Waldorf Educational Concepts Related to the Developing Child and (Neuro-) Biological Research

Interpretations of basic concepts used in Waldorf teaching and their ability to explain findings of biological research

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Abstract
In Waldorf teaching the human being is looked upon as a basically spiritual being. Seen from this stance, man can only enfold all his abilities in the physical world when he succeeds in developing his physical body as an instrument that responds precisely to all his intentions. This conveys the task to the teacher and educator to let the pupil experience life in a way capable of structuring body and brain to its individual needs. This involves understanding the child in terms of concepts not normally used in psychology. My thesis is based on phenomenology within the frames of a general qualitative study. In this paper the basic concepts of Waldorf education are interpreted with respect to the child’s normal development and in their ability to explain findings of biological and neurological research seen from the point of view of this pedagogy. On this background I have attempted answers to questions related to the development of gender, the breathing related to teaching, brain plasticity and willpower, memory, perception and mirror neurons, the possibilities of the teacher as artist and the question of the free will. The findings are logical implications of the functions attributed to these concepts by Rudolf Steiner. I found that in some cases it is possible to explain controversial problems in science in a simple way by these concepts and that in others additional viewpoints of this kind may help direct research to more crucial questions of humanity.

Foreword
Writing a master degree thesis as a pensioner has little to do with the build up of a career. It reflects a decision to sum up knowledge and experiences and put them to the test in a process of updating and expanding knowledge into new views. As a student, I made up my mind at 22 years not to waste life by leaving the chance to continuously learn and train something. The consequence of following high school and university undergraduate courses, however, was to me a growing feeling of being saturated with useless knowledge which made me doubt the fruitfulness of my decision. Though this turned out to be the case for some of the material which was actually outdated by the time I left the courses, the main discovery to me was that what I had learned only represented a very small sector of the approaches available to these studies. Seen from a pedagogical point of view, I understand the need for limiting the curriculum, but there is also another reason for leaving out findings that represent strongly diverging standpoints: the fear among university and school staff not to represent the ‘winning view’ within their field. When ideas for this or other reasons become the only ones in a field of study, thoughts tend to undergo a process of ‘cementation’. For this reason, I have this time tried also to read findings of well known or wise, aged scientists to whom career may no longer be a main incentive. Going into research therefore should in my opinion involve a revitalisation of the brain by enhancing its possibility to restructure by artistic training. In this
thesis I have shortly pointed to my way of doing this in chapter 2. A next step would then be to develop the ability to perceive. To know exactly what you have seen, heard or felt, leaving out the traditional way of interpreting. Then after some 10-15 years of remodelling the brains capacity to deal with any thought and percept behind it so that also the feeling corresponding for example to ‘right’ or ‘wrong’ is immediately accompanying it, previous knowledge should be updated. For people who have not had the luck to experience this immense widening of scientific possibilities, the concepts used in this paper may look controversial. But there are great advantages by continuously increasing ones sensitivity by training perception. In my opinion the lack of exact perception in science is the cause of the real threats imposed on nature and ourselves as I have tried to show in section 1.2. If perception could be raised to a much higher level by applying corresponding methods in teaching, I believe the concepts of the human being used in Waldorf education would open an arena for research in which animal suffering could be greatly reduced since the human perception this way will be able to unveil connections directly without measurements. This way of researching would also represent a bridge between the disciplines of science since the apparatus of measurement and coordination would be the human being itself and therefore all scientific findings would be controllable to anyone interested without much special qualification.

But this idea does not mirror the situation of today. It represents the context, however, in which this thesis should be seen. My work is merely pointing in a direction where such goals may be realised in the future, a first intermediate stage towards the realisation of what the human being is in its full capacity. Still, I draw the conclusion from my investigations that the concepts used in Waldorf education can already explain phenomena of biological research not accessible to the traditional view of the human being.

These two years at the master degree course at the RSH has been very rewarding in terms of very good lectures, interesting discoveries made by our teachers and fellow students and continuous debates on a wide variety of themes. For all this I would like to express my thankfulness to my fellow students and to our courageous lecturers who certainly not conform to my above description of the career people. Special and most heartfelt thanks to my mentors Gunter Gebhard and Bo Dahlin whose efforts I value above everything in the course.
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Steinerpedagogiske begrep relatert til barnets utvikling og (nevro-) biologisk forskning

Tolkninger av grunnleggende begrep som benyttes i Steinerskolene og deres evne til å forklare funn i biologisk forskning

Sammendrag

Steinerpedagogikken har eksistert som mulighet siden 1919 og er i dag representert i 57 land med 965 skoler, et omtrent dobbelt så stort antall barnehager og cirka 600 institusjoner for spesialpedagogikk.

Bakgrunnen for dette mastergradsarbeidet

Hovedspørsmålet for dette forskningsarbeidet har vært å undersøke i hvilken grad Rudolf Steiner’s begreper relatert til mennesket kan sies å være kompatible med resultater fra biologisk og særlig nevrobiologisk forskning. For å nærme meg utgangspunktet for en slik vurdering, har jeg først tolket Steiner’s utsagn om disse begrepene der han hovedsakelig henvender seg til lærere og lærerstudenter eller der uttalelsene ut fra min vurdering synes å ha pedagogiske konsekvenser. Basert på disse tolkningene undersøker jeg funn fra biologisk forskning og ser om det er mulig å forstå dem ved hjelp av et slikt begreps sett. Deretter tar jeg for meg ytterligere forskningsmateriale på disse feltene og tolker dem ut fra den forståelsen som fulgte av denne første gjennomgangen.

Jeg har begrenset omfanget av undersøkelsene til tre stadier i barnets utvikling: Tiden rundt svangerskap og fødsel, tiden omkring skolestart og utviklingsforholdene i forbindelse med puberteten. Det biologiske forskningsmaterialet er valgt med tanke på deres relevans innenfor Steinerpedagogikken.

Fysiologisk siktemål

Innenfor dette skolesystemet ser man på mennesket som et primært åndelig vesen som ikke uten videre behøver å lykkes i å utvikle en fysisk kropp og hjerne til fullverdige verktøy for alle intensjoner og behov dette individuelle mennesket måtte ha. Det blir da en hovedoppgave for læreren å bidra til at tilpasningen til kroppen kan komme så langt som mulig, nærmere bestemt til et stadium der ungdommen kan oppløve seg som fritt tenkende og skapende i kroppen sin. Man må imidlertid være klar over at selv om Steinerpedagogikken har eksistert i snart 90 år, står den foreløpig ved begynnelsen av sin utvikling. Den har etter min mening et
meget stort uutnyttet potensial som først gjennom videre forskning kan bli tilgjengelig i læresituasjonen.

Læring i indre bilder
Som den viktigste delen av læringen de første årene av skoletiden opplever barn i steinerskolene stoff presentert som eventyr, myter og sagn. Dette materialet er ikke tilfeldige sammensetninger av historier, men er representativt for en visdom som engang var menneskehetens felleseie. Foruten å inneholde et stort spekter av emosjonelle opplevelser, har disse bildene mulighet til å vokse med barnets intellektuelle modning; senere kan eleven foreta en bevisst selvstendig tolkning i dette svært omfattende stoffet. I denne tenes påpekes det at en slik måte å innlede all læring på innebærer flere betydelige utviklingsfordeler for barnet. For det første er det å kunne leve i sine egne indre bilder en viktig forutsetning for å huske presist. Et indre bilde inneholder stemninger, farger og former som flernyanserte vinklinger mot selve innholdet. For det andre er neppe to barns indre billeddannelser basert på den samme fortellingen like. Dermed oppstår det et frihetsrom hvor den enkeltes individualitet kan få utfolde seg. Bildedannelse blir på denne måten etter hvert grunnlaget for den egne intellektuelle utviklingen siden barnet har vent seg til å bygge sine egne hukommelsesbilder og fortsetter med det også i forbindelse med fagrettet begrepsundervisning. Fra nevrofysiologer har det den senere tiden blitt gjort oppmerksom på at barn som ikke tilstrekkelig lenge har fått utvikle seg i en indre billedverden, en ”mytisk” fase, ikke klarer å utvikle en selvstendig tenkning senere i livet. De blir da fanget i andres synspunkter og forestillinger. En nevrobiolog og psykiater bruker betegnelsen ”selfsentrert pseudoautonome” om slike barn og hevder at fordi antallet slike tilfeller øker kraftig, representerer de en trussel mot stabiliteten i alle vestlige land.

