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SEMANTICS OF MONSTROSITY IN THE NINENTEENTH CENTURY

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SUMMARY

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The emphasis of the normal, the human aspect and feature in monstrosities is a leitmotif that becomes prevalent in the scientific debate on teratological phenomena in the nineteenth century. The discourse highlights the organisation of the civilising process with regard to creating an antithesis between human and animality. In this respect, anthropology establishes anthropometry as a measuring and classifying instrument, hence supporting concepts of norm and abnormity in the scientific discussion. The classification approach finally translates teratological occurrences into the "human system" with the monstrosity being transformed into a subject of knowledge. Scientific discourse poses and installs the latter as living attraction for medical and anthropological examination, thus stressing boundary permeability between man and animal. Evolutionary theory finally initiates the quest for the missing link between man and ape, with congenital disorders, such as microcephaly, becoming particularly supportive of the idea of a manifesting existence of a primitive pre-human form.

Know thyself, pathologically, what a fragile bubble you are, and exposed to a thousand calamities. If you understand these things, you are a man, and a genus very distinct from all the others[1].

Key words: Monstrosity – Medical Anthropology – Anthropometry – Missing Link

The Scientification of Man - Anthropology: The New Science of Man

The history of the study of abnormalities of physiological development provides for a complex and multidisciplinary approach, yet holistic perspective: teratology can be read as a history of a medical field but more so, it can be read as a history of the human body, evoking specific questions and a broad selection of topics. The phenomenon of monstrosity reflects scholarly opinion and view, as well as belief, misbelief, superstition, concepts of science and technology in historical change. A limited focus on the subject therefore seems inapplicable, as it demands a wider, broader framework, allowing conclusions drawn on an interdisciplinary level.

The trope of malformation is closely related to the growing realisation and awareness of the human body's vulnerability and its violability in terms of evolutionary mechanisms. During the nineteenth century the interpretation of the "monster" develops towards a perception of a being of same species, rather than a "separate evil being", thus making it an intermediate or transient form for neighbouring species contributing to the order of things. The occurrence of monsters is necessary in order to make a chronologic regression on the continuum back to the scheme[2].

The elevation of science and the dawning realisation gives way to a more humanistic view of the monster as a being whose genesis now lies in medical error[3]. The actual metamorphosis from monster to malformation, is also tied to the dialectics of Enlightenment, with the latter being defined by science and thus turning the concept of "unbiased perception" into a big myth: the cathartic process of the "scientification" of man does not adhere to factual and objective investigation according to scientific method but eventually becomes a destructive force by projecting a negative transformation[4].

Science does not stand apart from society but is embedded within it and, therefore, reflects cultural norms rather than absolute truth. Thus

the human body is perceived through a culturally determined picture, which itself affects perception and experience of society. This rationale is even more important with regard to the history of teratology insofar, as the discourse on monstrosities not only provides reliable information for the historian, but is a subject of enormous social importance, assuming that scientific perspective is always a reflection of social change[5]. Considering the limited and determined phrasing of a scientific problem in terms of expectations and results, culture influences assumption and perception, affects the formulation of questions, impacts the facts and the interpretation of facts one is looking for. Reaction to interpretation and conclusion is hence regulated or pre-determined.

Nineteenth century is an era in which humankind attempts to re-define its place amongst other things in the universe. Limits and boundaries are expanded and reset, new theories (specifically evolutionary theories) challenge the conventional and traditional theorems. The political, spiritual and philosophical revolutions of eighteenth century had questioned social and religious dogmas of man in nature and in society, and the defining and realisation of the monstrous body and its dissociation from mythmaking, eventually posed the question: What is man? What is human? The discourse on man's position in nature and society is linked to the emerging of teratology as a scientific field. Both factors are mutually dependent. Natural sciences and humanities are trying to find new answers, thus leading to a growing interest and an igniting enthusiasm for anthropological studies. Anthropology is yet to explain and research the origin - the descent of man. Before the emergence of Darwin's doctrine, a vast amount of information and questionable evidences is compiled in order to justify and elaborate on the kinship between man and animal. Gaps in definite knowledge and reasoning are closed by homogenous and tightly woven systems, taking advantage of mythical and fantastic creatures. The broadening of the mind, the widening of the field of

experience, eventually had put man's existence into perspective and provided the basis for anthropological research[6].
Anthropology – the new science of man – develops and establishes within the framework of natural science and human science, absorbing and merging biology, ethnology and medicine, just as Darwin transforms from being a biologist into an anthropologist[7]. A particular strong affinity develops between medicine and anthropology as the group of experts is composed of mostly physicians, with their professional and academic background providing for overlapping discussions on ethnical and cultural issues. Linnaeus and Buffon both blur the field of teratology and anthropology, interpreting particular physical features as abnormal and pathological, and creating the "pathological cranium" and the "pathological race", with the latter being described in the socio-medical discourse, with racial and racist tendencies becoming evident in teratological papers.
The emphasis of the normal, the human aspect and feature in monstrosities is a leitmotif that becomes prevalent in the nineteenth century scientific debate and papers on teratological phenomena. In this respect, anthropology establishes anthropometry as a measuring and classifying instrument, hence supporting concepts of norm and abnormity in scientific discussion. The measuring and classifying finally translates monstrosity into the "human system" with the monster being transformed into a subject of knowledge: as anatomical specimen or living object. Scientific discourse poses and installs monstrosities as living attractions for medical and anthropological examination, thus stressing boundary permeability between man and animal.

