in the genitalia for Busch.

> »There is a direct opposition as it took thorough anatomical and physiological knowledge to identify matches and explanations for the opposites that are rooted in variations during development. There are differences according to sex until well into the embryo's sixth week of existence. The formation of all human embryos is therefore based on one common type« (Busch 1839: 63).

It is important to understand that Busch vehemently argues against any assumption that the original state of genitalia was a female one – the way Tiedemann for instance had assumed.

Following Busch and others, the descriptions of the differences were continued. They found their way into the developing specialized disciplines of biology. Ever more subjects were discussed for their differences in an individual and detailed way – and the social discussions over those differences became intense. The hypothesis of the women's limited brawn when compared to men was countered by referring to examples of women who worked hard in the field or in the factory. There, women presented considerable brawn. Scholars intensely debated the skulls and brains, and they often drew conclusions for the capacities of mind based on them. Such debates revolved around the following aspects: does the *absolute* size of skulls and brains determine intelligence (size matters)? Or could intelligence be the result of the *relative size of the skull and brain in relations to the size of the body (or even its weight)*?

In the first case, an elephant is extremely smart, for example, whereas a human being or a mouse should be embarrassingly stupid. In the latter case, if the relation to the overall body size or weight, a simple diet would diminish a human's intelligence ... Or was intelligence rather the result of the brain's structure and furrows? Is that an important sign of intelligence? If so, the circle was concluded whether present differences were »natural« or the outcome of social impact. Helen Bradford Thompson Wooley (1874–1947) as a psychologist presented with her dissertation an empiric emancipatory discussion of the matter. It was published as *The Mental Traits of Sex: An Experimental Investigation of the Normal Mind in Men and Women*[26] (see Thompson 1903).

There were important questions to be solved not only in matters of content. As the writings show they were impulsively discussed anyway. No, even the choice of methodology was debated: how to take a photograph of a human skull the right way in order to thoroughly research the flattening of the forehead (as an indicator for an individual's intelligence and psychological condition)? Was it possible to plaster cast the head of a living person in order to represent their faces and dimensions of the skull? Or would the long period of drying invalidate any meaningful preservation? Lastly: how to measure the skull and identify its inner volume? Was it possible to use millet to identify that volume – provided the moisture of the millet would not vary too much in between measures and mess up the comparability. Or why not use the grist of grains – yet, how finely cut should it be? And, of course, was it possible to make assumptions for the brain and its size based on identifying the inner volume of a skull? The scholars Paul Broca and Carl Vogt were dedicated to measuring brains, for instance. They debated such questions as much as Helen Bradford Thompson did discuss the methodology for measuring intelligence (see, for instance, Gould 1981).

It was not uncommon to disregard the findings of competing scientists based on their methodological approach. Other authors, such as the neurologist Paul Julius Möbius (1853–1907) from Leipzig were less concerned with the question of how to measure correctly (he is still of

26 Helen Bradford Thompson, The Mental Traits of Sex: An Experimental Investigation of the Normal Mind in Men and Women (Chicago: University of Chicago Press, 1903).

mild interest for his rather slim *Ueber den physiologischen Schwachsinn des Weibes [On the Physiological Idiocy of Women]*, 1900). Möbius wrote:

> »When measuring the circumference [of a head, HV] hatters have their own method which they do not understand – and which I have neither. You add the length and width of the reduction, then half the sum, and look up the resulting number in a table which shows you another number that presents the circumference in centimeters. I am not blessed with much experience in mathematics and rather approach the matter as a handyman. Yet the results are correct« (Möbius 1903: 18).

Hatters used a tool to take the circumference of a head (the so-called »conformateur«). It could only measure circumferences of at least 53 centimeters/20.8 inches on male heads – for which clientele the hatters worked. Möbius concluded the fact that there simply were no male heads with a smaller circumference of 53 centimeters/20.8 inches.

Figure 6: Measuring the Circumference of a Head with a »Conformateur« (taken from Möbius 1903: 17).

»Newer« Evolutionary Theories After Charles Dawin – Differences of the Sexes and Emancipatory »Romanticizing Darwin«

The term »evolution« did not always have the meaning it is connected to it today. At the beginning of the nineteenth century, people understood it to be something different. The term was used in the understanding of the preformists: individuals are preformed and simply have to reach their adult size – »God« had created everything at a certain point in time. In this sense, »evolution« was meant to be stagnation inasmuch as »development« merely meant the »maturation« of already existing matter. There was no room for considering the new formation of organs or species.

Following Charles Darwin, however, the meaning of »evolution« has shifted. For us, »evolution« means that the features of a species (or the development of new species) take place over a long period. Today, scholars are also considering the exacerbations of development. What made Darwin's assumptions so provocative for his contemporaries was the fact that his *Descent of Man, and Selection in Relation to Sex* (1871) placed human beings among other animals. Then, Darwin described the common ancestors of humans alongside some other primates. Humans were thus dethroned as the »crown of creation.« Darwin did face much opposition, but also biting media representations and ridiculing caricatures (see, for instance, Darwin: Voß 2008).

In 1859, Darwin had published his *On the Origin of Species* in which he thoroughly outlined their evolution (in the modern sense). He was able to tie in with previous discussions such as those sparked by the botanist and zoologist Jean-Baptiste Lamarck (1744–1829) and the physician Lorenz Oken (1779–1851). Those scholars had described the possibility of an evolutionary development of organs and organism as well as the new development of species at the turn of the nineteenth century. Oken had even concluded that the embryonic development of animals went through stages resembling lower species. Ernst Haeckel (1834–1919) continued the work when he presented his – what we call today – »biogenic basic rules« in 1866: the development of the embryo is a quick-motion evolution of the species. Evolutionary »higher organisms« allegedly experience in their embryonic developments the stages on which »lower species« were stuck.

In his *Descent of Man, and Selection in Relation to Sex*, Darwin saw exactly that in the center of the mechanism behind evolution: the selection in relation to sex. By choosing the sexual partners, certain peculiarities and features of a species might be spread whereas others would diminish over the course of several generations – until those peculiarities and features would simply become extinct in a species. Both the female and male sexes might determine the »choice« of the sexual partner:

> »The sexual struggle is of two kinds ; in the one it is between the individuals of the same sex, generally the male sex, in order to drive away or kill their rivals, the females remaining passive; whilst in the other, the struggle is likewise between the individuals of the same sex, in order to excite or charm those of the opposite sex, generally the females, which no longer remain passive, but select the more agreeable partners.«[27]

In both cases, evolution apparently was a male endeavor for Darwin. When following him, the first scenario (the struggle for the female) sees the stronger and more untiring male as victor. Therefore, they enjoyed a more pronounced success in procreation and their features spread – and eventually prevail – among the entire population over time. The second scenario presents the necessity for males to be particularly attractive, colorful, and generally presenting a most handsome and attractive figure to lure in females for mating. Thus, the more handsome, attractive, and likely stronger males, again, enjoyed a more pronounced success in procreation – and their features were evolutionarily speaking an advantage. They would spread among the population.

There were exceptions of that rule. In humans, males apparently were stronger, yet females had developed as well and have been chosen on the basis of their beauty (Darwin 1871: 399) Yet Darwin also concludes that the male sex – human males included – always present a greater variability, and its features have developed. Generally speaking, however the female sex, does not present such a development. Such understanding is most present in Darwin's conclusions which can be found in a similar

27 Charles Darwin, *Descent of Man, and Selection in Relation to Sex,* vol. II (London: Clowes and Sons, 1871), 398.

way with Tiedemann, Ferrero, and Lombroso: individuals of the female sex are closer to a more childlike stage of development than their male counterparts. Darwin writes that »Hence in most cases the young of both sexes resemble each other; and the female resembles her young offspring through-out life« (Darwin 1871: 397).

Darwin summarizes the idea when writing:

> »There can be little doubt that the greater size and strength of man, in comparison with woman, together with his broader shoulders, more developed muscles, rugged outline of body, his greater courage and pugnacity, are all due in chief part to inheritance from some early male progenitor, who, like the existing anthropoid apes, was thus characterized. However, these characteristics will have been preserved or even augmented during the long ages whilst man was still in a barbarous condition, by the strongest and boldest men having succeeded best in the general struggle for life, as well as in securing wives, and thus having left a large number of offspring. It is not probable that the greater strength of man was primarily acquired through the inherited effects of his having worked harder than woman for his own subsistence and that of his family; for the women in all barbarous nations are compelled to work at least as hard as the men. With civilized people the arbitrament of battle for the possession of the women has long ceased; on the other hand, the men, as a general rule, have to work harder than the women for their mutual subsistence; and thus their greater strength will have been kept up« (Darwin 1871: 325–26).

What is striking in Darwin's considerations, of course, is the clear racism he professes. In contrast to Blumenbach's discussion, Darwin clearly voices his understanding of some societies being on a higher level of evolution than others (see also, for instance, Darwin 1871: 338, 363).

The differences of the sexes are, according to Darwin, the outcome of struggling for survival and especially procreation. He outlines the differences as such:

> »Man on an average is considerably taller, heavier, and stronger than woman, with squarer shoulders and more plainly-pronounced muscles. Owing to the relation which exists between muscular development and the projec-

> tion of the brows, the superciliary ridge is generally more strongly marked in man than in woman. His body, and especially his face, is hairier, and his voice has a different and more powerful tone ... Man is more courageous, pugnacious, and energetic than woman, and has a more inventive genius. His brain is absolutely larger, but whether relatively or compared to the larger size of his body, in comparison with that of woman, has not, I believe been fully ascertained. In woman the face is rounder; the jaws and the base of the skull smaller; the outlines of her body rounder, in parts more prominent; and her pelvis is broader than in man ...« (Darwin 1871: 316–17).

It seems likely that Darwin based his conside1rations on the character, too, which is clearer elsewhere. Women, for instance, are characterized by a »greater tenderness«, and »less selfishness.« She directs her »maternal instincts ... towards her infants [but also] towards her fellow-creatures.« Man, however, »is the rival of other men; he delights in competition, and this leads to ambition which passes too easily into selfishness« (Darwin 1871: 326).

As to the mental capacities of the sexes, Darwin concluded:

> »The chief distinction in the intellectual powers of the two sexes is shewn by man attaining to a higher eminence, in whatever he takes up, than woman can attain – whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands« (Darwin 1871: 326).

Those understandings in Darwin's work are not exactly ambivalent: women are clearly set behind men. In light of this, it is the more striking that some authors who strove for the emancipation of women referred to Darwin's theories. Others, who argued against such emancipation, refused »to romanticize Darwin.« Several aspects are indeed striking.

1. Darwin also professed to the leitmotiv of a common sexual disposition which we have addressed throughout the entire chapter on biological theories. Differences were thus rather the result of developments. Darwin also outlines the possibility that features were inherited differently: features acquired by the male sex would go on to their male descendants. Considering this, Darwin's common sexual disposition might be understood as divergent after all. But ...

2. Darwin neither professes to an absolute distinction between the sexes when it comes to heritage. He repeatedly discussed the fact that features which are passed down from one sex did at least rudimentarily affect children even if they are of the other sex (Darwin 1871: 327–29). When referring to the mental capacities, Darwin assured the reader:

   »It is, indeed, fortunate that the law of the equal transmission of characters to both sexes has commonly prevailed throughout the whole class of mammals; otherwise, it is probable that man would have become as superior in mental endowment to woman, as the peacock is in ornamental plumage to the peahen« (Darwin 1871: 328–29).

3. A third aspect is equally noteworthy. Today, Darwin's theory is often contrasted to Lamarck's as if Darwin rejected the notion that once acquired features were not passed on to the next generation. Yet, he clearly wrote when referring to intelligence:

   »In order that woman should reach the same standard as man, she ought, when nearly adult, to be trained to energy and perseverance, and to have her reason and imagination exercised to the highest point; and then she would probably transmit these qualities chiefly to her adult daughters. The whole body of women, however, could not be thus raised, unless during many generations the women who excelled in the above robust virtues were married, and produced offspring in larger numbers than other women« (Darwin 1871: 329).