Persepsjon som fysiologisk virkemiddel
I Steinerskolene spiller utviklingen av iakttakelse via hele sanseapparatet en spesielt viktig rolle. For elevene fra 12 års alderen begynner hovedvekten i undervisningen suksessivt å flyttes over på fenomenologisk basert virksomhet. Filosofisk sett har denne undervisningen sitt fundament blant annet i Husserl’s reaksjon på det han kalte en ”matematisering av virkeligheten” og Merleau-Ponty’s forståelse av hvordan mennesket når til kontakt med verden. I sin spesielle pedagogiske utføring kalles Steiner’s fenomenologi for Goetheanisme. Fenomenologi fra og med dette alderstrinnet innebærer å flytte følsomheten
fra en indre til en ytre aktivitet der tenkningen blir stadig viktigere. At denne måten å arbeide på medfører store fordeler fremfor teoretisk undervisning har vært vist blant annet i speilnevrons forskningen. Det er også klart ved ”split brain” forskning at det er forskjell på høyre og venstre hjørnehalvdel når det gjelder hukommelse. Venstre hjørnehalvdel har en sterk tendens til å fabrikkere falske minner av persepsjonelle inntrykk mens høyre hjørnehalvdel gjengir sannferdige minner. Ettersom all visuell persepsjon kanaliseres til høyre hjørnehalvdel, understrekes betydningen av fenomenologisk læring gjennom synet i motsetning til teoretisk læring som svært ofte henviser eleven til logiske operasjoner via venstre hjernehemisfære.

Kunstnerisk utvikling
På denne bakgrunnen blir det forståelig hvorfor Steinerskolene legger så stor vekt på kunstneriske fag der særlig visuelle øvelser som tegning, maling og bevegelser spiller en stor rolle. Det utvikler høyre hjørnehalvdel, og intensjonen er at den i aktivitet skal kunne balansere den venstre og derved bidra til sikrere hukommelse og sannferdige slutninger. Sett i lys av hjerneforskningen har imidlertid et kraftig fokus på kunstnerisk læring også andre betydelige følger. Antonio Damasio, en av de store nevrofysiologene nå, har påvist at profesjonelle kunstnere kan la kroppen motta eller avvise enhver følelse når de koncentrerer seg om arbeidet sitt. For den som lever seg litt inn i hva dette faktisk betyr, blir det klart at dette dreier seg om utvikling av frihet, frihet fra andre følelser enn de man målrettet ønsker å benytte i et studie eller en undervisningssituasjon. Da blir også en av grunnene til at Steinerskolene ønsker å utvikle det kunstneriske talentet også hos lærerne forståelig. En annen grunn er at tyske forskere har kunnet vise at elever umiddelbart opplever lærerens holdning til dem i sin egen hjernen. En lærer som ikke kan gjennomskue sin egen føllesesvirkelighet og har en aldri så liten negativ innstilling til en elev, forårsaker angstblokkeringer i elevens hjerne som hindrer eleven i å fungere i læringssituasjonen. Disse påvisningene samsværer med resultater fra Rizzolatti et al.’s utforskning av speilnevroner.

Konklusjon
Dette arbeidet viser at det er fullt mulig å forstå fysiologiske fakta ut fra en logisk bruk av disse Steinerpedagogiske begrepene, men det krever betydelig innsikt både i hva disse begrepene omfatter og nevrofysiologiens begrepsverden og måter å forsk på. Ikke desto mindre kan Steiner’s begreper forklare ellers uforståelige påvisninger fra vanlig forskning,
som for eksempel Libet’s berømte funn av ”beredskapspotensialer” i hjerne nevroner som aktiveres før forsøkspersonen bestemmer seg for å utføre en handling. Ut fra dette forsøket har forskere trukket den slutningen at det ikke kan eksistere noen fri vilje. Dette kan tilbakevises og andre problemer lar seg også løse ut fra de begrepen som benyttes i Steinerpedagogikken.

1. Introduction

In Waldorf teaching the human being is looked upon as a basically spiritual being. Seen from this stance, man can only enfold his complete spiritual ability in the physical world when he succeeds in developing his physical body as an instrument that responds precisely to all his intentions. This conveys the task to the teacher and educator to let the pupil experience life in a way capable of structuring body and brain to its individual needs. That involves understanding the child in terms of concepts not normally used in psychology. In this thesis the basic concepts of Waldorf education are interpreted with respect to the child’s normal development and in their ability to explain findings of biological research seen from the point of view of this pedagogy.

1.1 A short orientation

Waldorf schools have existed since 1919 and are represented in 57 countries with a total of 965 schools of which 287 out of Europe (Weltliste 2008). Waldorf pedagogy seems to be able to adapt to all world cultures independently of religion, density of population and to some extent even of economy. The view of the human being as worked out by Rudolf Steiner in his Anthroposophy, meaning the wisdom of the human being, constitutes the basic study for Waldorf school teachers. This does not imply that pupils of the Waldorf schools are taught Anthroposophy, however, that would contradict the main paradigm of this philosophy: the lifelong education towards individual freedom. Since in Anthroposophy the human being is regarded as a continuously growing spiritual being making itself a home in a body through what normally is denoted the soul, the question arises how these non-physical entities can be understood in their interactions with the physical body. This thesis is therefore a study focusing on two of these non-physical entities of the human being in their relation to general biological findings and neurobiology. These entities are the “astral body” or soul coordinator in its aspects of feeling, will and thought, and the “etheric body” or the “architect” structuring the body. These “bodies” define a different way of evaluating the needs of a child during its years in school and sometimes conveys another understanding of commonly used concepts of
teaching. Some main concepts used in Waldorf teaching are therefore explained and interpreted as to their consequences for education. The concepts of “astral” and “etheric bodies” are also used to explain findings within biology and neurobiology to find out if they are logically compatible with these facts.

During this work, I have gone through a process of developing my sense of exactness related to the material I am handling. After having formulated my question for this paper at the end of section 1.2, it soon became obvious that I would have to specify what I was trying to find out more precisely. Steiner’s work is comprehensive, counting some 360 book volumes, each of which could contain information that would influence the way of dealing with my question in a slightly, or even radically different manner. So I had to concentrate on sayings which are often repeated in Steiner’s works or, to my knowledge, seem to be commonly accepted among experienced Waldorf teachers. Doing this, however, I was aware that Steiner also goes very much further in his detailed descriptions of how the “etheric” and “astral bodies” relate to the function of the human physical body organs, how illnesses result when they do not support or counteract each other etc. Though this would be relevant to my study, it would also call for a much wider investigation of biological facts as to how these organs react under different conditions, normally and during illnesses. So, the time available considered, I chose to concentrate on a few of the questions often encountered in the studies of practicing Waldorf teachers. These questions all reflect the main idea in Waldorf teaching: to develop a physical body as a capable tool for the needs of the individuality of the child. The main problems dealt with are: a background for what to teach when, gender and puberty, the breathing process, the question of will, the formation of memory, pictorial and phenomenological teaching and the question of freedom.