Semantics of Monstrosity – Anthropometry: Measuring "HumAnimal"

Ignited by Darwin's theory and the finding of paleontological records, the upsurge of natural science and the increasing interest in the history of man, lead to the founding of anthropological societies. Virchow and Bastian supported their formation in Germany, Broca

in France, and Hunt in England. Most of these anthropological societies also subsumed ethnological studies under the concept of anthropology although the Darwinistic dogma was not generally accepted[8]. The heyday of anthropological science indeed began with the founding of those societies but the majority of anthropologists were actual anatomists and their activity encouraged and forwarded the physical approach and perspective in anthropological research. One of the main figures in the German speaking world was Rudolf Virchow whose influence can be described as authoritative as he emphasised craniology with special focus on arrested cranial development[9]. The measuring and classification of crania should allow for cataloguing and providing a scheme of anthropological differentiation, thus making craniology the basis of any anthropological research. "Racial differentiation" gained particular importance due to the vast amount of comparative cranial studies, with morphological and neuro-anatomical "facts" being interpreted in order to support racist prejudices. Even if the collected and measured crania did not resemble animality, or were not disfigured by illness or any pathological condition, craniologists were driven by the idea to extract and define the animal instinct in the cranial shape. The limit between man and beast became blurred and was dependant on the discretion and "measure" of the respective scientist, with large scale anthropological studies providing physical characteristics and more racist "results".

The malformed body now becomes a subject of anthropology, suggesting for a new classification which is reflected in the theory of descent but also in the theory of degeneration (cf. criminal anthropology). The passion of the nineteenth century for measuring and categorising bodies not only dominated anthropology but also psychiatry which introduced physiognomy as its favoured diagnostic tool[10]. Before an order of things built the basis for teratological research, efforts were made to create a hierarchical systemisation and organisation of monsters and monstrosities by applying physiogno-

mic method. According to the principle "society and state need animal characteristics to use for classifying people"[11].
The drifting society of the age of Enlightenment was striving towards a generally accepted and universal order, with measuring becoming a regulative principle. The excessive measuring of man suggests the idea of self control which again allows controlling "the other" or "the malformed". The concept of malformation was applied as identifying principle, allowing scientists to define monstrosities as antithesis of nature, a visible antithesis respectively.
Nineteenth century medicine predominantly focuses on identifying, capturing and defining norm/normality, and by emphasising the bipolarity of the normal and the pathological, the ideal human model, a human prototype, was created (Albinus' idea of the *homo perfectus* is based on exact measuring of the human body and the ideal proportion theory)[12]. Science is not intrigued by the random, individual body or variation, but fascinated by the typical, general, ideal and normal body. The measuring of the human body and the prototyping of the latter also implies measurable characteristics and attributes of man[13]. In this context the question about soul and mind arises, as both are considered human characteristic. This, as exclusively human considered duality, is challenged by the disfigured and malformed bodies, especially by congenital conditions with duplications. Human body measuring and the hence resulting definition of a norm, which again is used as benchmark for the deviating and anomalous, allows for creating an ideal physical picture of man. Through the integration of the body into a structured, well defined and orderly system, measuring is used as quasi normalisation process and procedure.

Theory and Problem of Classification and Measuring

As almost important as the definition of living things, is their integration into a classification system. Biology and medicine rely on a strict order, with taxonomy providing for an integration of crea-

tures in the biological system, and nosology describing the systematic classification and description of pathological conditions. This nosological attempt of classification eventually results in a theory of concepts and relation between the normal and the pathological. A classification however is based on a generally accepted social belief and opinion, thus science calibrates and adapts its approach and findings to social conventions.

Not only nineteenth century anthropology but medicine was determined by the idea of measuring, or more correctly, by the belief in measuring which lead to a production of "reliable" data that allowed for conclusions which again were affected and drawn on preconceived opinions. All generalizations and standardisations related to man are based on presumption and axiomatic definition, which are mutually dependant on social change. Norms are considered concepts of objective truth and every theory is subject to the influence of its environment and to overcoming tradition[14]. Yet, concepts of norm imply moral and aesthetic ideas and perspectives, so that anomaly and abnormity not only is interpreted as something different but as something outrageous, inferior or abominable[15].

Foucault interprets all physical and mental disciplining and standardising as an effort of "optimisation of an economic society"[16]. Accordingly, the essence of humanity is defined by a differentiation between normal/pathological, well-formed/malformed, functional/dysfunctional and ill/healthy. Consequently, abnormities and malformations, teratological phenomena in general, can be used for studying, interpreting and evaluating factual and tangible relevance of early treatises on the ideal principles. Through standardisation and normalisation, the "other" becomes or is made visible and measurable – thence experiencing devaluation. Vice versa, norms and standards are defined by divergence and anomaly, with the occurrence of abnormity as a negative manifestation providing for the interpretation of standards as a positive phenomenon. In fact, em-

phasising or accentuating the malformed body is a manipulative act which suggests a standard; excess or defect/deficiency can only exist in the concept of desirable benchmarking, and is therefore related to a standard. This discussion shows that categorising is fundamental to social perception, thus making teratological occurrences a victim of perverted categorization and integration into a biological system, since they are defined through their abnormity. Hence, the "monster" becomes the source of specification[17].