Darwin clearly accepted social influence and described passing on acquired features onto the next generation as a possibility. The social aspect is something Darwin considered further for his theory of evolution. »Attractiveness«, for instance, differed for him according to regions, thus different features of »attractiveness« would be passed on in the different societies (Darwin 1871: 339–40).

It is a very social aspect Darwin described in the conclusion of his Descent of Man, and Selection in Relation to Sex: the development of language has had an enormous effect on the development of the brain. He wrote that

> »[a] great stride in the development of the intellect will have followed, as soon as, through a previous considerable advance, the half-art and half-instinct of language came into use; for the continued use of language abilities have reacted on the brain and produced an inherited effect; and this again will have reacted on the improvement of language ... The higher intellectual powers of man, such as those of ratiocination, abstraction, self-consciousness, & c., will have followed from the continued improvement of other mental faculties ...« (Darwin 1871: 390–91).

A few pages later, he continued:

> »The moral nature of man has reached the highest standard as yet attained, partly through the advancement of the reasoning powers and consequently of a just public opinion, but especially through the sympathies being rendered more tender and widely diffused through the effects of habit, example, instruction, and reflection. It is not improbable that virtuous tendencies may through long practice be inherited« (Darwin 1871: 394).

According to Darwin, society has indeed affected the limitation of an individual. It has thus also affected the transmission and evolutionary development of features. And, referring to the proverbial »Survival of the Fittest«, allow me one remark: Darwin did not understand it as a call for all humans to fight one another and crush their skulls as a result. He rather understood a situation of competition leading to better chances for some, perhaps a longer lifespan but especially more »success in procreation« than others. In essence, humans as well as other »[s]ocial animals are partly impelled by a wish to aid the members of the same community in a general manner, but more commonly to perform certain definite actions« (Darwin 1871: 392).

People, who strive for the emancipation of women, often (and foremost) argue for equal opportunities in education for women/girls and men/boys. Mental faculties, it is emphasized, are developed through education. If this stimulation is lacking, the mental faculties simply wither away. In this sense, Hedwig Dohm (1831–1919), a literary scholar and publicist, argued for *Die wissenschaftliche Emancipation der Frau [The Scholarly Emancipation of Woman]* (1874). When discussing the theses

of Theodor Ludwig Wilhelm von Bischoff (see above), she saw the overwhelming success of men in the sciences as an outcome of the seclusion of women, among others.

The German pillar of Socialism, August Bebel, concurred with this contemporary of his, and combined this view with the theories of Darwin in an explicit and detailed way. His *Die Frau und der Sozialismus [Woman and Socialism]* (1879) had initially been banned but then found a broad audience (1910 saw its 50th edition). In his book, he described that

> »Darwin is likely correct when stating that a list of the most remarkable men in poetry, painting, sculpturing, music, the sciences and philosophy would utterly trump a comparable list of women in the same fields. But how could it be any other way? It would be remarkable if it were otherwise. For this reason, Dr. Dodel-Zürich replies to the idea that it was different indeed, if over the course of several generations women and men had enjoyed equal opportunities of education and instructions in the arts and disciplines. The female physiology, speaking on the average, is generally inferior to than of her male counterpart. This is not the case in many savage peoples. The example of women working at the circus (also as acrobats) prove the degree of courage, daring, skill, and physical strength if having exercised and been educated from the earliest childhood onward.
>
> As such a development is a matter of the living conditions and education (or, phrased scientifically crass, of breeding) it might be accepted that the people's physical and intellectual lives will present the most beautiful outcomes as soon as society interferes in their developments with a keen eye on purpose and aim« (Bebel 1950 [1879]: 336 et seq.; emphasis in the original; detailed footnotes are omitted).

Bebel refers to Arnold Dodel-Port (1843–1908), a botanist from Zurich, Switzerland. He was one of the most important authors to promote Darwin's findings. In his own *Die Neuere Schöpfungsgeschichte nach dem gegenwärtigen Stande der Naturwissenschaften [The Recent Creation Story in Regards to the Present State of Science]* (1875), Dodel-Port set Darwinism into the focus of his considerations. Therefore, his conclusions as to the mental facilities of women and men were Darwinist indeed:

> »It is supposed that, since the historic times, the capacity of skull and the volume of the brain, respectively, among civilized nations have grown. If that holds true, we might expect – with close to mathematical certainty – the greater growth in the capacity of the female skull the more we enable our female sex to enter the arena of the mind and compete her intellectual powers with those of the supposedly superior mental faculties of men ... Therefore, if the women's emancipation of the mind becomes a reality, it greatly benefits the future male generations as well. We may congratulate them for having intellectually more advanced mothers than previous generations« (Dodel 1875: 186).

Dodel-Port, just like Darwin, professed to an understanding of some ever-evolving societies while others were declassified as »un-cultivated« and »un-civilized.« It is equally apparent, that Darwin's theories were employed for promoting the emancipation of women (and similarly of workers). In essence, some scholars understood Darwin's ideas in such a way that the brains of women could reach a similar volume (and quality) as of men, provided the correct social conditions existed for them.

Such »romanticizing Darwin« caused opposition, as it did in Paul Julius Möbius. He emphatically argued against the emancipation of women, for instance. Suppositions of women merely lacking mental exercises, he argued, were a sign of

> »common Darwinist romanticism. Seeing an acquired atrophy of the brain as hereditary (and the other way around) but also expecting women to have large brained granddaughters if they exercise their own brain, is romanticisim. It could only make any sense if we talked about parthenogenesis. There is hardly any less brash way to strike truth in the face than those ›feminists‹ do« (Möbius 1903: 24).

Thomas Henry Huxley (1825–95) was a natural historian from London and equally active in promoting Darwinism. He championed the education of women in general and women workers, but also doubted whether the (artistically and intellectually) best women could acquire the same skills as the best men. He did assure his contemporary readers, though, that women would find their new position in society. But it would be their

own, not man's as men would always prevail in a struggle with women over importance if they set their minds to it. The physiological advances of men would simply see to it (Huxley 1877: 24 et seq.).

In essence, Darwin's theories could be employed for and against the struggle for women's emancipation – and it was done so with gusto. Darwinism did explain for one side that social conditions had hitherto crippled the women's abilities to develop mental facilities which were similar or equal to that of men. The adapted upbringing and education could facilitate reaching male standards – and such strengthened faculties of the mind could be inherited by (and thus expanded upon) by the following generations. The other side argued that the »inferior« intellectualism of women was not the outcome of dissimilar opportunities of the sexes. Women had merely taken a position in society »their nature« assigned them to take (Möbius, Bischoff). Huxley presented a third option to read Darwin under the lens of the sexes: women did not have equal opportunities to shape their minds in the past but should have now. Yet, according to Huxley, the »best men« would also always trump the »best women.« In other words, in Huxley's understanding, women could merely narrow the intellectual margin to men. Nature, however, prevented them from outrunning their husbands.

Conclusions

As demonstrated, experts in biology and medicine have struggled between the several positions in respect to sex for quite a while. Thus, it is plain false that they had almost exclusively argued for a difference of the sexes since the end of the eighteenth century. It rather holds true that their descriptions – often based on the understanding of development of the embryo as well as the human species as a whole – have to be understood as a separation of »perfection«, i. e., the ideal state of development, from something »imperfect«, meaning the consideration of reality playing into assumptions. This was already visible in Laqueur's findings for the ancient period.

Biology and medicine present a discussion over sameness and difference of two sexes. Some theories even considered every human being male

and female at the same time, thus understanding »male« and »female« as socially ideal constructs which simply do not exist in reality. Following Karl Heinrich Ulrichs, Johanna Elberskirchen and August Bebel (whose contemplations on the matter we met above) factually political writings dedicated to the emancipation of women, too, argued substantially – not merely passingly – in the understanding of biology. They referred to a common sexual disposition, the female-and-male-being of every human individual, as well as Darwin's theories of evolution. It seems worthwhile, from a modern perspective, to do research into the plurality of biological-medical theories of the sexes but also just how they were employed in more politically oriented writings on the emancipation of women.

When turning to the current biological-medical theories of the sexes on the following pages, it is of essence to recognize the debates between several positions. The controversies between theories of development and those of preformation are most important. Separating those two approaches in an analytical way (as was done in our historical chapter) may provide a better understanding for possible paths of the current debates. Those current debates may – or may not – emphasize the (socially predetermined) concept of binary sexes which rests on preformation and/or determination. Said concept often pathologizes the formation of non-standard genitalia. Other concepts we discuss, do rest on the same foundation of preformation and/or determination when taking into account the variety of individually dissimilar formations of the genitalia into their theories. They follow an evolutionary theoretical approach.

Current Biological Theories of the Sexes

The essence of what is discussed above proves: there were debates over the differences in the mental facilities of women and men. Other, heatedly fought over, debates covered the sexual differences in other physical or psychological features such as bodily strength. Some participants in those debates argued for sexual differences of the mind but also the strength of the body. Others argued against them. Debates moved between poles. It is an entirely different picture when considering the arguments stemming from procreation and features which became more and more actual markers of the sex with the progressing twentieth century: hormones, chromosomes, and eventually genes, too.

Whereas the theories of preformation easily presupposed the two sexes that were socially to be expected as different ones (also for the biological-medical theories of the sexes), the situation became a lot more complex under the eye of the developmental theories (the epigenesis): theorists could not only tie in when describing differences of two sexes, but also the sameness of them and the woman-and-man-being of every human individual at the same time.

The Sexes between Brain, Muscles, and Microscopic Particles

The assumptions presented by Pizan and Gournay, Wollstonecraft and Bebel (the faculties and differences of the mind were the outcome of living conditions and those of society such as education and experience) seem

convincing. Natural scientists such as Darwin, Huxley, and Thompson shared them. Therefore, it seems the more surprising that scientific research into the brain (in the field of neurobiology) may still describe the differences of the brains of »women« and »men«, often regardless of their social background. Even if assuming the existence of pre-determined and unchangeable differences in the »female« and »male« brains (and their functions) one might expect that the counter-thesis (emphasizing the impact of socialization) may at least be recognized when devising such research – if for no other purpose than to hedge against the charge of being unsound in the methodology.

Anne Fausto-Sterling and Sigrid Schmitz have indicated exactly that problem for our current brain research, that of the late twentieth and early twenty-first centuries. It simply does not happen. When choosing subjects for research, it often does not even occur to the researchers that they are repeatedly drawn from the same pool of students from the own university. Their socialization and talents are rarely reflected. It might be of interest to look at, say, where and how a person was raised – whether in an urban or rural environment, poor or affluent – how the family was structured, whether they were showered with attention or neglected. Even more so (we are talking about brain research, so why not consider its most essential tasks?) what special skills did they acquire such as a foreign language, playing an instrument, communicating as a deaf person within a environment based on hearing, being exposed to a variety of stimuli in early childhood, physical exercise etc. What current challenges do occupy that person's mind? Is it a rather stressful or relaxed phase in their lives?

Those conditions for the research subjects are hardly addressed at all. People are found and committed as if just »fallen from the sky.« The subjects' brains are treated like biological machines created in uniformity just moments before research commences, not like brains belonging to people with a history. The hypotheses which are devised to explain the differences (of the sexes) that are identified on this bases project those brains back for many years – as if no one changes over the course of their lives. Then, in their projected times of embryonic formation or childhood, their development is solely considered the outcome of switched-on or – off genes and hormones as the core of found differences between human beings. Genes and hormones are the reason! Well, it is an assumption

which cannot be validated beyond doubt. The importance of socialization can be validated at least partially. Yet, it is utterly disregarded from the start. Whether or not such an approach is by design: it just allows researchers evidence of their own assumptions already entertained at the onset.

Just to emphasize once more (as this important aspect tends to be missed and keeping the argument of Beauvoir in mind): it is rather meaningless whether there are currently differences identifiable between »women« and »men.« It is important to consider those differences (which do exist) as part of the question whether they are the result of a »natural« disposition or the outcome of social inequality. As today's neurobiology (virtually) neglects the socialization of a person, the field is – please excuse the harsh choice of words – unfit to identify the reasons for those differences unless its methodology is adapted. Neurobiology may do little more than describe the product of the underlying reasons for those differences of today – sometimes in a more methodologically sound way than at others (see also Excursus 5).