As an introduction in 1.2, I refer parts of my biography to give an account of the phenomenological way of observing used in this paper. Then in chapter 2 how this way of observation became a method for the work presented here. The study itself is divided in three parts. First my interpretations of Steiner’s use of these concepts in their role during childhood and puberty, secondly, a study of biological facts to find out whether my interpretations can explain these findings. The third part is a discussion where other findings within the bio-disciplines are also valued against my stance of interpretation. The study is focused on three stages in the child’s development: the time of pregnancy and birth, the seven year old, and the time connected to puberty.
Since the emphasis in this paper is put on brain research, a short historical account is given here: Neuroscience has developed through a number of phases after World War 2. Very diversified ideas of what the brain was and how it functioned was presented, many of which are still widely adopted among scholars of education. Forty years ago, the common belief among scientists was “that the human brain came as a tabula rasa into the world, free to be instructed, open to everything and each one equipped with roughly the same potentials” (Singer, 2001, p.1, my translation). Split brain research demonstrated that the left and right hemispheres were occupied with very different tasks some of which were earlier not even believed to have a connection to the brain. For example Kandel & Hawkins (1992, p.53) writes that researchers in the 1950’s after the localization of movement, perception, attention, and language to the brain, still doubted that memory could ever be assigned to a special region of the brain. Then came a time when neurobiological research focused more on the fixed systematic functions of the brain. The brain was believed to have a fixed cortical representation of each part of the body from birth onwards, a number of cell systems that would remain so throughout life. At the same time, the importance of genetically governed restrictions to brain use was emphasized well beyond its actual significance as seen from today’s point of view (Bauer, 2006a, p.232). In a still later period, brain plasticity was demonstrated; the fact that restructuring and functional change is a constant part of brain life (Kandel & Hawkins, 1992, p. 60). The remarkable thing is that the implications of these findings were seldom applied to teaching, and when converted to practical methods, they would often violate crucial parts of neuroscience. As a crude example of this, Singer (2001, p. 2, my translation) reports in his own words impressions he got when visiting a teachers college: [In school one] “could limit teaching to disciplinary measures […] other teaching activities would play no part [in education] since the children would anyway become what their genes would make them.” He then adds that this misunderstanding of neuroscientific views probably stems from the medial exaggerations in connection with the recently finished genome project.

In this thesis, I hope to be able to show that it is logically possible to explain biological findings by taking the stance that the human being is basically a non-physical being.
1.2 My background, question, and reasons for undertaking this study

My interest in nature led me into studies of the natural sciences from high school on. I studied production- and mechanical engineering, geology and metallurgy and graduated in production engineering and later in metallurgy. In industry I was later engaged in applied research, mainly within quantitative spectral analysis and precipitation hardening treatment of copper and aluminium alloys. Also, in the School of Medicine, University of Oslo, I participated in biochemical research and published work in this field. – Based on the experiences made during that time, I was well acquainted with the empirical methods relevant to these fields of research. Also, this work extended my interest into a much wider scope of the natural sciences and I have kept on reading papers on technical subjects, physiology, and brain research since then.

I grew up in a time when the youth felt the threat of nuclear war as a reality. The problem of how science had been able to put mankind in this absurd situation was a question that interested my generation in general and me as a student of natural sciences in particular. In student circles this situation was looked upon as a lack of morality within the sciences and also in society since society largely mirror the beliefs and attitudes held in natural science. We felt cheated by our predecessors and I believe that this represents one of the causes of the 1968 student revolts. Large numbers of students met and talked the matter over and this sometimes resulted in study-groups with the aim to find out what went wrong and how we could do things better. I participated in one such group where all members had to be prepared to give a lecture to the others on the actual theme at every meeting. We wanted to investigate the philosophical bases for the sciences, and to put a long story short, we ended up with Kant’s philosophy as the main influential factor. It is no exaggeration to say that we were scared by the possibility that we as scientists could know nothing of the real nature of the objects of our investigations, at least this is what we focused on as a main postulate in his works then.

We all knew the book “Som tusen soler” by Robert Jungk (1957), a book describing the personal stories of the scientists involved in the development of the atomic bomb, and in Kant’s philosophy we now felt sure we had found the reason why these brilliant researchers could not foresee the consequences of their work. A rather more difficult matter was next to find a way to avoid this type of failure towards humanity. But we found a possible solution in
the philosophical works of Rudolf Steiner. In the following, I will try to give a short introduction to the thoughts that led us to that conclusion.

In dealing with the question of natural scientific methodology, Steiner points to Goethe’s way of entering into what one could describe as a communicative scientific relationship with natural phenomena. This implies in Steiner’s view that man’s thinking ability has access to the same non-physical realm of thoughts that governs nature and its beings. This access, however, demands in Goethe’s sense that man learns to think coherently with the natural object in his focus of interest, which would mean no less than seeking the concept, the idea in the perception itself and not in some obscure causality behind it. Steiner formulated it this way (Steiner, 1973a, p.150, my translation): “To know means to add to the half reality of the sense experience the perception of the thinking in order to complete its picture”. Today, I would choose the word synesthetic to characterise the multi-sensory quality of this striving for the truth in the process of perceiving. It is also holistic in the sense that the concept or idea found would be one that is instantaneously related to the wholeness in which the object protrudes. Much later in life, I discovered that our attitude towards the natural sciences at that time was largely shared by Husserl as expressed in his campaign against the “mathematization of nature” and the call for a “return to the things themselves” (quoted by Dahlin, 2001, p.454). Merleau-Ponty, another philosopher taking up Husserl’s thinking, wrote that “[...] the experience of perception is our presence at the moment when things, truths, values are constituted for us; that perception is a nascent logos; that it teaches us, outside all dogmatism, the true conditions of objectivity itself, that it summons us to the task of knowledge and action” (quoted by Dahlin, 2001, p. 463). Dahlin (2001) points out that logos is meaning or knowledge and so Merleau-Ponty describes perception as meaning or knowledge in the process of being born. Without going into a detailed argumentation on the subject, I would say that the findings of the two philosophers in question converges closely to the role given to perception by Steiner.

This as opposed to the thinking practised in natural sciences, where one seeks, in accordance with Kant’s philosophical view of reality, the cause behind the appearance of the perception both in external nature and in mans sense-physiology. Steiner described it this way (Steiner, 1973, p. 279):
In a somewhat differing English translation this would be 1: “Those who continue to accept the contemporary view of physics on this issue have been completely won over by the fundamentally false notion that it is necessary, through intellectual reasoning, to trace perceptions back to their underlying cause”. (For original see appendix 1).

Let us look at the history of nuclear science in the last century: What made it possible for a number of in a conventional sense “normal” human beings like Niels Bohr, Max Planck, Werner Heisenberg, Robert Oppenheimer and Enrico Fermi, to participate in the development of something like the atomic bomb? That is, an invention capable of tearing all ecosystems apart once and for all if used on a massive scale. Why did these gifted scientists not discover the true capacity of their project early enough to call the whole thing off? Robert Jungk describes the reaction the scientists had when they first experienced the reality of a nuclear explosion: “None of the people present reacted as rationally as they had prepared to do.

Everyone, also those who knew themselves independent from religious bindings or tendencies – and that goes for most of them – describe the experience in terms more frequently used in mythology or theology”. For example general Farrell writes: “…a lasting, terrible thunder, a message from doomsday letting us feel that we, poor midgets in a blasphemic way had dared to touch powers so far exclusively governed by the almighty” Even the extremely rational physicist Enrico Fermi was deeply shaken and unable to drive his own car after the happening. -“We have done the devils work” Robert Oppenheimer said in 1956 after the scientists had discovered what they had done to the stability of the world (Jungk, R.1957, pp 179-180, p.291, my translations).

In the group we argued that this example display the problem arising from the false method used in natural sciences. If one decides to look for an underlying cause of the factual perception, the connection to the reality of the perception is lost. I believe this may also describe in a wider context the consequences of the normal natural scientific method; when remaining within the span of our natural senses, we also remain “in the light” with respect to our compatibility with nature. Going further, going behind this borderline and seeking the causes of perception, we are left “in darkness” with respect to the full consequence of what we are dealing with, because our possibility to experience, to feel what is right or wrong is not engaged in the same way when we leave the field of the senses. This is no longer a mere

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philosophical view stated by Husserl and others, it also has a neuroscientific base as demonstrated by Giacomo Rizzolatti and his coworkers. In chapter 2 I shall go into this in more detail.

I am not denying that our sciences today have given impressive results in terms of technical innovation, high standard equipment for nearly every thinkable task and medical and surgical opportunities one could only dream of fifty years ago. I do not propose that we should reject any of these. On the contrary, we have to use all these possibilities because this is our only option for the moment. So a lot is won, but what is lost? My question is: would we have been worse off if we had kept to a perception based science as indicated by Goethe and Husserl, or should I say a humane science?