Before a new framework for classification and organisation could be established, the actual study of anomalies and malformations had to be scientifically approached, although some scientists were still convinced of a divine order of things. Taxonomy reflects a zeitgeist that seems to be obsessed with classifying, cataloguing and indexing – an obsession almost turning into a delusion during the nineteenth century. Even before Linnaeus presented his *Systema Naturae*, scientists tried to master the diversity of phenomena by classifying and arranging them in order. Natural cabinets came in handy, creating an ideal platform for classification, so that the malformed and nightmarish occurrences could be quasi neutralised. The dilemma of classification however, posed the question whether congenital malformations were to be interpreted as supernatural, as existences outside the system.

Moreover, teratological occurrences were suffering from terminological obscurity with missing nomenclature obviating their assimilation in the system of nature. Malformations were included because of their rareness but not for the sake of identifying them as actual part of the system. The study of malformations was based on classification and limited to the subsumption of the seen – indexed as benign/malign, normal/abnormal. It was the extreme, the different other, that became the focus of comparative studies and evaluations. For a long time, classification in teratology was defined by the work of Paré, until Buffon's framework became the general reference

scheme. The latter was eventually adapted by Geoffroy Saint-Hilaire whose subdivisions according to physiological and anatomical characteristics, seemed to confuse and irritate his fellow physicians, and therefore were not widely accepted[18]. The categorisation of congenital malformations provided by Blumenbach et.al., and the allocation and structuring resulting from research in anatomy during eighteenth century, eventually supported and advanced the search for general principles and regularities.

But regardless of the attempts of systematic capturing and compiling case studies that signified the first steps towards scientific method and scientific approach, it was still a long way to reasoned thinking in teratology. The prevalent assumption of anatomical perfection demanded a specific taxonomy to integrate the monstrous body in the order of nature.

That assumption however corrupted the mere existence of teratology as the latter cannot exist, let alone evolve, when physical abnormity correlates with the order of nature. Besides, repeated observation and the concept of series or serial occurrence were not aspects of knowledge and science at that time. The problem of classification in teratology became even more evident. Should teratological occurrences be classified according to morphological aspects, or according to peculiarity and distinctive feature, thus creating a generic designation for any minor deviation or minor anomaly? Due to diverging aetiological theories, a universal classification system was difficult to establish, and diverging assumptions and opinions on the definition of malformations did not contribute to a smooth systemisation and a clear order.

With the main focus on researching the origins of life and postulating epigenesis from the second half of the eighteenth century, monstrosities had now become part of the evolution of man. Indeed, an explanation of malformations and teratogenesis was still not available, but scientists were developing an understanding of the normal

development of an organism. Epigenesis provided new perspectives on monstrosities suggesting a gradual formation of all parts of an organism. Anatomical studies performed on the basis of epigenesis led to comparative analyses, creating awareness for interdependence and correspondence. "The inner and external, the inherited and adapted are most closely correlated"[19]. Eventually, the law of deviation enters scientific discussion. Important theories with regard to the hypothesis of degeneration as well as the later theory of descent are introduced, most notably the concept of developmental arrest. Any deviation from the norm is now related to a recurrence of animality with malformations beings said to resemble animality in their internal structure and order. The difference and line between man and animal vanishes: the monstrosity is considered normal occurrence at the wrong point in time.

Physiology, anthropology and anatomy are now preoccupied with finding and exemplifying differences between man and animal, between human and monstrosity, between man and woman. Both Darwinism and the study of heredity finally manage to establish themselves in science of a conservative society, with the fear of degeneration and the malformed body falling into good ground[20].

The Descent of Man and Scientific Reasoning for the "Missing Link"

Pivotal theories and research approaches have been defined throughout the eighteenth and nineteenth century but it is evolutionary theory that finally initiates the quest for the missing link between man and ape, with congenital malformations becoming particularly supportive of the idea of a manifesting existence of a primitive pre-human form. Cases of microcephaly thereby were favoured demonstration objects and specimens, with evolutionary theory classifying them as "pre-human form". Historical case studies on malformations show a strong tendency linking partial developmental arrest to animality[21]. Geoffroy Saint-Hilaire and also Meckel recognised similarities

between specific appearances in embryonic development and malformations of distinctive animal feature[22]. Geoffroy Saint-Hilaire describes one congenital malformation that is characterised by deformed upper and lower limbs giving a seal-like appearance which made him refer to the condition as "phocomele" (gr. "seal"). Such terminology and analogical conclusion seems virtually endless with Virchow claiming that one may as well refer to those suffering from microcephaly as "ape-people"[23]. This general theriomorphic interpretation of teratological occurrences was a convenient approach that allowed for identifying some animality at an early stage of human development, as well as discovering a corresponding similarity to all animal species.