Anne Fausto-Sterling and Sigrid Schmitz have indicated in their own current research that there are gaps in the methodology of neurobiology. They have discussed the methods of brain research critically and have shown just how the social presupposition of two different sexes was already at the starting point of most research endeavors (see Fausto-Sterling 1985, Fausto-Sterling 2000, Schmitz 2006; Jordan-Young 2011; but also Schmitz 2004 and Quaiser-Pohl 2004).

Excursus 5: A Thorough Look into Biological and Medical Research and Their Methodology Is Worth the Time!

Most often, employing the term »significance« for scientific research implies the thoroughness of the results. Here, however, it is interesting to consider the definition of the term. Statistical significance merely refers to an agreement. It »just« means that – with the stated probability – an observation likely is not the outcome *of utter chance*. Differences in statistical tests are referred to as significant if they were identified as having not occurred randomly with a probability margin of less than five percent. It means, that significance in itself does not suffice as a degree of plausibility.

Identifying the significance also entails considering the frequency of making spot tests as well as variations within the individual groups. Yet, it is equally helpful to consider for the actual research individual findings for the individual subject, but also to consider how those individuals were grouped in the first place. For example, some research have indeed found *significant* differences in the brains between the groups of »woman« and »men.« Looking closer into the results, however, also show clear variances within those groups. The following example may make things clearer:

Simon LeVay described significant differences of the INAH3 – a region of the anterior hypothalamus – for heterosexual and homosexual males as published in his *A Difference in Hypothalamic Structure between Heterosexual and Homosexual Men*. The region in homosexual males was apparently similar to those of women (who had not been subcategorized according to their sexual orientation). When referring to the following figure (7), however, it is striking just how great the variances within those groups are – for INAH3, too. They are hard to miss and cause more questions than give answers.

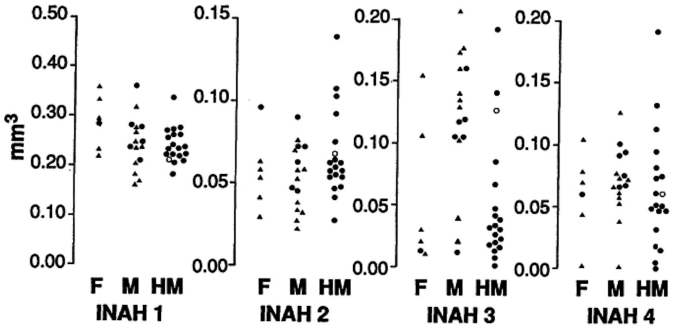

Figure 7: Differences in the sizes of the Interstitial Nuclei of the Anterior Hypothalamus (INAH) between women/females (F), heterosexual men/males (M), and homosexual men/males (HM); measures in mm^3 (as taken from LeVay 1991).

The region of INAH3 of individuals within the groups of heterosexual as well as homosexual males show results between 0.01 and 0.02 mm^3. In other words, results differ within one and the same group by a factor of 20. The measurements of those few women under research equally show such a great variance among the individuals of that group. One obvious conclusion should be that those regions may vary rather strongly from individual to individual in general – thus looking into explanations could be of interest. Socialization might be one factor but also the fact that many of the deceased homosexual males under research actually had contracted AIDS. While socialization did not play any role for this study, LeVay simply denied any influence AIDS may have on the outcome. Yet all measurements taken of INAH3 in the brains of »homosexual males« between 0.01 and 0.05 mm^3 were taken from the brains of individuals who had contracted AIDS (see LeVay 1991; Fausto-Sterling 1992).

LeVay's study subsequently enjoyed great popularity in the popular sciences, as did a study headed by Bennet and Sally Shaywitz (and their colleagues) in 1995. It appeared in the renowned journal *Nature*. The Shaywitz-study is still employed for making assumptions to an activation of the prefrontal lobe for *most language tests* (!) when attempting to conclude the different results based on sex. Yet, that study only looked into a limited number of regions in the brain, but more importantly, the Shaywitzes limited their findings to *recognize rhyme patterns* (!). While in male brains only the left lobe was activated for recognizing rhyme patterns, the Shaywitzes found that both frontal lobes were activated in females. The researchers had studied the brains of nineteen men and nineteen women. Eleven of those nineteen women actually did show an activation of both frontal lobes when being asked to recognize rhyme patterns. The other eight remained unmentioned in the article.

The study was also criticized for the fact that there was no description of the effect size – meaning, how much findings differed from individual to individual, that the number of subjects was very limited as was the number of regions in the brain under study. The

subjects' socialization was of no interest at all to the researchers. Such reference to the effect size is important, of course, as neurobiology presents us with colorful and bright representations of their findings in charts of the brain. Even the tiniest, and hardly measurable differences may be represented by the colors red, green, yellow, or blue – which appear significant but basically, like a smoke screen, signify nothing at all. Colors and their intensities on charts do not represent the degree of differences at all. For this, we need stated parameters of the study which come in numbers and are rarely colorful.

Despite their obvious methodological flaws, the studies of LeVay and the Shaywitzes (and colleagues) found their way into renowned biological journals (*Science* and *Nature*). Being renowned, however, does not make a journal infallible. A later study by Julie Frost and her colleagues did not find any difference between »women« and »men« at all when they attempted to re-create the Shaywitzes' study of recognizing rhyme patterns in 1999. Although their number of subjects was significantly higher (fifty for both sexes) and had considered more factors, that study did not reach the degree of popular attention the Shaywitzes did (see Shaywitz 1995; Frost 1999; Schmitz 2004).

The description of differences is also still a fact for other physical features. Here, too, it is rarely asked »whence and where to.« Often, scholars merely describe the state of today – which is then often simply taken as the result of biological factors. Inequality – whether based on dissimilar nutrition or exercises of the muscles – and its impact on physical and physiological features rarely plays any role at all when biologists consider the sexes. Everything we have discussed thus far, however, indicates that such inequalities clearly impact bodily features. Bourdieu and Fausto-Sterling today professed to this fact in their concepts of »habitus« and »embodiment«, respectively.

Yet, the works of Wollstonecraft, Marx, and Bebel indubitably profess to their early understanding of living conditions having not only an impact on the faculties of the mind, but also on the other physical features. They already outlined that it was possible to identify a person's »class«

by merely looking at them. Thus, it does not suffice at all to limit research into the differences of the sexes on simply describing just the way they are at the present: whether this or that bone is prolonged, this or that group of muscles has more or less fat embedded in it. It does not suffice any longer to then conclude those factual differences (of the sexes) are in themselves proof for their »naturalness.«

It is not merely the case that many of those studies themselves are already questionable in their methodology, or choice of subjects, as described above for those of the brain. Subjects are moreover already grouped as »women« and »men« from the onset. Those groups are then put opposite to each other, and differences suddenly appear meaningful. Yet, the variety of findings may be great even within one group, say »women« (see Excursus 5). Reasons for those differences are not sought but rather form the basis for the entire study: given differences are presupposed to be just that – given – and unchangeable. The reasons for them? Well, chromosomes, genes and hormones! What else?

It is worthwhile to turn to them for our discussion. One starting point are also the previously mentioned works by Fausto-Sterling.

A brief summary might be in order. The descriptions of differences of the sexes – and assumptions to their reasons – have been debated for quite some time now: whether regarding the faculty of the mind, peculiarity of the musculature and fat distribution, as well as other macroscopically visible features. Today, the scientist's last resort to preserve the safety and predetermination of such differences lie in microscopic aspects: chromosomes, genes, hormones. These are very complicated to challenge for a society, as criticism may easily meet the argument that, well, it takes a well-equipped (and thus expensive) laboratory to actually enter the conversation.

Other features of the certainty of an existing binary system of sex are also less discussed. The fact that there are two sexes, it seems, is rooted in procreation and thus serves the preservation of the human species. Two complementing sets of gonads and two blueprints of genitalia of the male and female sexes are merely the outcome of a »natural« necessity. Here, too, hormones, chromosomes, genes but also those chemical groups directly attached to them are particularly in the focus of scientists who explain that they cause a male or female development of the genitalia.

Thus, there is good reason to turn to this understood »core« of our knowledge of the binary sexes in the following – to those microscopic features. When wishing to question the currently prevalent biological theories about the human being as a sexually binary one (but also for raising the question of »female« and »male« equality or the existence of multiple sexes) a detailed discussion of the current scientific common ground is of the essence. This means addressing genetics, endocrinology, and evolutionary biology. Any reasonable suggestion for shaping society must be in accordance with the scientific »findings« of the times. Simone de Beauvoir, too, has stood firmly on the grounds of scientific research in her times.

The discussion below, however, will demonstrate that it is becoming harder and harder for current biological researchers to press their findings into a binary model of the sexes. Changing our perspective seems inevitable – away from two sexes toward many, from preformation toward epigenesis.

Procreation as a Characteristic of the Species – and the Individual Form of Human Genitalia

Procreation is essential for the preservation of the human species. There is no doubt about that. The human agents of germination have been described as eggs/ovum and sperm since the nineteenth century. Both are cells that must conglomerate in order to form the basis for the embryo.

It may seem that all questions as to the sexes are answered by this statement, right? All previous discussions in this book have been rendered mute when mentioning eggs and sperm? Well, let us look into another argument: procreation is a matter of some people in our society, not all of them. Although we presuppose the people's ability to procreate when considering and classifying them – society has taught us to – yet it is often not even probable that they do. The state of Saxony, one of the East German Länder, for instance, has re-introduced subsidizing the artificial insemination which Germany as a whole had actually ended in 2004. They did so after a study found – or rather estimated – that fifteen percent of all heterosexual couples remaining without child without wishing to do so. The estimated number of unknown »cases« likely was higher, according

to the experts. Fifteen plus percent is a high number among the population, especially when considering that only some couples likely consulted a physician for their prolonged failure in procreation. Other couples may simply accept it, adopt, or become foster/surrogate – here meaning »honorary« parents to the children of relatives or acquaintances. Let us not forget that artificial insemination is not a guaranty for pregnancy – far from it. The risks are also considerable for the woman although this is rarely pointed out. In 2002, thirty-five to forty million inseminations led to about one million child births (see Berg 2003). Since Saxony had re-introduced subsidizing them in March of 2009, 552 inseminations helped start the lives of 112 children (see Tagespresse, and, among others, Block 2010).

When it comes to organic fertility, it is interesting to see the rather relaxed attitude of biologists and physicians dedicated to the development of the embryo. Studies on mice often demonstrate that »typically female« or »typically male« mice had developed. That those rodents are infertile equally often comes as an addendum. Infertility, the inability to procreate, apparently go well together with »typically female« and »typically male.« – Well, looking closer, we do the same when interacting with people in our everyday lives. There is more of a vague idea of fertility projected onto the specific people we deal with (rooted in our acquired understanding of what is »female« or »male«) rather than validated facts.

Popular as well as scientific considerations of procreation often simply forget, though, that the wish to procreate (or abstaining from it) is a personal one for every human individual. Political considerations of birth figures of a population which are apparently too low or their tastes, often see humans as potential »machines of procreation.« To have or to have not. Having children is a personal decision based on a personal background of one's own necessities and conditions of life. Economical and other social factors do play a role, no doubt, but the wish to have (or aversion to having) children is one of the most personal considerations of every human being. Every popular or scientific discussion of procreation should rest on that fact. Yet, they often separate the potentially presupposed ability to procreate from the ambition to actually do so. Asking about the personal and potential wish often remains forgotten.

These brief remarks already demonstrate that »procreation« is a problematic topic better to be seen with two perspectives. On the one hand,

procreation is a necessity to preserve the human species. Thus it is a »characteristic of the species.« Being part of the sexually reproducing side of the animal kingdom, human eggs and sperm need to meet in order to jointly develop into an embryo who is then born and nurtured. The wish to do so aside, it is statistically sufficient that – good health care and social caring provided – some ten or twenty percent of all humans procreate occasionally in order to keep up the numbers of a population (if that should be the driving force, however, is a topic for another discussion).