Let me illustrate what I mean: Antibiotics are mostly designed drugs today, which means that the producer of the drug must know exactly how molecular combinations and electron interchanges work on a nano scale. Likewise, one needs a theory of how the drug will act in a living body. This knowledge is won by means of empirical experiments based on logically deduced models, and both are outside the realm of human perception. Based entirely on perceived observation, however, any biologist will know that bacteria and vira attacked by antibiotic chemicals suddenly may change their properties, and certainly will change them in the course of time, and become resistant to that drug. This problem has gone so far by now that medical personnel fear a future where certain bacteria may extinguish whole populations. Even if this will only take place in a very remote future, it is obvious that a prolonged use of antibiotics must result in a large number of lethal bacteria and vira that man shall have to combat to survive. Here we see an example of how chemo-atomistic knowledge makes it possible to produce and use substances despite the fact that sense-based common knowledge predicts disaster by utilising them. I will argue that this situation would not have developed if instead the scientists had put the emphasis solely on what they could relate to the experience of their senses. In that case, research efforts would have been directed towards for example a strengthening of the human and animal bodies. And no one would lose the practically oriented certainty of the “lived body” experience that protects one from the temptation to ignore this biological adaptation principle. That can only happen to intellectual, abstract thinkers believing only in the value of mathematical reasoning.
Returning now to our study group in the 1960’s, we formulated and discussed questions like this one: Do we need a methodological change in the natural sciences, or do we still believe that ethical norms can bring the necessary stability into this wildly expanding field of knowledge with all its consequences for mankind? We decided that a methodological change was necessary.

After a session of further studies, we recognised that such a change had been prepared in the Waldorf schools for a long time already. Since our brains in Steiner’s view must be understood as receptor organs (1978c, p. 47), education should support the development of a phenomenological, sense-based science. This is perfectly possible by not dealing with underlying causes penetrable only by advanced logic. Again, I would like to exemplify what I mean: Working with colours, healthy perception will tell you that red is an energetic colour. It comes actively towards you, and makes a strong impact. Blue on the other hand, has a negative energy in that sense, it does not attack you, it draws you towards its own position. This is recognised in psychology. Red traffic lights has a powerful “wake up” effect, green gives freedom while blue light has a “vacuum effect” and may cause fear for that reason.

Addressing only red and blue, what has natural science of today to tell us about them? The complete opposite of the perceptual experiences! Red has a greater wavelength and hence the lower energy as compared to blue. In the group we also discovered that the wavelength based colour theory comprise a number of unsolved riddles. One main such riddle is that one cannot measure wavelengths in the experienced colour world corresponding to the theoretical values. This was pointed out by Edwin H. Land, the inventor of Polaroid photography and colour television. He showed that all colours is seen by the human eye in a film with only two colour pigments present, and after numerous experiments using “Mondrians” (ie. colour paintings with differently coloured geometric shapes like squares, rectangles etc.) and by measuring the wavelengths of colour reflected from them during different lighting conditions, he could conclude that there exists no systematic relationship between wavelengths and the colour experienced by the eye. Land later confirmed these statements in the 20th Werner Heisenberg Lecture (Pöppel, 1985).

I am not suggesting that spectral analysis for example does not solve practical problems in an adequate way. My point is that analysis of this kind is carried out in complete darkness and can also be a matter of the absorption characteristics of physical substances not present on the retina and therefore is not based on the function of the human eye and the colour
interpretations made by the brain. To put it in the words we used in the late 1960’s: Natural science teaching normally show a lack of coherency with perception. To day, after many years of teaching experience in this field, I have seen one of the consequences of doing this: It leaves the youth with a problem: can I trust my senses when science tell me something else, often contradictory to my experience?

From a neurobiological point of view, such examples of contradictions in teaching practice have a possible detrimental effect on the structuring of the brain when we demand from our pupils that they must be able to remember and use them.

Where there is will, there is also a way. And when the will is strong enough and the same way is used over and over again, then little by little the way becomes a highway, also in the brain. And since the difficulty in leaving this habitual trail steadily increases, one should take great care when deciding why and for what one uses the brain. (Hüther, 2006a, p. 98, my translation, app.2).

To the extent that the acceptance of a double nature of reality finds its physiological platform in the brain, uncertainty and fear enter into our everyday experience of the world. I do not suggest that all findings in nature should have a “common denominator” or should fit in the same grand unity, but rather that elements used in the description of a phenomenon must belong to the same line of thought, a consistency of perception, concept and idea. Switching between different models of interpretation should be avoided in teaching unless the observations on which they are based can be demonstrated. By violating the feeling of coherency with the perceived reality, we also violate the children’s sense of truth. The consequence is that our pupils become reluctant to learn, and since a personally activated will is necessary in order to build synaptic networks (Spitzer, 2003, p. 155), very little happens through teaching of this kind as compared to what is actually possible. A double nature in this sense represents a lack of morality to a child, and hence it will not accept, not learn. This is what we experience in schools in general today.

When seen from this angle, the method of teaching natural sciences in the Waldorf school shows its value. The teaching starts at the age of 12 when Steiner points out that the child experiences the gap between its own concepts of the world and the adult’s. This calls for a teaching method that bridges the gap instead of widening it. By working experimentally and
at first not interpreting, only perceptive qualities are emphasised. Then comes the time to look back and memorise in detail the proceeding of the experiment. This is done twice, at the end of the lecture and the next morning before letting the pupils interpret the experiment. In this way the coherency is sought between the perceptions and possible thoughts of explanation without referring to common conclusions from the side of natural sciences. So the class establishes a relationship to the concepts belonging to the theme in question, or to the processes discovered, or to a natural law as conceived by the class. Doing it this way, the children are not forced to go further in their understanding than their perception admits them to, and so they are left in an emotional space they fully control. This evokes enthusiasm for learning, so they activate their willpowers and their brains are built correspondingly. When this developmental stage is firmly established in terms of neurophysiology, and then we speak of the time well after puberty, the school introduces them to the conclusions of the natural sciences, but then they are in a position to address these findings out of their own thinking, to reject or accept whatever they find logical out of their own reasoning.

So, already back in the 1960’s, we found that there was coherence in the understanding of perception and the method of teaching natural sciences in Waldorf schools. Compared to our everyday experiences at the university where fundamental questions like this one was not even brought to the surface, it gave us the certainty we needed: we believed we were on our way to the insight necessary in preventing further disastrous mistakes like the nuclear bomb. And what was better still; we saw the possibility to educate the next generation to personal freedom, the freedom and joy that results from sense observations; “as seen for the first time”.

As described above, phenomenological work in the Waldorf classrooms for natural sciences has as one of its aims to develop a sharpening of sense perception in general. So many of us felt drawn towards the task of teaching in a Waldorf school.

Waldorf education is usually associated with Rudolf Steiner´s spiritually oriented philosophy, the Antroposophy, and rightly so. Very few, however, know that when this philosophy is applied to education and teaching, a main focus is the physiological development of the child. The reason for this in a Waldorf context could be stated as follows: A spiritual being like man can only enfold his complete spiritual ability in the physical world when he succeeds in developing his physical body as an instrument that responds precisely to all his intentions.
Above, I have described some important steps in the personal thought process that focused my interest on Waldorf teaching. I am aware that the content constituting this process deviate considerably from the main trends in society of the time. As mentioned in the introduction, Steiner’s way of addressing any investigation involves so many aspects and results in so many different “part-truths” ending in a number of pseudo-paradoxes, that it will take a long time and a very vivid cognitive process to be able to draw final conclusions on the matter in question. But exactly this lasting struggle with a problem can give us a clue to what Steiner intends to develop in his reader in terms of brain physiology: The restructuring of synaptic networks, a sharpening of our instrument to allow constant growth of consciousness.

Working out the details in his educational physiology, Steiner discovered a number of relationships that were either not known to the natural sciences of his time, or he interpreted known facts in a way that often differed from what was generally accepted then.

On this background, I wish to investigate in some detail the extent to which Steiner’s basic concepts related to the human being are compatible with findings of biological and neurobiological research. In doing this, I will pay attention to the extended role of perception in Waldorf teaching. Also, I will limit my scope of inquiry to brain physiology and anatomic systems particularly relevant to Waldorf education.

With this study I hope to contribute to two things: In making Waldorf educational methods more understandable in terms of educationally applied neurophysiology, and secondly to point to a way for Waldorf teachers to deepen and explore further the grounds of their pedagogy.
2. My way to a method

In this chapter I will attempt to re-establish some of the major thought processes that once brought me to a conscious insight in epistemological relationships. Doing so, I must lean on material that played little or no part in my life, but can demonstrate aspects of the processes in a convenient way, considering the limited frames of this work.