The effort of reconstructing the actual moment or point of transformation from human to animal, is related to the perception and interpretation of monstrosities as a manifestation of arrested development during embryonic period. The "monster" remains rooted in its animality and animalistic appearance on its way to hominisation, and, as a preliminary stage to becoming human, carries particular signs of animality (e.g. excessive body hair). Interpreted as hybridic forms, both hypetrichosis and microcephaly were considered the most obvious appearances documenting the descent of man in his mental and physical development, often described as human with beastlike physique and undeveloped intellect.

The scientific discourse on malformations during the nineteenth century highlights the organisation of the civilising process with regard to creating an antithesis between human and animality. The symbolism of the monstrous body not only describes the physical degeneracy but also its alleged moral deterioration. Darwin speculates on life expectancy and fertility as well as the survival of the fittest – which on the other hand implies the elimination of the weak – as part of a natural process. This physical metaphor stresses the universal law of nature, interpreting monstrosities as an archived condition, as quasi

artefact of a pre-human form, but at the same time supports the idea of eliminating the weakest link in order to allow for the natural process of the "struggle for life". The natural process appears less natural as it is initiated by direct human intervention – a consideration that should soon translate to social hygiene and eugenics[24].

In 1851 Darwin's work *On the Origin of Species* was published, in which malformations are discussed as a massive deviation in structure, a deviation that according to the author was mostly disadvantageous and always useless[25]. Malformations were almost unnoticeably shifted to being mere variations, which made a conceptual differentiation impossible. One classification attempt that should become crucial for the search of the "missing link", defined monstrosities as "reappearance of long lost characters"[26].

One of the prevalent paradigms of the late eighteenth and nineteenth century anthropology was the "great chain of being" which is based on the assumption of a hierarchical order of nature and a unilinear development of the primates. Thus stressing, that any newly discovered species had to be integrated into the system; a paradigm that also implied the concept of a missing link between species.

Carl Linnaeus should usher in a new epoch of anthropological classification as for the first time since Aristotle, man was integrated into the scheme of animality[27]. The 12th edition of the *Systema Naturae* shows *homo sapiens* at the top, as well as subgroups of *ferus, americanus, europaeus, asiaticus, afer* and – most importantly - *monstrosus*[28]. Nevertheless, the concept of biological evolution could not yet flourish and fully evolve as Linnaeus assumed progression from a fixed number of archetypes but the summarising of the primates into one class ignited the search for distinctive characteristics between man and ape. Linneaus' system asked for a detailed listing of distinctive characteristics for every species and type, quickly showing that the differences between various simian species and genera were bigger than the difference between human and simian. The progressive

approximation between *homo* and simian raised some concern with Linneaus putting emphasis on the additional specification *sapiens*, as wisdom was considered *the* distinctive human feature. The appearance of primates seemed to sabotage the natural system, as the beast challenged man's position in nature. *Homo* was experiencing a reduction ad absurdum, as his appearance was mocked by the ape. Who else apart from the devil could have challenged the divine?[29]

The Monstrosity as Missing Link

Applying Darwin's evolutionary theory to man was more than a logical necessity in the course of the publication of *The Descent of Man* (1871). Rudiments, such as the vermiform appendix or lanugo hair (to be found in any animal of higher order as well as in humans) were considered evidence for man's decent from a lower form. Darwin's argumentation however, lacked fossil documentation which could have testified and supported the phylogenetic history. Furthermore, reconstructing the phylogeny of primates was based on generalisations and although archaeological findings were considered valuable proof of the age of man, the existence of actual human fossils was controversial. Evolutionary chain was inconsistent with gaping evidence, and so the search for the pre-human form persisted[30].

Whereas Darwin's theory was based on the belief that early embryonic stages were similar to those – equivalent in related species, Haeckel's interpretation of the theory of recapitulation postulated that each stage in the development of man represents one adult form in man's evolutionary history – an evolutionary ancestor. The theory of recapitulation was an attempt to synthesise Lamarckism and Darwinism. Research data was gathered in different ways but analysed and interpreted towards one specific conclusion: human genealogy was to be defined by applying the theory of arrested development, illustrated and exemplified by specific malformations, thus leading to a positioning of the monstrous body as demarcation line

between man and ape[31]. According to Foucault, monstrosity and fossil can be interpreted as backwards-oriented projection of difference and identity, with the monstrosity explaining the genesis of differences, almost like a caricature on the basis of a continuum, and the fossil reminding of the first persistent attempt of identity.
Even though the majority of scientists focused on finding distinctive features between man and animal, ape respectively, German pathologist Carl Vogt reversely applied "teratological evidence" and opposed the anthropoid to the microcephalic "apeman" the "smallhead", whose brain structure according to Vogt was following the simian type, suggesting that "smallheads" would indeed represent the archetype: "*corpore homo, intellectu simia*"[32].
The cranium has always been considered the most human part of *homo sapiens* and perhaps the only feature which allows for a definite differentiation and demarcation between the humanoid and the anthropoid skeleton. Accordingly, the cranium was essential for nineteenth century science since it was an important criterion for global human classification and hierarchisation and the hence resulting scaling of cultures. The appearance and shape of the cranium became *the* parameter for defining ethnic heritage and race with physical anthropology being literally based on cranial schemes and systems of classification and hierarchisation and distinctive features[33].
Leading craniologists such as Virchow and Gegenbaur were evolving from supporting descriptive research (cf. Blumenbach) towards a new, phylogenetic approach in craniology, trying to relate findings and observations to the lower vertebrates, with Gegenbaur trying to isolate the archetypical cranium[34].
Medical anthropologists, pathologist and anatomists were trying to give aetiological reason for microcephaly by applying their individual logic to their studies on cephalic deformations and brain anomalies, thus resulting and being reflected in a wide array of aetiological hypotheses circulating around maternal traumata, pathological pro-