This »characteristic of the species«, on the other hand, does not say anything about the individual characteristics of the individual human being. A person does not have (or even wish) to personally have children. Just to be »organic« once more: there are multiple possibilities for genitalia to develop in an embryo, unlike a heart, liver, or lung – because they are not essential for the individual's survival. Malformations of the heart often lead to the death of the embryo or the infant if health care is insufficient to transform that heart into a state where it can function. Variations of the genitalia, however, do not lead to such negative outcomes for the individual as genitalia merely have to enable procreation which is crucial for the survival of the species but not for that of the individual. The formation of genitalia, too, is a developmental process into which a number of factors play. Thus, there likely is a greater variety of genitalia possible than for other organs – simply because there is no narrow corridor of the »correct« form for the organism in order to survive as it is compared to a heart.

Such considerations often meet the argument that one has to base all assumptions on »natural« requirements. We cannot – allegedly cannot, that is to say – consider health care or social caring, or the individual's wishes having an impact as »the primordial human being« did not command over such modern technological options of health care. Natural and humanity's history would be mixed according to this. The »natural« way of how other species procreate is another argument for comparison. Other animals are of no importance for our discussion for us. Their mode of reproducing – whether sexually or asexually – as well as the development of their sexes differ from species to species when compared to humans.

Human beings (and we discuss them in this scope) clearly profess to their »evolution« as being affected by economic and social conditions, health care, the individual's choices but also nutrition and caring for others.

Humans have changed the face of the earth everywhere according to their needs as no place remains untouched. Humans have devised atom bombs to eradicate themselves and other species if necessary. How on earth, to ask bluntly, should a distinction between »natural« and human history work? It would require a certain lack of understanding of the last ten thousand years of human social, historical and scientific development. Human history is part of our natural history – as the history of other species is part of natural history, too. Natural history, seen differently, is equally part of ours. Evolution – spurred by nature but later also by humans – led to more and more complex organisms and, eventually, to the modern human one.

The Formation of the Genitalia in the Development of the Embryo

Let us turn to the stages of the genitalia's development of a human embryo just as it is described in developmental biology before turning to chromosomes, genes and other factors such as hormones (see Excursus 6) (see Voß 2010: 242 et seq.; Ainsworth 2015).

Today, our comprehension largely follows the historical understanding described above: one embryo is not sexually distinctive from another in an early stage of their development. Genitalia are described as »neutral« or »bipotential.« According to this, every human embryo has the potential in their first weeks of development to grow into a more or less »female« or »male« one. The term »bipotency« alone, however, indicates only two possible outcomes are at the core of considerations. Actually, the idea is for the embryo to develop its gonads in the first phases of the genitalia's formation. There are allegedly only two possible varieties – testicles versus ovaries – whose subsequent hormonal release would engineer any further sexual development.

We currently understand the appearance of gonads in an embryo to take place around the fourth week of its existence. They remain in their bipotential stage described above until the seventh week. Then, the embryos show more and more differences, professing to their »female« or »male« direction of development. Two tissues seem crucial for the formation of the gonads: one of them is the coelomic epithelium (also called

somatic mesenchymal cells) which become the somatic (physical) tissue of the gonads. The other crucial tissue are primordial germ cells (also known as gonocytes) which infuse into the somatic tissue and form gonads there. The primordial germ cells' infusion takes place in the sixth week of the embryo's development. It may be the result of the coelomic epithelium sending out chemical »attractants.« That phase of sexual bipotency also witnesses the formation of the Wolffian/mesonephric duct and the Müllerian/paramesonephric ducts. Both later play a role in the differentiation into »female« and »male« genitalia.

Development of the testicles: The somatic cells further differentiate into »Sertoli cells.« Around the eighth week of the embryo's development, they organize the testicular cords. The testicular cords comprise germ cells which form into »spermatogonia« and, following division and differentiation, into spermatozoa from puberty onward. All germ cells outside of the testicular cords wither. The »Sertoli cells« are crucial in the embryo's further development as they release the »Anti-Müllerian Hormone« (AMH) which causes the Müllerian duct to regress.

Somatic cells which have not taken part in in the formation of the testicular cords develop into »Leydig cells«, situated between the testicular cords. They produce testosterone from the eighth week of the embryonic development onwards – up until the eighteenth week they are particularly induced to do so by the mother's human chorionic gonadotropin (hCG). Later than that, the pituitary regulates the production of testosterone through the luteinizing hormone (LH), also called interstitial cell-stimulating hormone (ICSH). Testosterone in turn affects the differentiation of the Wolffian duct to epididymides, ductus deferens, seminal vesicle and the exterior sexual characteristics. Both testosterone and the equally influential dyhdrotestosterone (which belong to the group of the »androgens«, the so-called masculinizing hormones) take their affect from attaching to the »androgen receptor.«

Development of the ovaries: Here, the Somatic cells differentiate into a cortex area (a connective tissue dense in cells) and the »marrow«, which is less dense. The germ cells remain in the cortex area for the development of the ovaries. The embryo's gonadal cords – which in a male development evolve into testicular cords – regress. There is a development of secondary gonadal cords in the cortex area instead. Germ cells, which are comprised

in the cortex area, form primordial follicles by multiplying and covering with a single layer of follicular epithelial cells which have formed from the secondary gonadal cords. The germ cells enter into the prophase of the first maturation division of meiosis. They remain in that phase at least until puberty. Then, the primordial follicles mature »primary«, »secondary«, and eventually »tertiary follicles« after being induced to do so by the »follicle stimulating hormone« (FSH).

This period until puberty equally witnesses a halt of the further gestation of the follicular epithelial cells. They then become »granulosa cells«, which release – aromatase, an enzyme (again, induced by FSH). Aromatase plays a role for the conversion of testosterone into oestradiol, a member of the family of estrogens. They are the hormones which are considered to be important for »female sexual development.«

The granulosa cells are for the formation of the ovaries what the Sertoli cells are for the offspring sporting testicles. Theca cells, on the other hand, correspond to Leidig cells. Theca cells do in fact form the layer of cells that surrounds the follicles. Just like Leidig cells, theca cells equally react to the luteinizing hormone the pituitary sends their way, and androgens (testosterone and androstendione) are produced as a result of that. Under the influence of the enzyme aromatase said androgens are converted into estrogens (see Excursus 6).

Just why the Wolffian duct regresses in the development of ovaries while the Müllerian duct moves forward, remains unclear. Until well into the 1990s, studying the development of embryos meant studying that of »male« ones. Just how female ones come into being was deducted from that! One explanation for what we see, the regress of the Wolffian duct was explained by the absence of testosterone, while the further development of the Müllerian duct was considered the outcome of absent AMH. In other words, certain conditions would lead to the development of testicles. If those conditions were absent, ovaries result in an utterly passive way. That there might be some active steps in the development of ovaries involved is a more serious consideration of studies from the 1990s onward. Whatever those studies may find: we do know that the Müllerian duct further differentiates into fallopian tubes, uterus, cervix, and upper vagina.

It should be clear by now that the common dispositions for the development of the sexes are overwhelming. Germ cells as well as the Wolffian

and Müllerian ducts are common to all embryos in the initial stages; granulosa and Sertoli cells, theca and Leidig cells also correspond to one another and develop out of the same embryonic origin. Androgens equally form in all embryos. They are simply converted into estrogens in different quantities (see Excursus 6). Thus, is it not imaginable – the following will make it clearer that it is more than an imagination – that the sum of factors, moments and quantities of their availability, differ from individual to individual? It is equally clear (in fact a truism) just how co-dependent the development of the embryo is to factors coming from the mother's body.

All considerations also lead to conclusion that a simple »either – or« (either testicles or ovaries) cannot be a fact for the development of the germ cells – least of all for the formation of the other parts of genitalia from there. No, all (biological) considerations have to lead to one notion at least: there might be a variance in the formation. It may be the result of factors having an impact on some areas of the forming tissue only. Cells may form receptors for androgens or estrogens in variance to the concrete blue prints studies have allegedly identified.

There is a more variegated picture when it comes to the possibilities of how genitalia are formed. It is worth finding a new classification of our findings – one which does not presuppose a binary »nature« of the sexes. It should be worth our while to break with a mode of thinking which disqualifies variances as »disturbances« or »digressions« of a »normative development.« A new classification should moreover lead to a better and (for this time being) more convincing description of the variety of the manifestation of the sexes which actually presents itself.

Excursus 6: Biosynthesis and the Effects of Androgens and Estrogens

Most often, androgens and estrogens are presented as opposites. The first have allegedly a masculinizing effect; the latter a feminizing one. It is equally assumed testicles produced androgens, ovaries estrogens. This, a closer look may be advisable.

Androgens and estrogens are based on biosynthesis which is more or less the same for both. As steroid hormones they go back to cholesterol. Androgens are the descendants of pregnenolon (or progesterone, which is a product of conversion). At an initial step,

they form the androgens *androstenedione* and *androstendiol* that eventually become *testosterone*. Those androgens – particularly in connection to the enzyme aromatase – converted into estrogen. Thus, androstenedione becomes the estrogen *estrone*; testosterone *estradiol.* Androgens are therefore always the basis for the conversion of »estrogens.«

The biosynthesis of androgens and estrogens do most often – but not exclusively – take place in the germ cells. Countering examples are the formation of androgens in the adrenal cortex, or of estrogen in the placenta. Such production also takes place in other tissues but only in very moderate quantities. If androgens reach a high concentration, they may be converted into estrogens in the fat tissue.

It is common wisdom that androgens and estrogens affect the formation of primary and secondary characteristics of the sexes. That wisdom actually neglects their other effects, though. Estrogens seem beneficial for the wellbeing of the heart, the growth of bones, and the formation of sperm cells. Testosterone, on the other hand, seems to affect the blood circulation system, blood cells, liver, but also for burning fat and carbohydrates. There is no doubt, estrogens and androgens are both very important for »women« and »men.« Anne Fausto-Sterling rather suggests classifying them as »growth hormones.« »Sex hormone« simply conceals the entire scope of their effects.

The hormones' quantity and interdependency seem important. The various cells of the forming gonads interact and react to stimuli (given they possess the corresponding receptors). Enzymes/emzyme complexes or other complexes of proteins are necessary to from androgens and estrogens. They, in turn, only have an effect when the corresponding receptors to connect are present in the cells. Only then can androgens and estrogens initiate reactions. Thus, their effects may differ according to the individual conditions and influences.

The other conclusion this leads us to is, of course, that a mere »high concentration« of androgens does not necessarily means a masculine appearance. A body lacking the receptors for andro-

gens or providing large quantities of aromatase which convert said androgens, may appear utterly »female« despite a »high concentration« of androgens. Then, the problem is not the forming appearance, but society's typical disease mongering the varying concentrations of hormones. Five to fifteen percent of all women at the »child-bearing age«, for instance, are described as sick just because they form too much »masculine« hormones (see, among others: Ebeling 2006b; Stryer 1999 [1995]: 739 et seq.; Horn 2009: 398 et seq.; Schartl 2009: 719 et seq.).

It is not exactly news that estrogens and androgens are present (and have an impact) in men and women alike. Is has been described since the 1920s (see Oudshoorn 1994; Fausto-Sterling 2000; Sengoopta 2006).

Gonads, Germ Cells and Eventually Chromosomes and Genes: Do They Prove Sexual Binarity?

»Testicles« in particular have been in the focus of research since the 1700s. They have been assigned special »sexualizing« features. In the beginning, only »male testicles« were described as masculinizing the organism. Then, at the begin of the nineteenth century, »female testicles« (ovaries) were considered and described. In the common understanding, they were seen as the main organs for feminizing an organism. The chronological order (first researching the »masculinizing effects«, only later the »feminizing« one) is a leitmotif for the biological-medical sciences. The starting point then was – as described – to see the man as the perfect formation of a human being who was superior to the imperfect version seen in the woman. Based on this, the formation of a man allegedly required certain additional developmental steps that were missing in the development of a woman. It was an androcentric stance not uncommon to the biological-medical studies.