A main argument in section 1.2 of this thesis is that empirical methods in natural sciences have a strong tendency to mislead scientists when they wholly or partially leave the field of human perception in their work. In accordance with Husserl and Merleau Ponty, my view is that one has to experience through the senses when seeking new concepts and ideas capable of solving questions vital to humanity. Adhering solely to the outwardly directed sense perceptions, however, would leave out the study of literature, other people’s descriptions and cognitive combinations of personal experiences. Henry Bortoft (1996, pp. 50-51) describes this problem in the following way:

 [...] although we could not see the world without the senses, we also could not see it with the senses alone. Knowledge of the world is based on sensory experience, but knowledge is not the same as sensory experience. There is always a nonsensory factor in cognitive perception, whether it is everyday or scientific cognition. Knowing even the simplest fact goes beyond the purely sensory.

Bortoft indicates with the expression “cognitive perception” that thinking in itself has a sensory side, possibly coinciding with the view held by Steiner (1973a, p.150):

Knowing means to add the percept of the thought to the half reality of the sense perception, and thereby completing its picture. (My translation, app.3).

The next step on the way to a method shall for that reason be to seek relationships between sense perception and thinking.

In trying to establish how sense perception works in relation to our thinking, I will remind the reader of two simple experiments with so called optical illusions in the form of pictures:
In fig.1 the eye gets the impression of spirals moving clockwise and anti clockwise while thinking reveals that you actually see concentric circles (by noticing that the distance to the centre of the “spirals” does not alter as your move around the anti clockwise “spiral lines”). In fig.2 the situation depicted contradicts logical reasoning but many of the details look plausible to the eye at first glance.

These two pictures demonstrate how easily sense perception can be led into illusions until the element of thought is applied to the field seen by the eyes, as in this case.

By watching the figures 3 and 4, most people discover a meaningful shape or a second possibility of understanding after some time. Since, as Bortoft points out, each picture remains unaltered all the time as perceived by the eyes, it is obviously something else that changes during the time of watching. It is our thought seeking a fitting concept or a possible meaning that gives or alters our conscious interpretation of what we see. What sort of process is that? It is the same process we experience when we perceive something for the first time. A new sequence of sounds, a new smell, a new object. We sharpen our senses to make sure we have heard, smelt or seen all details correctly. It is as if we try to “touch” every detail of the
new phenomenon, but we do not yet know what it is. I will argue that this is exactly what our thought does on encountering pictures like the two just mentioned. It is a process of thought perception.

From this, I draw the conclusion that thinking is also a perceiving organ, not only one of reasoning, and that the perceptual objects of this thought activity are concepts or meanings.

With regard to fig.4 above, pupils of the 12th grade most often discover the young lady at once, less commonly they see the old one first. But the second discovery demands a longer time for the perceptive thinking to find. When watching fig.3, considerable time is most often needed before the picture appears in our consciousness. Our thinking ability searches for meaning and after some time succeeds in recreating the idea of the artist who drew the picture. So there are two possible ways that perception of thought works in terms of time: one instantaneous and one demanding more time.

Another phenomenon has also convinced me that thinking is an organ of perception. When watching other people with our senses we can frequently make out what intention a person has just before he or she actually commences the act. Whether we follow someone’s movements with our hearing or see a person in the process of doing something, we can often understand what is going to happen next, i.e. the intention of the act. Since nothing has happened yet, we “see” this intention in our thought instantaneously, our thinking perceives what is about to happen.

Reflecting on these kinds of personal “lived experiences”, as phenomenologists have denoted it, it is encouraging to read what a leading group of neuroscientists write on this topic (Rizzolatti, Fogassi & Gallese, 2006, p 32):

It is interesting to note that philosophers of the phenomenological tradition long ago posited that one had to experience something within oneself to truly comprehend it. But for neuroscientists, this finding of a physical basis for that idea in the mirror neuron system represents a dramatic change in the way we understand the way we understand.

The determination of the mirror neuron systems and their functional importance will probably demand a long time of experimental work yet, but Rizzolatti et. al. have shown that in
humans, mirror neurons respond a maximum on fMRI\(^2\) when the task is to understand other people’s intentions. With regard to social understanding and learning processes, this finding also points to “a mechanism, based on mirror neurons, [...] permitting the *direct and immediate comprehension* of others’ behaviour without complex cognitive machinery” (ibid. p.35, my italics). I understand this “direct and immediate comprehension” as identical to the fast, intuitive function of our perceptive thinking when we deal with immediately understood figurative patterns. The more time demanding process described above (figure 3) requires an element of conscious search until this sudden experience of understanding appears and may therefore involve other brain centres before the mirror neurons are activated in the way Rizzolatti et. al. have shown using short film clips.

In the cases dealt with so far, the perceptive thought is directed towards the outer reality and is guided and supported by the inputs from the other senses. In this way, relationships comprising colours, shapes and perhaps smells and sounds give rise to an inner picture. Pictures of this kind remain our experiential reference base, a base we continuously enlarge by adding relevant details throughout life.

The other possibility is to start not with inputs from the senses, but with an idea conveyed by literature, scientific findings, or a personal theory. In this case we try to construct an inner framework for a picture of the phenomenon in question. Then there is no feedback from the senses and the possibility of creating an illusion is much greater. Our thought perception concentrates just as well on this inner framework, but lacks the guidelines of the wholeness belonging to the phenomenon. At times, this leaves reasoning to itself. Knowing that, however, one has to wait until experience or other people’s relevant findings confirm or reject parts or the entire initial theoretical framework. In a process of this kind, one can enliven and develop the two described aspects of thought perception – the immediate (intuitive) and the searching – by drawing plants in development or practicing other kinds of artistic work related to nature.

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\(^2\) fMRI, functional Magnetic Resonance Imaging is a technique enabling direct 3 dimensional or cross sectional observation of blood concentrations in the brain and hence of the centres of neuronal activity.
Fig. 5 shows sketches of a real bean plant from 5th to 18th day after the germination started. Fig. 6 is a construction, an attempt to follow two natural principles to see if they together can explain how a fruit develops in two dimensions. Both belong to my own exercises when I tried to establish the same kind of perceptive thinking as a tool for my inner work on theoretical themes as required by observations in nature. By careful and attentive drawing of such phenomena one counteracts the tendency to loose oneself in abstract theoretical speculations. Ones thinking develops a concrete, wholistic approach to things.

There are other ways of avoiding the construction of false mental models. One such way is to check what the opposite of the phenomenon you are studying would be and thereby placing it into a much bigger picture. Enduring search over longer periods of time, steadily adding more to the first picture and always being ready to alter it, will sooner or later lead to convincing results. In other words, deliberately see the phenomenon from so many angles as you possibly can, and doing that, also be aware of your personal inclinations, such as your basic beliefs. What makes this worthwhile are the moments when one reaches a point that allows an instantaneous insight, a stage where your thinking perceives the complete picture as if it were one belonging to the wholeness of outer nature. So in my view it is certainly necessary to go through stages of immediate comprehension. But these stages might equally well be the result of prolonged studies and gathering together of contextual material.

So far in this chapter I have tried to explain what I understand by the term extended role of perception in Waldorf teaching mentioned in section 1.2 together with an outline of the method I practise on that base. In more detail, my study has the following aim:
1: To re-establish in part Rudolf Steiner’s view of the human being.
2: To interpret biological and neurobiological findings from the point of view of Waldorf education.
3: Discussion, including a comparison between some of these interpretations and the corresponding views held by bio scientists.

All the three parts of the study involve the task of comparing. In the first one, statements from Steiner will be compared to other findings in literature, art and my personal experiential discoveries. In the second part, biological and neurobiological findings are compared to the pedagogical view of the child and some of its consequences for teaching, as taught by Steiner. And in the third part I will compare these interpretations with the conclusions drawn from the same material by neuroscientists. Of these sources of knowledge, only my personal experiences are gathered directly from the lifeworld, the world of lived experience. Now, obviously, there are experiences behind all scientific findings, all pieces of art, historical descriptions, myths and tales. But when this knowledge reaches me, it may not be so close to the lifeworld anymore. Still, the study of other peoples findings belong to the empirical methods of phenomenology, as van Manen puts it (2002): *the object of phenomenological research is to “borrow” other people’s experiences.* This is the first step in my method before comparing different experiences to each other.