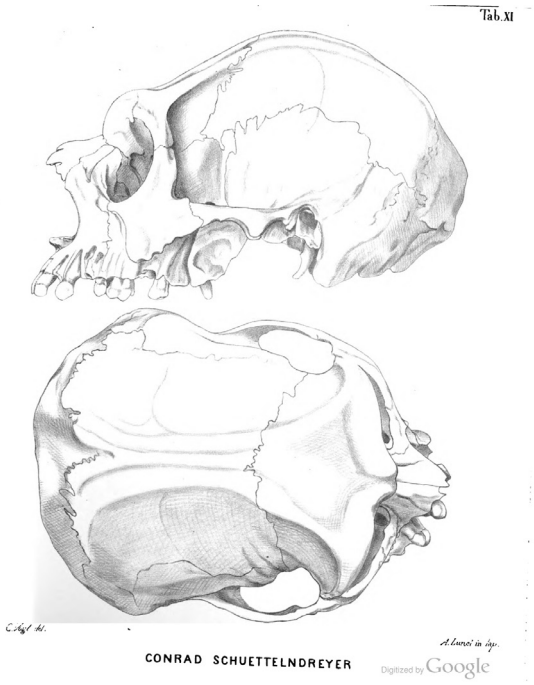

Fig. 1 - Conrad Schüttelndreyer. Archiv für Anthropologie, Zeitschrift für Naturgeschichte und Urgeschichte des Menschen 1867; 2. VOGT C., ref. 32, p. 151.

cesses as well as combined arrested developments. Vogt and Aeby performed detailed measurements on pathologically modified crania which stimulated the publication of various case studies.

Vogt's study *On the microcephalic individual or ape-man* provides a distinct collection of 40 case studies. His dedication to applying the atavistic concept to teratological appearances is reflected throughout the paper, for instance in the case of thirty one year old Conrad Schüttelndreyer, who had already been described by J.F. Blumenbach as the "Thiermensch aus Bückeburg", the animal-man from Bückeburg. Conrad Schüttelndreyer's mother was said to have had maternal imaginations of a "dancing ape", resulting in the birth

of a child that resembled a troglodyte. According to Vogt, Conrad's microcephalic cranium was one of the most primate-like in all aspects but brain volume (Fig.1).

Vogt also mentions a group of microcephalic children from a village near Stuttgart, Germany, where there was a reported accumulation of "ape-like infants"[35] and which prompted authorities to appoint a physician to investigate the matter. Vogt claims, that the cases of fifteen year old Johann Moegle (Fig.2), ten year old Jakob Moegle (Fig. 3) and five year old Georg Moegle, with the middle child showing the

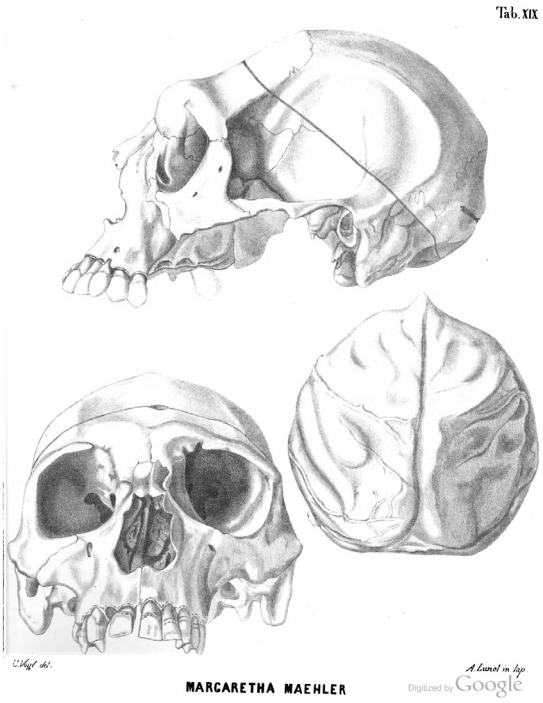

Fig. 2 - Johann Moegle, Archiv für Anthropologie, Zeitschrift für Naturgeschichte und Urgeschichte des Menschen 1867; 2.VOGT C., ref. 32, p. 173.