Through this focus on the »male testicles« and »ovaries« they were assigned far-reaching functions. Rudolf Virchow (1821–1902) was an important (and otherwise progressive) physician and social policy expert whose involvement brought important hygienic institutions to Berlin in

particular such as the first communal hospitals, canalization, and central drinking water supply. On the gonads, he wrote:

> »Woman is a woman just because of her gonads. Ignore all peculiarities of her body and mind or her nutrition and nerve activity: all sweet gentleness and rounding of the limbs with the peculiar form of the hips, the development of the breasts while the vocal organs remain unchanged, that beautiful decoration of the hair on her head and the soft, hardly noticeable down of the remaining skin, and then the depth of her emotions, this truth of immediate recognition, this sweet temper, dedication and faithfulness – in short, everything we admire and revere in a true woman: it rests on her ovaries alone. Take away the ovaries and you will face that mannish woman in all her ugly in-between-ness: coarse and rough shape, strong bones, the moustache, the rough voice, flat chest, the envious and selfish soul and the crooked view of the world« (Virchow 1856 [1847]: 747; footnotes omitted).

It is clear what importance was given to ovaries (and testicles). Ovaries and testicles were seen as the sexualizing features. Not only did they held sway over how a human body was formed physically but also its personality and moral dispositions. Virchow's quote demonstrates the vivid – and often overwritten – language that was commonly used to describe the differences of the sexes then.[28]

In the beginning twentieth century, the belief in the gonads was so strong that scientists considered the benefits of transplanting the tissues of testicles and ovaries, later of the substances isolated from them (the »hormones«). In their eyes, it would have an impact on the formation of physical, physiological, and psychological features. Of course, those tissues and their substances were believed to have a rejuvenating effect as well.

A parallel understanding developed at the same time – we are still at the turn of the twentieth century. Rather than considering the gonads, researchers focused on the substances of procreation: egg and sperm cells. As we saw in our historical overview in the last chapter, natural philosophi-

28 As a side note and recommendation: Londa Schiebinger described that scientific language so excellently for the field of botany in her *Das private Leben der Pflanzen [The Private Lives of Plants]* (Schiebinger 1995).

cal and biological-medical considerations of the sexes revolved around the importance of these cells. The theories of preformation, on the one hand, understood the substances of procreation to be fully formed grown »men« or »women« – albeit in a tiny version. The theories of development, on the other hand, saw the substances of procreation being an »unformed matter« which would develop and differentiate. There were also several approaches to explain the difficult issue of the children resemblance to both their parents.

With the progress of the microscopes (and thus the microscopic research, of course) the cellular structure of »eggs« and »sperm« was eventually understood in the nineteenth century. Karl Ernst von Baer (1792–1876), a German researcher in Estonia, scientifically described the »egg« in 1827. In 1841, Rudolf Albert von Kölliker proved that sperm was tissue and not tiny, fully animated living beings (although we still use the term »spermatozoon«, which means just that: seed living being). Oscar Hertwig (1849–1922) eventually described how the egg of a sea urchin was inseminated (those eggs are popular among researchers for their size).

The morphology of »chromosomes« has been known since the 1840s. They were described in detail and for their possible function in matters of heredity in the 1880s. It was the German Theodor Boveri (1862–1915) who in 1904 described the mechanisms of the chromosomes' reduction and distribution in the formation of the germ cells (meiosis). He also demonstrated that homologous chromosomes paired when egg and sperm cells fuse.

The 1890s brought the understanding that the chromosomes played a role in transmitting the sex to the offspring. Hermann Henking (1858–1942) demonstrated that – as a result of meiosis – two versions of sperm cells appear: some contain a certain, large element of chromatin, others do not. Following up on this, researchers such as the Americans Nettie Maria Stevens (1861–1912) and Edmund Beecher Wilson (1856–1939) made similar observations in several species of insects. Some species presented an additional element of chromatin in a part of the sperm cells (which was absent in others). Some species showed one pair of chromosomes whose partners clearly differed from one another. In 1909 and 1911, the smaller of these chromosomes was termed »Y-chromosome«, the larger »X-chromosome.« Theophilus Painter

(1889–1969) outlined in 1923 for human beings that the cells of male individuals possessed a pair of X- and Y-chromosomes, females had a pair of two X-chromosomes. Painter concluded that the decision over the sex of human being rested in the chromosomes (see Voß 2010: 209 et seq., 246).

Today, this understanding of a clear differentiation of the chromosomes according to sex often leads to a hasty conclusion: well, the debate is over. There are – only! – two sexes! Such a conclusion is as incorrect now as it was for the 1920s. Then, as it might be recalled, the theory of intermediate stages considered the factual existence of sexual variances. Moreover, the conclusions according to chromosomes did not necessarily stand in opposition to that theory.

Richard Goldschmidt (1878–1958), a renowned zoologist of his time, presented his understanding of the chromosomal sex as being female or male. Yet, he also concluded that all individuals harbored the disposition to both sexual characteristics – female and male – which he called »factors« of femininity and masculinity. Goldschmidt studied insects – like most of his colleagues did, in particular (gypsy) moths (Lymantria dispar) – but transferred his findings to all animals, humans included. Depending on the species, the factor of femininity or that of masculinity would be localized on the X-chromosome – and thus may be present »twice« – whereas the other was on the Y-chromosome. For some species, Goldschmidt assumed them on the autosomes (the remaining chromosomes of the »body«).

Quantity, timed influence and speed of the reactions of both factors would differ – especially because of the different position in the chromosomes. The predominant factor determined the sex. Although one factor often permanently dominated the other, another interaction was possible. Sometimes, Goldschmidt believed, factors would take turns in their dominance in one and the same individual. He referred to the point in time as pivot, i. e., when one factor took over the dominance from the other. Depending on how early or late that pivot occurred, the eventually dominant factor had a greater or lesser impact on the physique, physiology, and psychology of the individual. Goldschmidt outlined an »unbroken line of succession of transitions« in the formation of sexual characteristics; »femininity« and »masculinity« were »extreme poles« of this line. It is very difficult to ignore the similarities between Goldschmidt's under-

standing and that of the theory of intermediate stage (see Voß 2010: 212 et seq.).

Goldschmidt's assumptions were popular among scientists as well as laypeople (see Satzinger 2009: 259 et seq.). Paul Kammerer (1880–1926) was an Austrian biologist who thoroughly studied heredity concluded from them that »There are only hermaphrodites.« One of the chapters of his book which appeared in 1927 was titled as such. Then, Kammerer wrote that

> »the germ cell – as it was said – is home to both male and female dispositions. One is preferred over the other and therefore dominates the development in an undisturbed manner. Yet, the other is never utterly suppressed as it is always present in the form of stunted organs of the other sex [...] Whether the latent or potential bisexuality of the germ transforms into the current, visible bisexuality of the hermaphrodite depends on both dispositions of the sex being in an equilibrium (or close to it). When they are not, one is more dominant than the other. This disposition thus determines the ›purity‹ of the adult's sex. The more the development of a ›split-up sexual organism‹ (*getrenntgeschlechtliches Lebewesen*, in the original German) is progressed, the more the preferred sexual disposition prevails. Because the process is far from being a sudden one, there are no clear boundaries between the hidden hermaphroditism of the germ on the one hand and the seemingly single-sided and allegedly pure sexual nature of the adult on the other hand. There is no complete conquest of the other disposition as there will always remain some form of remnant. In other words: there are no strictly ›split-up sexual organisms‹. There is, to be exact, but one single sex – or better, one sex of a dual nature: the hermaphrodite. *Every individual is hermaphroditic to some degree:* even the most virile of men harbors female elements; the most feminine woman has male elements« (Kammerer 1927: 81 et seq.).

It is a curious (and for the following quite important) fact that Goldschmidt never understood the chromosomes to dictate the development of the sex. It was rather a composite of chromosomes and other influence from within the cell and the organism. Goldschmidt's contemporary Thomas Hunt Morgan (1866–1945) theorized in America a different

model of interaction according to which one specific gene produces one specific enzyme. For his theory, Morgan rested on the researches in cross-breeding strands of fruit flies (drosophila melanogaster). He argued that a definable segment on a chromosome (a gene) leads to a protein (enzymes are proteins) or the respective feature of an organism.

The theory is still considered valid for fruit flies and their so-called »mono-genetic diseases« (meaning »de-formations« of the flies' features that can be traced back to one gene).

The difference between Goldschmidt's and Morgan's hypotheses is as such: Goldschmidt saw the effect of the chromosomes in connection to processes of the cells and the organism in general. Genes were active on different levels of a hierarchy. Morgan's concept was a little more simplistic: chromosomes and genes had the sole say in the development of characteristics and features. The cells were merely the location where it happened (or tool, if you will).

Harmonizing both concepts would have been worthwhile for the further evolution of science. The teachings of Goldschmidt, however, ended with the German Fascists persecuting and killing its main representatives. When the National Socialists gained power, Goldschmidt's conditions for research took a turn to the worst in Germany. In the ductus of the racial ideology then he was considered Jewish. After his emigration to the US in 1936, Goldschmidt lost the favorable research environment he had in the Berlin Kaiser Wilhelm Institute of the 1920s.

The study of hormones also lost that understanding of a more complex interaction. Bernhard Zondek (1891–1966) was influential in the research of hormones, too, then. As he was also Jewish, he emigrated as well – to Palestine in his case. He had found, for instance, large quantities of »estrogen« (»feminizing sexual hormones«) in a stallion. Adolf Butenandt (1903–1995), on the other hand, was one to remain in Germany – as a member of the Nazi-Party and who was later a Nobel laureate and president of the Max Planck Society.[29] Thus, he set his own mark on the understanding of hormones. His rather simplistic model presented hormones as the

29 The Max Planck Society for the Advancement of Science was formed in 1948 as successor to the Kaiser Wilhelm Society. It is a formally independent but state funded association of Germany's foremost research institutes. The translator.

sole agents of forming the sexes – despite the fact he found discrepancies in his scientific research. The model he propagated, however, neatly tied in with his own understanding of clear boundaries between the sexes in matters of biology and social as well as family duties (see Satzinger 2009).

The German Fascist ideology ripped a gap into our understanding which initially could not be closed even after World War II ended. Goldschmidt's theories remained overlooked well into the 1980s (see Satzinger 2004: 6 et seq.). When James D. Watson and Francis Crick (in collaboration with Maurice Witkins) published their molecular structure of DNA in 1953, the »belief« in the importance of DNA and »genes« prevailed. As a side note: Watson and Crick used the x-ray structural analysis of Rosalind Franklin (1920–58), a member of Wilkins' team. They never even mentioned her name when they accepted the Noble Prize four years after her death.

Subsequently, biological and medical research was predominantly funded if seeking to understand genes – systemic research rather remained in its shadow as underfunded and with a rather marginal public perception. The same fate befell theories of a more complex understanding of genes as the creed of a »static genome« still prevailed. Barbara McClintock (1902–92), for instance, was initially ridiculed for her contradictory results. Her path breaking studies of »transposable elements« from the 1940s were finally recognized as late as 1983 when she received the Noble Prize. Only then did they achieve a more dominant role in research considerations. Systemic research that include the cells and the entire organism as well have covered ground again from the 1980s onward. Yet, it also took the rather disappointing results of the human genome project of 2001 which proved that decoding genes does not mean anything if ignoring a more complex interaction.

Thomas Kuhn (1922–96), the American historian of the sciences, quite rightly asserted that »no part of the aim of normal science is to call forth new sorts of phenomena; indeed, those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others« (Kuhn 2012 [1962]: 24).

It is crucial to consider the influence politics and funding have on current studies in biology and medicine. Yet, it is equally vital to understand

just how the idea of fitting results into the dominant boxes in the fields turn study results into theories. Those which do not (or did not) fit actually have existed but have rarely formed the dominant theories.

Let us not forget the »big« social frameworks which foster the dissemination of some theories over others. Those who benefit from a social order will, as mentioned, also prefer theories of stagnation and predetermination: they were not in such a cozy position because of social inequality but rather because of the »given skills they were born with.« True, education may bring inherited skills to full fruition but other people could not live up to that potential. Those who do were just incapable to excel themselves through such an education because of their »natural« disadvantages. Even today such a point of view is a rather widespread ideology.