More general, I am taking two stances in my study: One within the frame of the spiritual sciences and one within the frame of the general natural sciences. My method as described is within the boundaries of a qualitative phenomenological basic study.
3. The human being in a Waldorf educational context

In this chapter I explain the basic concepts in Waldorf teaching and an introduction to their significance during childhood and adolescence. The chapter is built on works of Rudolf Steiner, pieces of art, developmental biology and personal observations.

It appears to me that the question of what the human being is, remains unsolved in western society to day. And if I should be right in my assumption, how could we expect long term success from schools and educational institutions? The Waldorf schools are with respect to this question in a particular situation since they regard the human being as primarily spiritual, although it should be appreciated that these schools are as yet only in their very first stage of development towards a full understanding of what this might imply.

Despite enormous psychological and psychiatric efforts during the last two centuries, a picture of the human being capable of explaining some fundamental questions, such as where do we come from, where do we go after death and where are we every night during sleep, is not generally available. These questions are not even considered as having an influence on the educational relations of a child during its school years. Now, since I am no spiritual scientist, the deeper questions of what the human being really is shall be left to more competent investigators than me. What I will attempt in this chapter, however, is to bring to some degree of clarity the concepts needed for normal education in the Waldorf schools to day. These are the concepts of the astral body, the etheric body and the physical body and some aspects of how they may work as tools for the human spirit and soul.

For a start, consider a work of one of last century’s most celebrated Norwegian painters, Edvard Munch, an artist now looked upon as a master in exploring the human soul.
Figure 7 shows one of Munch’s murals in the celebration hall of the University of Oslo. Its dimensions are about 4.5 x 3 meters and is situated on the left side of the podium as a next neighbour to the famous painting of the sun. It was painted towards the end of the period 1909 – 1916.

Placing the picture in this position, next to the picture of the sun, underscores its title: the morning sun flows into the scene and causes the awakening. The body of a sleeping man appears on a “mattress” of water-like consistence. The body has not been given a normal skin
colour, but is depicted in a light greyish shade, possibly indicating that it is less important in this setting. The arms are out of proportion, the shapes deviating strongly from normal anatomy. Centred round the knees, a colourful outburst surrounds the body and causes waves on the watery “mattress”. Attached to the feet of the sleeping person sits a yellow man with thin, weak arms that contrast the thick, coarsely shaped ones of the sleeping body. This yellow person stretches his left arm against an imaginary waterfall that seems to be in the focus of his interest. Over the head of the sleeping person with his feet on the borderline between the imaginary background and the sleeping room, stands a man with natural skin colour. His arms are stretched into a region of air or space where two flying creatures and possibly two planets are shown to be present. This region transfers a warm feeling to the part of the body still within it causing the red of his hands and arm. His face, bearing a relieved expression, focuses on this region. Behind and at the right side of him appears something that could be a wing-form in violet.

We can compare this painting to descriptions of the human nature in one of Rudolf Steiner’s basic works in which he deals with the phenomenon of sleep and death (Steiner, 1977, pp. 112-116). Here we find him distinguishing initially between three different regions when researching the “land of spirit”. The spiritual world has three regions, corresponding to levels of existence in the visible world:

1. The region of “solids”. The volume taken by physical objects appear in the spiritual world as a kind of voided space, but the forces responsible for their shape is perceived as existing around the object. The colour of the object experienced by the eye is in the spiritual world seen as complimentary, i.e. a green stone would appear as red for example.

2. The region of the “sea” or “streams”. Every living plant or animal is part of this sea region. The “eye of the spirit” experiences life as a streaming or moving being. After death one will be amidst the forces that constituted one’s etheric body (life-body) in this region (ibid. p. 116).

3. The region of the “air”. This region consists of emotions penetrating it like the air in the physical world. Here one will meet the powers behind ones astral body, a concept by which Steiner means a non physical unifying organ for the soul qualities (ibid p. 116).
One can add to these findings what Steiner writes concerning the astral body during sleep; that it leaves the physical and etheric body together with the “I” (ibid. p. 82) and that it enters the body through the head when waking up. Also, Steiner points out that thought is experienced as heat in another of these regions (ibid. p. 114).

Based on these descriptions given by Steiner, I draw the conclusion that this painting actually depicts one awakening man. The title of the painting could just as well have been given with the word man in singular. “Man” in the Norwegian spelling of the time was MAND, while the plural form would have been MÆND. Since Munch often wrote his titles in capital letters and was famous for being rather liberal with his spelling practice (Stenersen, 1968, p. 135), a capital A with a somewhat extended horizontal bar to the right would easily be taken for an Æ. A final decision on the official title would still no doubt be the one cited above since the plural form agrees with what most people agree to see in the painting.

The possibility exists that Edvard Munch may have read the first edition of Steiner’s ”Die Geheimwissenschaft im Umriss” published in Germany in 1910. He spoke and read German fluently. He could also have attended Steiner’s lectures in Christiania (Oslo) in June 1912 or October 1913, where similar ideas as those described above were presented. He may also have come into contact with Steiner or his views on the human being just before or just after the turn of the century in Berlin, where Steiner held open lectures in the so called “Arbeiterbildungsschule” and published articles in different papers.

As a consequence of the descriptions of Munch’s character given both by Eggum (1983) and Stenersen (1968), however, it is most unlikely that Munch would have painted something not truly out of his own discoveries. Even more so, since this project was one of extreme national pride at the time after the liberation from the union with Sweden in 1905 and the effort to show the world that Norway was capable of matching a world standard on the cultural arena.

The interesting thing about this painting is that it in addition to depicting the three members of the human being, the physical, etheric and astral bodies, which is the theme in this chapter, it also opens for the understanding of Steiner’s view of the etheric body as a separate being not necessarily bound to a body but one belonging to and strengthened by its own life element which permeates the world. By looking at the etheric forces this way, Steiner’s description of how the child is enlivened by this element, especially during the first years of life, may
become more understandable. Also in connection with the “air” region, Munch’s painting in my view shows the arms of the astral body in contact with what Steiner denotes a common spiritualized astrality, a contact prevailing throughout childhood until puberty, but for an adult only functional during the time of sleep.

3.1 The task of the Waldorf teacher

Steiner defines the aim of education and teaching with the following words:

The task of education conceived in the spiritual sense is to bring the soulspirit into harmony with the triple-body\(^3\) (that is the astral, etheric and physical bodies taken together). They must come into harmony with one another. They must be attuned to one another; for when the child is born into the physical world, they do not as yet fit one another. The task of the educator, and of the teacher too, is the mutual attunement of these two members (Steiner, 1980a, p.23 my translation, app.4).

With the word soulspirit Steiner means the unity of the human spirit which for the purpose of this paper could be taken as the concept of the I and the soul together. The soul in Steiner’s nomenclature is also a non physical entity that may be subdivided into sentient soul intellectual soul and consciousness soul.

This soulspirit is to incarnate and to be harmonized with the triple-body consisting of astral body, etheric body and physical body.

In the following, I will use the term soulspirit for the higher human being and astral body as the term for the three soul elements: thought, feeling and will. I will also use the term etheric body and physical body or simply “body”.

Furthermore, the picture of the human being presented to Waldorf teachers could be as follows: The unity of the soulspirit exists before the physical incarnation and spends a long time searching for parents with a genetic constitution, soul abilities and a world view that can support the specific needs of the person in question. If successful, the physical incarnation

\(^3\) My word for “Körperleib”
starts and is brought to a first stage; the birth. From this time on a constant adjustment of the physical body to the needs of the individual takes place through childhood and adolescence until at least the 21’st year. The main idea here is to give the soulspirit the opportunity to create “organs” in the astral-, etheric- and physical bodies suited to handle a physical and social life without loosing grip of its personal developmental aims. This conveys the task to the teacher to help build up a triple-body capable of supporting each individuality in order that it may realise its full capacity in its lifetime. Seen from this angle, the what, how and why of pedagogy must be aimed at achieving these goals when selecting the content for teaching. The normal way of focusing on useful knowledge alone, is for this reason largely out of the question for a Waldorf teacher of the first school years.

3.2 The physical body
The meaning of the term physical body is not different from its ordinary meaning, as seen from a Waldorf standpoint. It will be described where relevant in terms of common biological and anatomical terms.