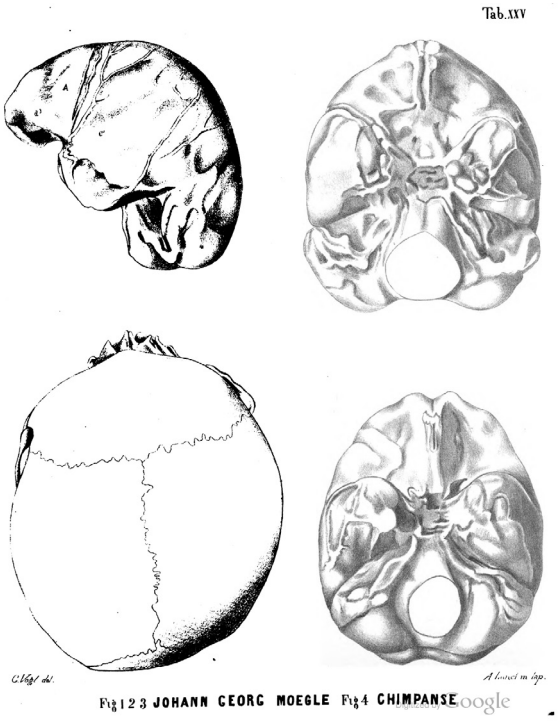

Fig. 3 - Jakob Moegle. Archiv für Anthropologie, Zeitschrift für Naturgeschichte und Urgeschichte des Menschen 1867; 2.VOGT C., ref. 32, p. 173.

most ape-like appearance and most advanced simian features, represented the perfect examples for the transient form between man and ape.

Another case study deals with a microcephalic individual from Jena, Germany, who according to Vogt, was kept like a pet by his fellow villagers and whose brain convolution showed strong similarity with those of the lower apes. Vogt states that the formation of the cerebral gyri was even less developed than the ones found in *simia troglodytes*. The latter not only had much broader central convolutions but

also showed differences in the Sylvian fissure (*fossa Sylvii),* thus leading Vogt to the conclusion that the microcephalic convolutions represented an incomplete, hence retarded system. Unlike the case of Margarethe Maehler from Würzburg, whose appearance according to Vogt resembled a higher ape, with an enormous superciliary arch as well as a prominent prognathism (Fig. 4). A comparison between her microcephalic cranium and the crania of a juvenile orangutan and chimpanzee, would not allow for a considerable distinction

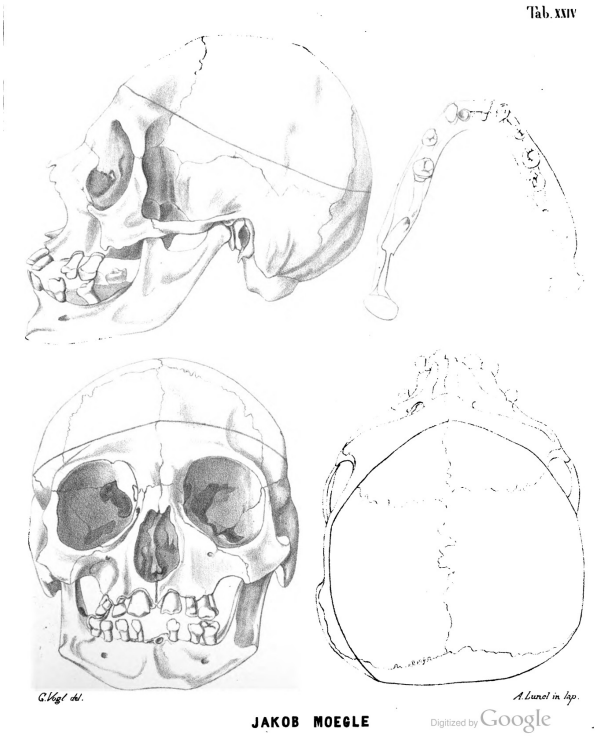

Fig. 4 - Margarethe Maehler. Archiv für Anthropologie, Zeitschrift für Naturgeschichte und Urgeschichte des Menschen 1867; 2. "Der Mensch verschwindet, der Affe tritt an seine Stelle." VOGT, C., ref. 32, p. 167.

between those two, explains Vogt. Also, the lacking incisive suture reminded him of a simian.

(Hu)Man disappears and is superseded by the ape. The ape takes (Hu)man's place.

Vogt attempts to classify the cases of Maehler et.al. as simian by applying skull geometry introduced by French anatomist Louis Pierre Gratiolet. Gratiolet engaged in brain size and brain location measuring by piercing wire through the cranium from different angles and points (eg. superciliary arch), allowing him to conclude on brain location and size, intellectual capabilities respectively. A simplified version of Gratiolet's experiment was performed by Vogt, who assumed that penetrating the human skull from a vertical angle through defined points on the rim of the orbit, would normally cut a considerable part of the frontal lobe and forebrain. But constructing the same lines on the adult microcephalic cranium showed that the wires did not permeate the brain - enough evidence for Vogt to prove the relation between microcephalics and primates. He also draws on the treatise of German anatomist and identifier of the remains of Neanderthal I, Hermann Schaaffhausen, who suggested that the development of prominent eyebrows was to be associated with savagery, cruelty and brutality[36].