Another of those frameworks of society does not reveal itself so easily. At first glance, we may identify an opposition between genetics and the Christian church. However, there hardly is one. Their teachings may go hand in hand – if only on the basis of *predetermination of the inevitable*. Genetics describes molecules which already harbor the complete set of information – they merely need to be heard. The Christian church, of course, takes recourse with »God« as the predetermined and final authority. »God the Creator« also easily explains for genetics just how that information has gotten into the genetic material. When we contrasted the theories of preformation and those of development for the seventeenth and eighteenth centuries, it was clear that the natural philosophical idea of preformation could rest on a Christian-clerical worldview. It may have been amusing to read about the belief of sperm or egg containing a tiny person. The current prevalent understanding of genetics is not so different, though. There, too, genes harbor the information for the individual parts of the body – a tiny person waiting in our genome, so to say.

Nothing is generated out of the vacuum. There is a certain socio-historical background against which Evelyn Fox Keller could refer to the twentieth century as *The Century of the Gene* (Keller 2000). Further study results have to be understood in the same light.

Thus far we do know that testicles have played an important role. They even gained importance with the studies of the French Alfred Jost (1916–91) from 1947. For his experiments, he removed the undifferentiated gonads of rabbit embryos in the early stages of their development.

Subsequently, no matter what the chromosomic combination of the rabbit embryo (whether »female« or »male«), the embryo always developed »female« characteristics toward fallopian tubes, uterus, vagina and female external genitalia. Jost concluded that a »female« development did not need gonads (ovaries) but the male one does (testicles). That experiment, and Jost's conclusions, formed the basis for later research. It became the dominant reading of the genetic paradigm which itself set the standard (see, among others, Rieder 2003).

1959 brought forth two other path breaking works: patients who harbored only one X-chromosome (but not the other or a Y-chromosome) had a female appearance (ovaries included). Their »X0-set of chromosomes« is commonly referred to – and pathologized – as Turner syndrome. Those patients with two X- and one Y-chromosome – »the XXY-set of chromosomes« and equally pathologized as a variation of the Klinefelter syndrome – developed male features. This did allegedly prove the peculiar importance of the Y-chromosome which – if present – inevitably leads to the formation of testicles.

Since then, the 1950s, scientists have searched for the chromosomic and genetic factor that enables the formation of testicles. Again, we may see the androcentric leitmotif in this: scientists always started at the assumption it was only the male sex that developed. That kind of research also started the quest for the particular segment of the chromosome (and at the beginning it was one singular sought-for segment) which would determine the testicles. Such testis-determining factor (for humans abbreviated to TDF, for the main organism of research as Mouse Tdy) was believed to induce the development of testicle in one single step. All further development toward »male« characteristics would depart from that.

Following the findings of 1959, TDF's location was assumed to be on the Y-chromosome. Therefore, it was under intense scrutiny. In 1966, scientists narrowed the area to short arm of the Y. Since 1975, several scientists identified several areas (»genes«) on the Y-chromosome as the culprit. Assumptions to have found the home(s) of TDF always ended in a dead end. There were just too many exceptions: either the area was present in several individuals who stubbornly still did not develop testicles, or individuals had them but not a trace of the supposed TDF-area on their Y-chromosome. Equally frustrating must have been to identify the area but

then finding numerous copies of it on numerous chromosomes of their genome. That it was responsible for developing testicles only then became less and less probable.

In 1987, David C. Page and his colleagues suggested a gene which they also found on the short arm of the Y-chromosome: ZFY. Its product, the ZFY protein, demonstrated clear chemical structures of a transcription factor, i. e., one which »switched on« the expression (meaning reading) of other genes. Thus, ZFY was initially believed to be the testis-determining factor. Yet, again, research into the development of the sexes of marsupials and rodents told a different story. The genome of marsupials showed genes that were homologous to ZFY – thus, very similar sequences – on the other chromosomes, to the »sexual« ones.

Research into the chromosomes of four humans equally provided evidence against ZFY being TDF. Those four human subjects had developed testicles although they also had a »female« set of XX-chromosomes. Further research showed that they also had parts of the Y-chromosome in their genome. It may have gotten there through translocation during the formation of the gonads in the parental organisms. Yet, said translocation had not transmitted the ZFY-gene. On top of that, looking closer into the matter revealed sequences on the X-chromosome that was similar to ZFY ... In short, ZFY was ruled out as TDF. As a single gene it simply did not have the far-reaching importance of »switching on« the development of the testicles.

In 1990, the gene SRY was presented as yet another candidate for TDF. It is still considered the most important factor for the development of testicles, although it soon presented contradictory research results as well. SRY – short for »sex determining region Y« – is in itself another example for the androcentric perspective. It was not termed »testicle determining« but »sex determining« as it was deemed the crucial factor of turning the generally »female development« into the specifically »male« one if present.

SRY, just like ZFY, was believed to be on the short arm of the Y-chromosome again. In 1990, scientists could also prove the existence of an Sry-gene in a mouse that was homologous to a human one. Other mammals presented other homologues, although the sequence was only partially common to several species. Other mammals did not show SRY-genes at

all (or their correspondence), such as the Ryukyu spiny rat *(Tokudaia osimensis osimensis* and *spp.)* or the Transcaucasian mole vole *(Ellobius lutescens* and *tancrei)*. More baffling to proponents of SRY or TDF: those species did not even show *any chromosomic difference* between »female« and »male« individuals.

In its function, the SRY-protein may be a factor of transcription. It may be involved in a variety of processes affecting the development of testicles. Experiments with transgenic mice indicate such function (within limits, to be fair): mice with a »female« XX-set of chromosomes were provided with a DNA-sequence containing Sry. As a result, two of eight mice developed a »male« appearance and were infertile. Six of the mice presented a »female« appearance. Sry therefore may have had an effect on two of the eight mice. In experiments which infused human SRY in mice, they did not indicate any »masculinizing« effect at all. This in turn indicates (well, it was explained that way) the structural differences between human SRY and murine Sry.

Human subjects were studied who had a »male« XY-set of chromosomes but had only partially developed a »male« phenotype – their testicles were only partially functioning or non-functional at all. Ten to fifteen percent of them presented a variation of the SRY-gene. Human subjects with an »XX-set of chromosomes« and a complete or incomplete »male« appearance lacked SRY entirely. This was the case with eight percent of the former (those with a complete male appearance, three out of 39) and 91 percent of the latter (incomplete, 39 out of 43) (see Voß 2010: 250 et seq.).

Thus, SRY *may* play a role in the development of testicles. Yet, it cannot live up to the idea of being that one determining factor. Even biologists have come to terms with the idea – popular science still needs to catch up with the fact, though. Now, the quest has begun for other genes which may be set below or above SRY in *a system of assumed hierarchical levels* (thus, more or less important than SRY). Today, scientists even consider genes which may induce a »female« development.

Several other genes have been described which may affect the development of testicles below SRY. Let us not go into detail there because it would slow us down in our discussion of the matter of the »naturalness of sex.« Just a few important points may be presented (for a more detailed

discussion, see Voß 2010: 245 et seq. There is an overview of the currently researched genes as well as the progress that was made with them). Just as much:

1. There are contradictory results with these genes as there were with ZFY and SRY, although the other may not be as well-researched as those two.
2. It is important to keep in mind that much of the outcome of genetic research tells us something about the genome of mice, not necessarily humans. SRY/Sry has proved that findings for murine DNA *could* indicate to some degree an applicability for human DNA. They are not much more than hints at where to look for factors.
3. It is quite interesting and important that those other genes under scrutiny are *not* found in the »sexual chromosomes«, but rather those of the body in general: in particular, on the chromosomes 1, 3, 8, 9, 10 etc.
4. The effect of any gene (and these in particular) must not be understood like that of a light switch: they are not switched on in one development (say, the »female«) and switched off in the other (say, »male«). It is rather a matter of relation: when and how much is a gene »read«? It is a matter of *more and less*. In most cases of those genes under scrutiny, *that* specific gene at *that* specific point in time differs no more than by the factor four, three or two in subjects that are grouped as »female« or »male.« Seen individually, there are particularly interesting differences.
5. Candidates of genes which are believed to determine the sex are rarely confined to that development. They are always involved in the development of other organs and tissues such as, for instance, the heart, liver, or kidneys. Scientists rather frequently describe a gene's meaning for the development of the sex first and, almost like an afterthought, indicate that the »typically female« or »typically male« mouse embryos had perished in the womb or right after birth. Why? Because their hearts had not fully developed after scientists tempered with that »sexual gene.«
6. One last glimpse at the effect of SRY is as important as it is revealing. Gene SOX9, commonly found on the human chromosome 17, seems to be one of the genes which foster a »male« development

> even if SRY is absent. This does indicate that scientists may consider a hierarchical sequence of gene and their »products« that is *not unambiguous*. If seen like that, many genes (and their »products«) would interact in a complex and variable fashion in the development of the sex. The effect one gene has most likely could be compensated by others. Then, the question arises (following Evelyn Fox Keller): how is a certain stability maintained despite – or even *by* – individually varying processes when developing a functional heart or a sufficient organ of reproduction in the development of the sex?

Several genes which are assigned some significance in the development of the sex are currently understood as expressed (»read«). They precede SRY in the process and act – seen hierarchically – upstream of SRY. Their effect is seen, among others, in the first differentiation in the tissue of the genital tract and the formation of the undifferentiated gonads. All of those candidates (genes that influence the development of sex) are situated on other chromosomes than the »sexual« ones.

SF1 (steroidogenic factor 1) and its products is one of the candidates. SF1 is researched the best and located on the short arm of chromosome 9. The other is WT1 (Wilm's tumor 1 gene) which typically shows up on the short arm of chromosome 11. The expression of SF1 was recognized in the developing Leydig cell (they are important for the budding testicles), in the follicular epithelial cells, the theca cells, and the corpus luteim of the development of the ovaries. On top of that, we find them in parts of the hypothalamus, skin cells and the spleen.

We see Sf1 (the murine equivalent to the human SF1) act in mice differently according to sex. At a later point of the embryonic development there is a different expression in chromosomally identified »female« mice than there is in »male one.« While the expression of Sf1 in mice with a XX-set of chromosomes temporarily regressed, that in XY-embryos continued uninterrupted. Scientists concluded the influence of Sf1 in the development of the testicles. Although results are not exactly clear there, the same is assumed for human individuals.

The current research for WT1 is quite telling for the following discussion. Scientists present the products of Wt1 (mouse) and WT1 (human) as important regulators of Sry/SRY. The following genes may also interact

with Sry/SRY as factors of transcription: Wnt4/WNT4, Dax1/DAX1, Sox9/SOX9 and Amh/AMH. When Wt1 was absent, the embryos developed irregular kidneys, hearts, lungs, spleen and adrenal glands. Typically, those embryonic mice died in the womb or soon after birth. An altered WT1 especially leads to an irregular formation of kidneys in humans, it seems.

Most interesting is the fact that »reading« of one gene does not necessarily mean just one product is formed in the cell (a lesson Wt1/WT1 teaches us). Today, scientists know more than two dozen different forms of WT1-proteins. They are grouped into four main groups – and the different variants apparently have different functions in the organism. They already affect the formation of the sex differently. So, *one and the same gene leads to a variety of proteins.* How that may happen and what implications may it have is something to be seen. Just as much: scientists see two forms of the WT1 protein as especially important. It looks like the quantitative relation of both forms plays a role in the formation of the genital tract.

In 1986, the path breaking work of Eva M. Eicher and Linda L. Washburn shed new light on the development of the ovaries, too. Since then, it is not understood as »just happening« anymore. Scientists have begun to look for regulating factors, thus for »active« steps of development. As simple as it may sound: the authors have emphasized that ovaries are complex organs whose development requires a flow of signals. Again, scientists had subsequently tried to identify the »one gene switching on« the development of ovaries: ODF, the ovary determining factor. Again, just as TDF witnessed, several candidates were called to the podium, discussed, and eventually dismissed. The results were just too inconclusive. One »frontrunner« for ODF is absent as of today.