3.3 The etheric body
Many scientists are aware of the peculiarities of living organisms. The neuroscientist Gerald Hüther (2006b, p.33) describes one of them in this way:

What makes a living system unique is not the complexity of its working processes, but its capability to govern and direct these processes in such a way that the system in question also remains stable when it according to the laws of physics and chemistry really should deteriorate (my translation, app.5).

And then he enters into the consequences of his argument:

The old and still widely distributed idea that a living being is solely a particularly complex form of matter which could be characterised through chemical or physical principles is thus useless for the comprehension and analysis of living structures. [...] What every living being accordingly must possess, and what makes it living in the first place, is an internally adapted plan, a controller of the inner organisation and a matrix
governing its structure, in other words an inner picture of how it has to be, or could become. (my translation, my italics, app.6).

Steiner uses similar characteristics, describing the etheric body as the architect of the physical body, a form inducing, sculpturing entity capable of remembering each cell of the body and its function. This view is supported by the fact that in approximately 7 years the entire mass of the human body is exchanged by new matter through the flow of nutritional elements and it is still possible to recognise the face, the way of walking, the way of encountering different situations by way of body language etc. after this time period.

A consequence of this architect function of the etheric body would be that if this part of the human entity is weak for some reason, then the physical body will lose its normal shape. This is indicated in the above painting by Munch, his yellow etheric man has unusually thin arms while the physical man has very thick and extremely unstructured arms. In Steiner’s view the etheric body is not autonomous before approximately the seventh year. Before this time it is closely interwoven with the etheric forces of the mother.

3.3.1 The etheric body, thinking and memory

Some time about the seventh year of age, the etheric body leaves the physical body to a certain degree. Steiner expresses this as follows (1977b, p. 146):

Thoughts protrude in such a way that they after the 7th year no longer touch the physical body. When the human being thinks, *it thinks in the element of the etheric* which fills its physical body. (My translation, my italics, app.7).

This does not mean that it leaves the space occupied also by the body, but rather that it loses the direct contact with it while still being able to influence as an “outsider”. This represents the start of the personalized, reflective thinking.

Steiner points out that the etheric body and not the brain is the carrier of memory (Steiner 1979, pp. 40-41). This can be understood when studying what many people have experienced in situations of shock. Under circumstances of this kind the etheric body loses its normal relationship to the body and the person is able to overlook his whole life, every single incident
in one magnificent tableau, proving a fantastic ability to memorise a complete human life (Moody, 1977, pp.51-52). This is also the case at the time of death (ibid. p.41). Reasons for not accepting the brain as the site of memory will be given in chapter 4.5 “Memory” and in the final discussion of chapter 5.2.

3.3.2 The etheric body and gender

The differences in gender are a rather more complex matter seen from this angle of view (Steiner 1976, p.65):

The human being is in fact man or woman only with respect to the physical body. While the physical body is male, the etheric body is female and vice versa. [...] The human being carries the opposite gender as etheric body within itself (my translation, app.8).

While men generally have a stronger physical body, women may have a stronger etheric body and this may account for their longer lifespan. Another phenomenon to be mentioned here is the fact that when Landstad, Asbjørnsen, Moe and others were collecting Norwegian fairytales around 1850, practically all people capable of telling one of the old stories in its completeness were women. This extremely good memory may be attributed to the more forceful female etheric body.

3.4 The astral body

In psychology, it is generally recognised that the soul (psyche) expresses itself through its thoughts, feelings and impulses of action. Gerald Hüther uses these terms when characterising the diversities of the human soul and keeps consequently to these characterisations of soul activity in two of his books referred to in this paper (Hüther 2006a and 2006b).

In Waldorf teaching the complexity of the soul, mainly represented by its aspect of the astral body, is treated with special thoroughness. As the carrier of feelings, thoughts and impulses of will (or action) (Steiner, 1980a p.84) it constitutes a constant focus of interest in teaching. As described, the astral body is seen as a primary receiving organisation for the soulspirit coming from the spiritual world to build up a physical body. In doing this, it still remains an outside element and demonstrates this every night when it leaves the etheric-physical unit during sleep to reactivate its life intentions. If this aspect is taken seriously, the teacher will have a
tool for deciding whether or not his teaching is of deeper relevance for a specific child. If he checks the child’s feelings and thoughts about the themes of the previous day, he may discover whether these themes are concurrent with the child’s personal “life intentions” or not.

In order to get an impression of how the astral body works relative to time in the physical body, I quote Wolfgang Schad (1986, p.18, my translation, app.9):

That the past, the present and the future can be at work simultaneously in the human individuality, is characterising it both as soul- and biological being. This shows itself clearly at the time of birth. The child’s senses and nervous system are already so far developed before birth that it could have taken place two months earlier. The fact that children have survived birth after only seven months of pregnancy, even without the technical aids of our time, should be seen against this background. The metabolic system and the organisation of the limbs are on the other hand in a very premature stage as seen from a physiological point of view. For a number of months the child will still need its special transition diet: mother’s milk.

On the average, it will last about one year after birth before arms and feet reaches the maturity of the nervous system, and so the ability to stand and walk. At the moment of birth, not before and no later, but exactly in the right moment, the rhythmical organ functions get ready for the outer world: The lungs expand, the intermediate wall of the heart closes. The rhythmical human being is born exactly at birth.

Schad describes here how the biological events in the early life of a child can be understood as divided into three functional systems. The nervous system with the brain, spinal chord and the nervous network of the body, the rhythmical system with lungs, heart and blood, and finally the limbs with their muscular systems and the metabolic systems including digestion. These three systems display a marked difference in maturity at the moment of birth. Has this heterochronic biological development something to do with the functions of the human astral body, as Schad indicates?

Starting with the nervous system, it should not be necessary to document that at least the brain with some 120 billion nerve cells serves processes of thought and perception as a main task.
And thoughts as well as perceptions have a quick nature, they move rapidly from one scene to another or follow a logical trail at great speed.

It is more difficult at first to see that lungs, heart and blood circulation serve the human feelings. But if one considers the effects of strong feelings, some observations will be enlightening. In the case of a shock, the flow of blood is immediately reduced. Blood withdraws from the face and skin and accumulates in the inner organs. The lungs fill with air and keep it for some time, the heart rate is drastically reduced and brain damage may result since also the blood thickens and carries less oxygen. Fear is accompanied by increased heart rate, excessive breathing and increased blood flow. Anger is also followed by increased lung activity, heartbeat, blood flow to the skin and muscles initiated by the ejection of hormones such as adrenalin. The feeling of shame causes immediate blood flow to the face and throat. In fact, all change in feelings is followed by a change in pulse, way of breathing or blood pressure and often all three of them.

When trying to establish the feelings showed in Ekman’s seven universal facial expressions (Figure 8 below), one should be able to detect at least some of these physiological effects as lived experience.

![Figure 8. Ekman’s seven universal facial expressions (From Kandel, 2007, p.386).](image-url)
with mirror neurons). Other examples of this could be performing artists of song, drama and
dance. They need more time than what mere thinking requires, in order to put themselves in
the mood necessary for what they wish to display, otherwise the performance becomes
superficial and not trustworthy.

I believe one has to be made aware that thoughts may have a “direction” in the sense that they
evoke a feeling of the necessity to act. While this feeling leads to quick physical response in
small children, it often requires minutes, hours or even weeks for a grown up to transfer it into
suitable action.

As pointed out by Schad, one can observe the close relationships between the thinking,
feeling and will elements of the astral body and the nervous system, the rhythmical system
and the system of the limbs. This I believe agrees with Steiner’s view of the astral body in its
basic physical significance.

Steiner also mentions that the astral body undergoes a form of rhythmical change every seven
days. Though obvious to teachers who have read this by Steiner and therefore have had the
opportunity to focus on it in their practical experience, I shall still comment further on the
biological side of this in chapter 4.1

3.4.1 The Astral body and gender

As a consequence of Steiner’s research, one must consider the human being before
incarnation as sexually undifferentiated:

It is of great importance to keep in mind that the human principle of gender only
applies after the entrance into the physical world. […] But in reality it must be
understood that up till the time of puberty, man lives as a general being of humanity.
The astral body is both male and female at the same time (Steiner 1978b, p. 242 my
translation, app.10).