Vogt also stresses the location of the microcephalic foramen magnum which approximated adult orang-utan form, and prognathism, both supporting his theory on atavistic recurrence. He eventually performed comparative analysis between the simian brain and the human brain on the basis of endocasts, with special focus on the frontal bone and the Sylvian fissure. One endocast showed a strongly atrophied third parietal convolution which correlated with the typical situation found in primates. He concludes that his case study research disproves the opinion that the main difference between the human and the microcephalic brain on the one hand and the primate

brain on the other, was the significant formation of the occipital lobe in the primate brain, the reduction of the latter and the back part of the parietal lobe in the microcephalic brain. The measuring of the brain endocasts leads Vogt to the assumption, that at least one case showed a brain volume and surface less developed than in simians. Most of the others showed a higher volume and larger surface than a chimp, however, only two cases showed developments higher than a gorilla. The overall surface of the microcephalic cerebellum and the cerebellum in normal adults was equal in size[37]. Vogt's measurements and evaluation suggest that the microcephalic individual is human with regard to its cerebellum and body.

Yet Vogt does not see these findings as a confutation of the atavistic theory and argues that the simian brain differs from the human brain by the simplification of the angular gyri (which is responsible for vision) and the typical formation of the ethmoid bone which could also be found in the cases of Margarethe Maehler and Jakob Moegle. On the basis of analysing the Sylvian fissure and the posterior inferior frontal gyrus of the brain (Broca's area) – both correlated with language production, he attempts to outline similarities between the microcephalic and the simian brain in a page filling comparison. Moreover, he claims to recognise simian structure in the shape and texture of particular gyri and brain lobes in microcephalism, in which capturing the actual moment of developmental deviation (deviation from the human form respectively) was crucial but in order to define that moment he would have had to consider fetal primate brains for his research – which were unavailable, hence classifies his own argumentation as hypothetical and his theory as not yet proven but still most likely.

With regard to aetiology, Vogt sees the laws of heredity abrogated since the majority of the cases he examined, descended from healthy, normal parents, and were also procreative. He is neither aware of the defining reasons that lead to congenital malformation within an

organism, nor of the reason for developmental arrest. He concludes that microcephalism was skipping heredity – also drawing on Darwin who observed some "delayed atavism" in the three-toed Hipparion. Accordingly, microcephalism represented a partially atavistic occurrence, which was found in the gyri of the brain and which would consequently lead to an irregular embryonic development – "pointing to the roots of the human species in its main characteristics"[38].
Especially the upper parts of the brain would show strong atavistic features, although the rest of the body tends to be quite human (regardless of the prognathism). Microcephalism represented an early evolutionary state of the human race, and should, according to Vogt, be seen as a mile stone in human evolutionary history: a mile stone each human being had to pass during his/her individual and embryonic development[39].
Another interesting case to be found in Vogt's elaborated study but also in Virchow's paper on microcephalism, is a couple that became famous in various sideshows: the so called "Actecs Maximo and Bartola". The alleged Aztec-siblings not only document the search for an extinct human race but also give evidence about how science in the nineteenth century was handling its study objects. Rudolf Virchow emphasises the couple's pathological appearance, stating that their facial structure would indeed remind of an "old-Mexican deformation type", this, however, would not allow for concluding on a pre-human form. Virchow argues that the humanlike appearance did not make an ape human, as well as the ape-like appearance did not make the microcephalic automatically a primate.
In his opinion, microcephalism is a condition of arrested development in the sense of J.F. Meckel, with only one part of the body showing primate-like features. Virchow refers to the case of the Becker family, who showed a remarkable high rate of recurring microcephalism within the family. Still, the pathologist could not observe any consciousness of existence, and also, the simian similarity was not

as strong as it would allow for any instinct or intellectual capability for self-sustainability. Virchow argues that microcephalism could have never been a normal state or a normal condition – an atavistic condition – at any time in evolution, with microcephalic individuals procreating and developing any further or progress. With regard to reproduction, he points out, that chances of an existing and surviving microcephalic race were unlikely. Considering a hypothetical breeding of microcephalics would undoubtedly lead to their extinction – without external triggers and without leaving offspring[40].

The Becker family, and particularly the case of Franz Becker, was the research subject of German anatomist Max Flesch's. Flesch was uncertain about the cause of microcephalism but was also biased with regard to the atavistic interpretation. He relates the condition to a pathological disposition of the mother as being a likely reason for the developing of a microcephalic cranium, also taking intrauterine pressure into consideration but still cannot see a satisfying explanation. Flesch believes that the causes for microcephaly are diverse and different in each case, nevertheless argues that such malformation is a proof of the kinship between man and animal. The anomalous structure of the cranium leading to an animal-like formation of the brain would show that man and some animals were closely related as anomaly in human would correlate with the regular form in e.g. primates[41].