Several genes and their products were considered influential for the development of the ovaries. One of them should be mentioned briefly, as another interesting aspect is connected to it. The first gene described as a candidate for ODF was Dax1/DAX1 (dosage-sensitive sex reversal, adrenal hypoplasia congenital critical region on the X chromosome, gene 1, to be exact). It was identified after the search had been limited on an area of the X-chromosome for a while. DAX1 is typically situated on the short arm of the X-chromosome in the region of p21.3–p21.2. Its product, the DAX1-protein, supposedly acts as a factor of transcription.

One of Dax1's expressions could be identified in several embryonic tissues of mice: among others in the cerebral cortex, the spine, thymus, heart, lung, kidneys, ovaries and the testicles. Whereas the expression of Dax1 was temporally limited in mice with a »male« set of chromosomes (XY), it was identified in mice with a female set (XX) throughout the entire embryonic development.

The effect of Dax1/DAX1 is quite interesting: DAX1 was considered the opposite to SRY. Why? Humans with a »male« set of chromosomes (XY) developed ovaries, thus showed a »female« development, if the area of the DAX1 gene was present twice – in an additional copy. *It did not matter that the SRY-gene was also present and active*. This, of course, cast a doubt on the thesis of a »female« development in the absence of SRY.

What held true for the WT1-gene and -protein, also holds true here: there are variants of the DAX1-protein. One and the same gene leads to a variety of products which have an effect in the cells. It is a new and curious fact for the argument that DAX1 also demonstrates just how questionable a strictly binary division between »female« and »male« development might be. Apart from its influence over developing ovaries, DAX1 is currently assumed to equally play a role in developing fertile sperm cells of »male« individuals.

In essence, there might be some new understanding hidden in the research on a genetic level – if such research did not rest on the assumption of »male« or »female« developments. It is equally curious that to this point findings for the development of the genitalia are hardly considered for those of the gonads. Yet, as our discussion of the embryonic development demonstrated above, it seems clear just how connected and interdependent the formation of tissue and gonads are in the development of the genitalia.

Other genes, which are considered important for the development of the ovaries, are situated on different chromosomes than the »sexual« ones.

The essence of considering what biological-medical theories identified as the chromosomal and genetic factors of the sexual development is:

1. The search for determining factors moved from entire areas of the chromosomes to individual genes.
2. First, researchers stipulated one single factor inducing the development of testicles. From there, they later considered several or many factors which would take an effect successively or interactively.

3. There did develop, at last, an understanding for the complexity of a »female« development, just as there already was for a »male« one.
4. Genes are not the same as their products even if the latter do indeed have an effect on cells.

The following illustration *(figure 8)* represents one (!) model of how genes (and their products) may interact in a mouse – not because findings for mice may be transferrable onto humans. They are far from it, as already stated. There simply are no comparably complex representations available of such a model for humans.

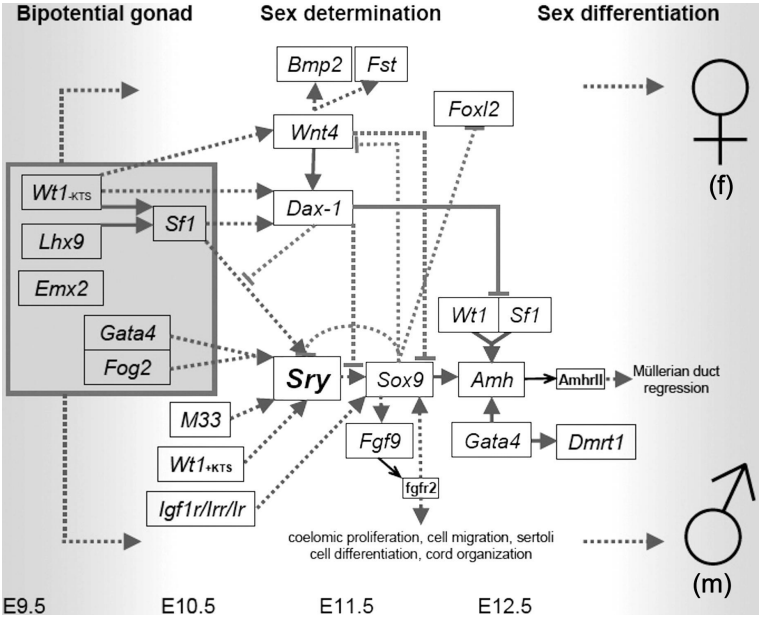

Figure 8: The interaction of genes and their products in the development of sex. The descriptions refer to mice and the time of their embryonic development (E) in days after fertilization (from 9.5 to 12.5). Arrow signify activating effects, the other connecting lines inhibiting ones. Solid lines indicate rather certain interaction; dotted lines indicate the indirect or assumed interaction. (f) = female development of sex; (m) = male development of sex (taken from Klattig 2006: 5).

Please do not feel intimidated by all the abbreviations for genes and their products. They are rather easy to access as are the detailed processes they are used to describe. The chart (figure 8) demonstrates well just *how many* factors seem involved in the development of the sex. We have already met some of them in our discussion above. Their interactions become clearer here. The analyses of gene expressions indicate that there might be some one thousand genes involved in the development of the sexes. When comparing those analyses, however, the candidates of what genes we are in fact talking about vary.

Consider the difference between the solid and the dotted lines in the chart. Whereas the first indicate the interaction between genes and their products we are rather certain of, the dotted ones refer to the assumed or indirect interaction. In other words, additional factors may play a role which researchers have not yet identified or fully understood. It is rather remarkable seeing the large number of dotted lines/assumed correlations and comparing them to the rather limited number of solid lines/certain identifications.

One certain conclusion, however, is rather simple: the idea of biology and medicine having access to a clear understanding of »what is going on« when sexes develop is no more than a phantasy – despite the fact that popular magazines foster that idea as do the German print media *Focus, Spiegel, Stern, Zeit*, or *Frankfurter Allgemeine Zeitung*. Our current biological-medical theories explaining the development of the sexes are far from being solid themselves – they are full of gaps. Scientists and researchers are aware of it (see Hiort 2007: 103). Yet, they also feel bound to simplification in order to inform the broader audience. Such simplification, by essence, has to level complexities in publications for the non-academic community. The complexities of the processes and the interaction of intertwined factors – in itself a necessary essence of our better understanding since about the early 1990s – fall short. The biological-medical sciences thus contribute to the stagnation of society's understanding of the genetic processes.

The outcome is (necessarily) rather simple. When being unaware of recent/current findings, »popular knowledge« *ideologically* remains on the grounds of the early twentieth century. Then, the far-reaching heredity of a multitude of characteristics was propagated and formed the basis for the biological racism and antisemitism. When considering the *genet-*

ic processes, popular knowledge does reflect the scientific understanding of the 1950s/1960s with their most basic models of how genes take an effect. In the end, such impermissible simplifications re-introduce those outdated theories into the biological and medical sciences themselves, because future scientists grow up with simple models, too.

Development and Differentiation: The Transition to Process Orientation in Current Theories of the Development of the Sexes

As demonstrated, biology's understanding also broadens when it comes to theories of the development of the sexes. Now, the focus is not set on one gene or a limited number of genes anymore when describing the formation of the genitalia. The focus has shifted to a complex interaction: several genes and their products seem to interact in complex networks. Many factors to have an impact and the quantity of their expression do play a role. Then, »sound« research also has to consider that their complex interaction may result in more than two possible outcomes when the genital tract is formed. The interaction of a number of factors may rather lead to forms of the genital tract that are varied, different and are more or less capable of procreation. Or, seen differently, even when considering the similarities of the genitalia of two individuals it does not necessarily have to indicate the same path of development.

Our understanding of the complexity needs to expand even further: we have focused our considerations on the level of the »hereditary material«, the deoxyribonucleic acid (DNA). DNA, however, does not factually act independently within the cell. The cell itself regulates the required steps in the formation of the products which act in the cell. It is often a protein but it may also be an active product which is the result of an earlier step.

As a first step, a »signal« induces to »read« a certain area of the DNA. Such signal may be a »factor of transcription« we have met above. It may also be gradients of chemical molecules, a strong stimulation caused by heat, etc. Areas of DNA in the chromosomes which are not expressed are typically packed tightly – they are referred to as »chromatin.« In this

form, it is usually impossible to »read« the DNA, so the tight package needs to be loosened to allow the next step (transcription, *see below*) to take place. Accumulated chemical groups (here: »methylations«) may also play a role whether or not a DNA segment can be read. The chromatin structure is loosened by complex cellular processes.

Then, *transcription* may take place. It »transcribes« the DNA sequence into another, greater molecule which is also (just like DNA) a nucleic acid: ribonucleic acid, RNA. Both DNA and RNA are a long strand of succeeding »bases« which form the basis of the nucleic acids. Two specific bases always form one pair. Because they do, the specific base-pairing enables the formation of the RNA as a complementary (»inverted«) copy of the DNA sequence (called matrix then). This, too, is a complex process for which several factors have to interact. It regulates whether a transcription takes place, is initiated, elongated, or terminated.

Such transcription is not exactly one hundred percent accurate, if, for instance, a non-complementary base is included. »Repairing mechanisms« – again the result of many factors in the cell – ensures a certain accuracy (or inaccuracy). The outcome is a pre-mRNA (a not yet completed RNA-copy). There are further changes in the molecule after the transcription before a mature RNA exists. The pre-mRNA, for instance, receives a cap structure on one side which may vary from pre-mRNA to pre-mRNA. The »cap« may be necessary to stabilize the molecule for the transport from the cell nucleus to the cytoplasm and thus for further »translation« (discussed below).

On the other side of the pre-mRNA strand, *polyadenylation* takes place, meaning that some 200 adenin-nucleotides are added to the pre-mRNA without a matrix (adenine is one of the bases forming the DNA and RNA). The polyadenylation likely also effects the stability of the mature RNA strand. Some pre-mRNA, however, are not subjected to a polyadenylation.

The molecule is further altered through splicing/»cutting« individual areas from the RNA sequence. Although they were also the result of copying the matrix of the DNA, they may be cut as having no coding effect – in other words are not relevant for the subsequent product. As a side note, only two percent of the DNA itself are a coding sequence! The individual areas are spliced according to marker sequences – itself yet another complex process.

There is also the so-called »alternative splicing« which may result in cutting areas of the RNA which do have a coding effect. This may result in two *different* mature mRNA coming from two pre-mRNA with the *same* sequence of bases.

The resulting mRNA is then *transported from the nucleus to the cell plasm*. This transport, too, does not simply »happen.« It relies on a regulating process. Only there, in the cell plasm, can the mRNA be translated. Or, better, may be translated. It is not imperative as the mRNA may be broken down instead. The mRNA may survive for a few minutes only or for several hours – depending on its structure. During that period several translations may occur, only one, or none at all.

Translation – the process that re-writes the mRNA sequence into one of amino acids which in turn are the bases for the protein – rests on various factors again. This stage also depends on regulating factors determining whether translation takes place, is concluded, or terminated. The outcome is, as mentioned, the sequence of amino acids that forms the bases for the proteins – but, again, not yet a completed product affecting the cell. It depends on the *post translational* stage, chemical reactions leading to a product with a specific activity, reactivity and localization within the cell. Some specific segments of the amino acid sequence may be removed; others may be added anywhere within the sequence. Chemical groups – such as proteins, sugar or lipids – might be added or new chemical compounds integrated. *Only now does a particular product come into existence, with a defined special-geometric form that presents chemical and physical characteristics*.

Why did we look into the matter in such a detailed way? Well, one important point for the embryonic development might have become obvious: *DNA – or »genes« – are not blueprints which only require being carried out. They are rather the starting point of various processes in the cell that specifically react to the environmental influences from within the cell, the mother's organism or the environment in general. They determine the formation of the currently required information of a gene. From one gene (DNA) may result a number of various products which are then variously localized and also take various effects.*

Regulations take place on all levels, in other (and rather crude) words: the DNA of one flake of skin on the ground cannot develop into a full organism. The environmental conditions for the cell and the mother's

organism are crucial. The cells are not a mere (passive) depository of information but rather an (active) »reaction chamber« of multiple reactions that depend on the influences from the cell, the organism, and the environment. This »reaction chamber« and the influences having an effect there, determine the specific products and their formation. DNA is but one ingredient for their existence in the end.