The growing number of theoretical elaborations on aetiology indeed led to some recognition of the similarity between the microcephalic brain and simian brain, but there were also numerous papers and commentaries published that started eroding Vogt's atavistic theory[42]. Nevertheless, contributions in medical-anthropological literature of the nineteenth century repeatedly denied pathological damage or pathological reason in the development of microcephaly. Vogt and his fellow researchers defined the moment of (atavistic) recurrence at a particular developmental stage at which the human brain shows

no specific characteristics thus allowing for "evidence" of simian type development. The foetal cranium of the higher or anthropoid ape clearly shows human characteristics thence the head of a newborn ape is of anthropomorphic shape but quickly adopts animal morphology during foetal development. (Unlike the human cranium which keeps its main foetal features also in its adult form.) The simian cranium and the round human cranium both derive from an almost identical basic structure and form, but although the shape of the outer surface of the cranium would suggest for atavism, the basicranium does not. The simian cranial base is flatter as well as the position of the basic bones towards each other is different[43]. Also, there are distinguishing morphological patterns regarding the proportions between face and basicranium. Such observations suggested that microcephaly develops in its own dynamic and on a pathological basis. The phenomenon of *fœtalisation* can therefore be understood as adaptation.

Criticism arose amongst scientists such as Bischoff and Virchow, who stressed the importance of a disrupting impact on the human foetal brain that seemed to cause microcephaly, understanding the latter as arrested development. The exact processes linked to the cause could still not be identified, but since the condition showed changes in severity and some variability, various aetiologies were discussed. Some spoke of premature fontanelle and suture closure (stoppage of growth due to ossification of the cranium), others of carotid artery stenosis causing a blockage of blood supply to the brain. Pathological reasoning slowly started replacing the phylogenetic theory, although the complete pathological process was yet to be explained and defined[44].

There is a scientific debate in the nineteenth century put forward by German pathologist Virchow, who tries to explain malformations as pathological disorder, focusing on anatomical peculiarities rather than assuming a "pre-human" form. Virchow made an outstanding

contribution to medicine by promoting a rationale driven approach to medical science. Whereas physical anthropologists' still focused on defining the biological border between man and ape, Virchow was dedicated to contrasting apithology and normality with pathology.

Conclusion

The atavistic interpretation of malformations is problematic because it neither allows for straightforward conclusion and assumption on progressive evolution nor does it suggest any evidence for the latter. Progressive evolution is, however, crucial for atavistic construction. More so, atavistic hypothesis seems less viable considering the re-activation of a non-active gene, since without selection (which must be presumed) genetic collapse will occur. Furthermore, atavisms that can be linked to a different type do not give evidence for a manifesting structure or recurrence of the past, thence the chance of creating the original state through backwards mutation is lower the more genes are involved in a complex feature. Homologies do not provide or support reasoning on a common descent as they may either be random or of systematic origin[45].

From a modern scientific perspective, the atavistic approach or vestigiality to analysing and interpreting congenital disorders appears presumptuous and precipitant. Any form within a morphological sequence can be identified in the teratological field sooner or later. By drawing on teratological examples to support phylogenesis, scientific results become a wishful prophecy, and the so called atavistic gene subject to speculation.

Understanding the pathological disorder of a developmental process eventually replaces the theory of atavism in medical science, furthermore the awareness towards developmental disorders provides for finding patterns, laws and conclusions – thus allowing for a defining of "patho"-logical characteristics. The discovery of laws and regularities in developmental processes was crucial, as

they were assumed to support concepts of normality and pathology. In this regard, the monstrosity is considered pathological phenomenon in a dilemma: on the one hand it resembles a human being, on the other hand is shows a defect; abnormal in morphology, a non-human hint of the human past that should be interpreted as inferior in the name of science. Because of the suggested universal law of civilization, the civilised society respectively, and with regard to the possibility of reproduction, the monster develops into a threat for humanity. Thus monstrosities are no longer read as ill, but as pathogenic, morbid and destructive, hence dangerous. Medical science starts stigmatising the latter as a threat for the whole human race. The question whether the monstrous body is of human nature, leads to a serious and rather momentous assumption, defining the monstrosity as a creature that resembles human appearance without being human[46].

Progress in developmental biology provided for an understanding of the laws of pathological processes; malformations are now analysed and interpreted in consideration of the normal course of development. Achievements and findings in the field of pathology as well as the general increase of knowledge at the end of the eighteenth century, have finally repositioned the malformed body, causing a gradual deconstruction of the monster and turning it into a human being. This transformation is also reflected in the terminological alteration from prodigy - monstrosity to malformation and congenital disorder; a morphogenesis provoked by an establishing objectivity in natural sciences, Darwin's theory of descent and the contemporary understanding and perception of living things with regard to the theory of autopoietic systems. The curiosity for the bizarre and absurd body, however, is not replaced but only camouflaged by the scientific and empirical method thus putting the postulated "scientification of man" into perspective. Concepts of foreignness, threat, imperfection and disgust are not eliminated.

The medical anthropological approach to the history of teratology and the debate over the interpretation of monstrosities as "missing link" shows that borders and limits between man and animal is a culture specific phenomenon. These borders have been shifted again by modern genetic technology and prenatal diagnostic methods. The possibilities of corrective, modifying and also eliminating interventions have raised moral and ethical questions. The debate over de-humanisation and transformation of the monstrosity into a missing link is today replaced by a bioethical debate stirred by modern technology and hi-tech medicine both performing in an ambivalent scientific system. Considering genetic technology, transplantation medicine and plastic surgery, it seems as if science creates modern monstrosities, medical-hybrids, or simply: monstrous human beings.

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