Let us look to history once again: the idea of the DNA determining everything is as wrong (and disproved) as all the other theories of preformation. DNA is rather *one* of the involved factors within the cell. It is the cellular processes that extract the DNA's specific information when needed at a specific point in time. Those cellular factors – including various proteins – must come together and interact in order to form a specific, »required« product out of a DNA sequence.

Researcher have looked into such integrated, systemic considerations, of course. Yet, geneticists have also dominated the understanding by focusing on the DNA – piling upon it the conception of already harboring all necessary information for the formation of an organism. That information allegedly only requires being read.

The theories of Goldschmidt and Kammerer prove that the integrated, systemic approach is not new. Since the 1940s, such considerations have been known as »epigenetics« (not to be confused with epigenesist, described above). Conrad Hall Waddington (1905–75) from the 1940s onward had discussed as »epigenetics« the factors contributing to the implementation of the genes' information within the cell plasm. He saw genes as dominant factor, no doubt, but relying on the other parts of the cells for which he called for further research.

Today, such considerations might play a larger role, and the dominant position of the DNA might be called into question – rightfully so. »Epigenetics« might include considerations of how other chemical changes are involved in the re-formation of the chromatin structure, transcription and translation. Factors that originate in the mother's organism should also be considered, but also how nutrition and stress affect the outcome. The latter are currently assigned a rather dominant sway over the processes of (physical) development.

»Epigenetics« have become a known and noticed topic from about 2000 onward. Special issues of professional journals have done justice

to epigenetics. Yet, their articles have also limited the definition of the field again. There, the *multitude* of the processes in the cell and from the organism and environment are apparently not considered anymore. »Epigenetics« is rather limited to *some* factors that have *a direct effect on the DNA*. The focus has limited to some changes on the level of packing the DNA to chromatin and some chemical groups (or other factors) that foster or hinder the transcription of the DNA.

There are many factors involved in processes that are open for regulation. It leads us to a »lack of molds« for the development of the sexes. There is no strict and simple pattern of turning an organism into »female« or »male.« The genital tract is rather the outcome of the individual conditions and the impact of influences. There should be no doubt left that there are thus many forms of genital tracts possible. They do exist, but are, of course, mostly covered by clothes and therefore rarely move into the focus of biology – likely for the better. Individuals who do attract the physicians' attention for not fitting into the current standards of »female« or »male« are still often pressed into a clear visual appearance of being »female« and »male.« This is often achieved in an utterly inconsiderate and violent fashion (as in the case of intersexuality, see 1-0-1 intersex 2005, Völling 2010; Klöppel 2010). Those individuals may also constantly hear (and eventually accept) that they are »sick« as they may not reproduce or do not possess the »typical« sets of chromosomes or hormone levels.

Yet, when considering the multitude of factors which take part in the development of the sexes: what is typical, then? Is it the set of chromosomes that matters? Is it individual genes and the many products formed from them? What needs to be the quantity of a product that makes a human person »female« or »male«? The indicator might be the gonads – or do they have to possess the ability to produce germ cells, too? Must a »man« be able to produce functional sperm cells? Must a »woman« be able to produce egg cells? Or must she also have the »inner genitalia« to develop an embryo and bring it to term? Or, most crudely, does the other appearance of the genitalia determine the »typical«: in particular, the penis, testicles, and vagina? *Not one human individual will ever profess to all these characteristics at the same time. Thus, there will never be a »clear« direction towards »female« or »male.«*

Conclusions

The theories of preformation (but also the natural-philosophical and biological-medical theories of the sexes) saw the existence of two sexes and their inequality in society. Theories from the end of the eighteenth century onwards dismissed them for explaining the factual possibilities of variations. This was achieved against the backdrop of more recent philosophical and considerable social changes, but also new »findings« of the natural scientist. Epigenesis with its developmental approach offered greater margins, now. That approach also allowed to explain the differences of the sexes – be it through the active progress or regress of the development. Yet, it equally allowed to explain the similarities between the sexes but also the woman-and-man-being of every individual.

The struggle between concepts of *preformation and development* has not seen a victor yet. Describing the structure of chromosomes and the DNA rather brought forth yet another wave of dominant preformistic theories. Only when they were identified as unsustainable did the perspective shift once more. Now researchers look into the interaction between factors, their being embedded within the cell and organisms, and the openness of developmental processes. In short, researchers look into a multitude of influences. *Thus, biology today arrives at systemic considerations in which development (epigenesist) rests at the core*. Biology witnessed new participants entering the debate: systems biology, theories of system organization, epigenetics ... Yet, they only have a slow impact on the theories of the sexes. When more complex research is done on the sexes, they often »rest« again (and again, dichotomously) on the social presupposition of two sexes: the sex of a »woman« and that of a »man.« Currently, epigenetics professes to that fact (see the essays of Bärbel Mauss and others, Mauss 2004).

Closing

The Intricacy of the Human Sexes clearly indicates that there is grounds not only for considering two of them but for many. Such understanding is not only justified, but it has always existed. Moreover, it seems to be the most convincing theory for the human sexuality today.

From an emancipatory stance, it calls us to let go of the idea of a binary sexuality – especially because such widespread injustice and inequality have been connected to it. Simone de Beauvoir and Judith Butler demonstrated models of radically broadening the options for thought in order to develop a social utopia of sexuality. Such broadening does rest on the current standards of the sciences and all the options of future development which they present.

Such utopia can rightfully utilize the theories of Karl Marx and their materialistic and social approaches. They always called for directing the perspective on the factual human living conditions, and strife for a society not for the few privileged ones but for all. Thus, it avoids neglecting the majority of the people and the marginalized ones at the same time when considering sexuality. Our excursion into history proved the existence of that possibility.

Marx also allows understanding that the human being has always been a social one – and why it is so easy to lose sight of that fact. This is an important starting point, especially for the consideration of the sexes as sex has often been seen as a »natural« fact. We often ignore its social conditionality.

Finally – which is most important – we need to shape society. We need to do that in such a way that nobody is discriminated against anymore

(let alone even violated) on the bases of sex, class, or for whatever other characteristics. It is simply unacceptable that social categories – such as »sex« – may have such an impact that human beings cannot be *human* to one another anymore but always have to act within the restraints of those categories. The social stereotypes of being »female« and »male« limit our options: even when we are self-confident and sure enough to profess to one or the other category, we still seek to avoid mistakes and ambiguity. But why are »mistakes« even possible? Why do we limit ourselves to stereotypes?

We need to strive for a more just society; one, that is aligned with the needs of the people. It needs to be fought for and shaped every day in order to avoid new conditions which make people feel oppressed and disadvantaged. This just society requires a utopia. It requires acting. Let us begin now – you and you and you and you ... and me!

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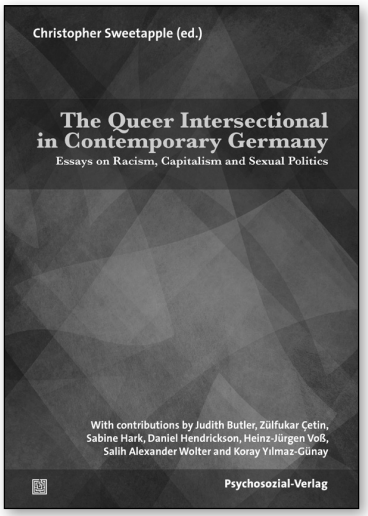
Christopher (ed.) Sweetapple

The Queer Intersectional in Contemporary Germany

Essays on Racism, Capitalism and Sexual Politics



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Anti-racist and queer politics have tentatively converged in the activist agendas, organizing strategies and political discourses of the radical left all over the world. Pejoratively dismissed as »identity politics«, the significance of this cross-pollination of theorizing and political solidarities has yet to be fully countenanced. Even less well understood, coalitions of anti-racist and queer activisms in western Europe have fashioned durable organizations and creative interventions to combat regnant anti-Muslim and anti-migrant racism within mainstream gay and lesbian culture and institutions, just as the latter consolidates and capitalizes on their uneven inclusions into national and international orders. The essays in this volume represent a small snapshot of writers working at this point of convergence between anti-racist and queer politics and scholarship from the context of Germany. Translated for the first time into English, these four writers and texts provide a compelling introduction to what the introductory essay calls »a Berlin chapter of the Queer Intersectional«, that is, an international justice movement conducted in the key of academic analysis and political speech which takes inspiration from and seeks to synthesize the fruitful concoction of anti-racist, queer, feminist and anti-capitalist traditions, movements and theories.

With contributions by Judith Butler, Zülfukar Çetin, Sabine Hark, Daniel Hendrickson, Heinz-Jürgen-Voß, Salih Alexander Wolter and Koray Yılmaz-Günay

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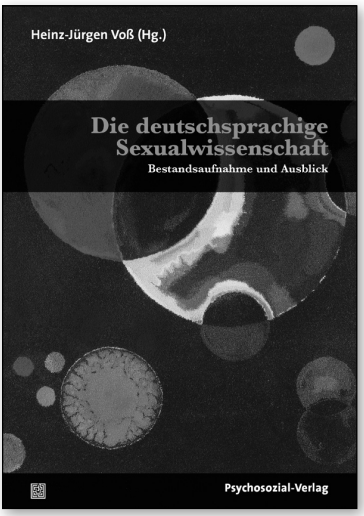
Heinz-Jürgen Voß (Hg.)

Die deutschsprachige Sexualwissenschaft

Bestandsaufnahme und Ausblick



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Von grundständigen Bewertungen bis hin zu prägnanten Ausblicken, die grundlegende Veränderungen des sexuellen Zusammenlebens der Menschen konstatieren oder gar ein Ende der ›Sexualität‹ – insgesamt oder zumindest in ihrer Besonderheit – sehen.

Längst ist die Euphorie der sogenannten Sexuellen Revolution einer allgemeinen Ernüchterung gewichen. Statt zu einer grundlegenden Umwälzung geschlechtlicher und sexueller Verhältnisse kam es »nur« zu neuen Arrangements. So stellt sich die Frage, welche Bedeutung das Sexuelle heute hat, das stets tief verstrickt in andere gesellschaftliche Konflikte ist. Zur Beantwortung dieser Frage bedarf es einer aktuellen Bestandsaufnahme wichtiger Sexualwissenschaftler*innen aus dem gesamten deutschsprachigen Raum. Die Autor*innen beleuchten vor dem Hintergrund des »neosexuellen« Wandels den Weg der Sexualwissenschaft seit der zweiten Hälfte des 20. Jahrhunderts.

Mit Beiträgen von J. C. Aigner, C. Baltes-Löhr, K. Bischof, M. Böhm, P. Briken, J. Budde, U. Busch, A. Henningsen, D. Herzog, O. Hiort, P. M. Holterhus, W. Kostenwein, R. Lautmann, S. Matthiesen, T. O. Nieder, L. Pietras, I. Quindeau, U. Rauchfleisch, E. E. Schütz, K. Schweizer, U. Sielert, V. Sigusch, K. Starke, H. Stumpe, S. Timmermanns, E. Tuider, B. Weidinger und K. Weller

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Little defines human life more than the biological sexes. The concept of the binary sexes greatly affects our choices given in society, our income, and our visibility. Moreover, it is also the root for profound discrimination. Today, the idea that the binary sexes are nature-given is so intrinsically woven into the fabric of human life that we tend to forget just how modern the concept is. We also tend to forget that it does not have to be more than a bump on the path to a just society.

Drawing from philosophical, historical, and biological perspectives, the author challenges existing beliefs in the inevitability of the binary nature of the human sexes. The study compellingly argues for the existence of many biological sexes, not merely two. It also outlines just how otherwise overcome assumptions still shape our seemingly modern understanding of the most basic classification of our societies: that of the biological sexes and the attributes piled upon them.

A native of Thuringia, Germany, **Heinz-Jürgen Voß** earned his PhD at the University of Bremen with a discussion of the human sexes from a medical and biological perspective. Since 2014, Voß holds the first German chair of Sexology and Sexual Education at the University of Applied Sciences in Merseburg. As a biologist and social scientist, Voß heads the German research project Protection of Children and Adolescents from Sexual Trauma as well as the European project Training in Sexual Education for People with Disabilities (TRASE).

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