These sayings rise a number of questions, two of which I shall look into in more detail in
chapter 4. First, if the astral body is composed of forces common to both men and women,
and if this astral body is adjusting for itself a physical body to its needs, how can one explain
that the physical human being is not bisexual? And secondly, since the sex of the physical
body is genetically determined at the conception, how could one understand that “one lives
like a general being of humanity until puberty”? The answers to these questions would determine whether girls and boys need different didactic measures or not during their school time.

3.5 Significances of the astral and etheric bodies during the school years

Consider once again the peculiar fact that we are born at three different levels of biological completion so to speak, and that these levels correspond to the nature of our soul expressions thoughts, feelings and will as shown above. Viewing this from a Waldorf educational standpoint where the astral body is regarded as existing prior to the physical body, the explanation for this fact can only be that the astral forces must be working very closely into the etheric-physical forces for this to take place. This agrees with Steiner’s description of the child’s situation during the first seven years of life (Steiner 1972, p.54):

[..] until the change of the first teeth, the soulspirit and the etheric-physical constitutes one unity. [..] What earlier co-worked in shaping the teeth, is detached in an ideal rise of force, becomes memory formation, memory exactness etc. (my translation, app.11).

Then comes a time when this unit splits up (ibid. p.53):

[..] until the change of the first teeth, the etheric body is closely, very closely connected to the physical body. Then it is liberated to some extent. [..] When the etheric body has split off, the forces that earlier was occupied with the physical body, starts to function in a soul manner (my translation, app.12).

It is not generally recognised that this change sometime around the seventh year is rather extreme. Before this change, the child lived in a situation where the impressions and feelings of its soulspirit had direct consequences for its physical development. By this I mean the forced condition children of this age experience in having to copy their environment. Studying this copying ability at its extreme, the following findings have been made in some 60 cases: Children who grow up together with animals alone, copy the behaviour of the animal; they will not be walking on two legs, they will not learn to speak and they will not be able to think and reason like a normal human being (Lindholm 2002).
So this splitting up of the etheric and physical bodies changes the conditions for learning and leaves the child a first freedom from the influence of the outer world. One of the consequences of this liberation is that the immediate relationship of the three members of the astral body to the three biological systems of the physical body, becomes less explicit. This means that the nervous system, rhythmical system and will function is given more freedom in relation to the immediate situation of the astral body. An example of this is that a child after the 7th year does not bring its soul experiences so fast into the action of the body as earlier on, it will spend more time on the experiencing phase and can remain at ease during a teaching hour. Another consequence becomes apparent when one asks what the basic condition is for a person to be able to understand the nature of the outer world. The answer in this context is that our ethical thought which produces the wish to learn has to be separated from nature represented by its own physical body. If this is not the case, the child would remain a part of the outer reality and would have to depend entirely on what it meets there. In this situation the child has no possibility to evaluate the consequences of what it does and should not be held responsible for it. You can not be part of something and still judge that something objectively.

This may seem to contradict the idea of the phenomenologists, that “one must experience something within oneself to really comprehend it” as re-established by Rizzolatti et al. (2006). In order to see the difference here, one must distinguish between the experiences imposed on the small child, experiences which leave the child no freedom to reflect, and the controlled experiences by a grown up person capable of evaluating it out of the freedom gradually won by this splitting up process.

Looking closer at the situation for a child before this change at roughly seven years age, two implications for teaching may be seen (Steiner, 1978b, p. 157):

There everything of the soul-spiritual works so that it really consists of physical-bodily processes, and all physical-bodily processes are at the same time soul-spiritual ones. It is all governed from the head of the child with respect to the sculptural shaping of the body, (my translation, app.13).

This means in Steiner’s view that a materialistic valuation of the child’s development is largely correct for this age group (ibid. p.157). By the word materialistic he understands a
physical picture of the human development out of which the soulspirit emerges. In this time, the etheric body of the child is closely connected to the physical body as mentioned above, but it is also linked to the ether forces of its surroundings of which the mother’s is usually the dominating one. These last connections enable the child to learn by copying what it experiences. The first connection should be understood as the condition for building up the brain and the organs of the body concurrent with what it meets on the scene of the outer world. As the etheric forces are occupied with the body, and since these forces are also the carriers of memory, the child should not be forced into learning processes where memorising is required. This could cause functional organ deficiency in coming years. Teaching conveyed as distinct logical truths before this age should therefore be regarded as indoctrination, since the child has no freedom to avoid such thoughts becoming physiology in the brain.

At the time of change of the first teeth, when all the new teeth to come are hardened and can be seen on x-ray photos, the active building forces partly leave the head and concentrates on developing the rhythmical system lower down in the body. But not only that (Ibid. p.158):

There certain forces become more soul-spiritual. [...] They do not work to the same extent in the physical happenings as before, on the contrary [they work] detached from the body in the systems of breathing and circulation (my translation, app.14).

In the light of the quotations on page 33, the forces in question are etheric forces in a process of establishing memory. This means that the etheric body from now on supports the feelings of the astral body and thereby making feelings the gate to thinking which again triggers memory (The bases for this idea is more accurately explained below). It should be emphasised here that the feelings are still a part of the physical body and still works closely with the senses while the thinking is not. Steiner explains (1977b, p. 148):

Just like reasoning is connected to the physical organism until the 7th year of life, so the feeling and will is connected to the physical organism until 14th, 15th year, until puberty, (my translation, app.15).

3.5.1 Memory and perception
According to Steiner, memory is not a simple concept. For one thing, there exists no thought storage function ((1977b, p.147):
No thought is stored, but something else is stored by which the thought can re-ignite again and again, (my translation, app.16).

What happens when you acquire a memory by perceiving the outer world, could be summed up in the following way (my interpretation of Steiner, ibid. pp. 146-147): First the observer connects thoughts to the experience, then these thoughts create rhythmical vibrations in the physical organs of the body (possibly on cell level) and are memorised (stored) there. As a response to the wish for a recall, the organs repeat the initial vibrations which the perceptive thinking detects and transfers into the original thoughts once again. A pictorial idea of this change of an outer perception through the eye into rhythms of colour, may be experienced when looking for 60 seconds at a medium strong lamp and then switching it off and closing the eyes. Then colours are seen in a regular sequence starting with yellow becoming orange at the periphery and gradually shading into purple as the colours contract towards the centre. Another sequence then starts with purple in the centre surrounded by blue and green bands, before the purple turns into violet with a small blue band on a widening green background. The shapes observed are after some time determined by that of the tungsten filament in the lamp. In my experiment, the sequences differ depending on the type of lamp used. I believe this to be the parallel of sense perception to what Steiner describes here as a process of memory, and I base it on this quotation (ibid. p.146):

Memory is not a function of thoughts sinking into the soul, but rather a consequence of the physical impact on eye and ear which experiences a continuation into the body, in order that an action parallel to thinking is present, and that this parallel action leaves a rhythmical trace.(my translation, app.17).

3.5.2 Pedagogical consequences

This is an attempt to clarify the Waldorf view of how the learning process could take place for age groups between 7 and 9. Primarily, the teacher should not aim at handing over informative material. Since memorising depends entirely on the thoughts of the individual child as described, the content of the teaching should be of a nature capable of firing the child’s inner world of thoughts. Since thoughts at this point in life are integral parts of a recently liberated life body, etheric body, they will greatly influence the child’s well being
and even health situation. One should also bear in mind that thinking in this age is not very intellectual, it is a much closer companion to the feelings than later in life. To reach and activate thought during teaching hours of these first school years, material is necessary that first of all stirs the feelings in an adequate, non-sensational way. The connection here is that physiologically, the etheric forces as carriers of the thinking ability now work in the breathing and circulation system which both Schad and Steiner denote as the arena of the feelings.

All teachers are of course very much concerned about the well being of their children, but this viewpoint represents a new tool for “diagnosis”: to closely follow the effect of one’s teaching on the way the children breathe. In the next chapter, anatomical reasons for the significance of the breathing process related to teaching will be treated in section 4.3.

On realising this, Waldorf teachers wish to let the children live and flourish in a pictorial world built up by fairy tales, mythology and stories capable of growing with the child into new levels of interpretation. After years of training feelings like those of truth, hope and courage, the corresponding physiology to seize the personal will has been built up and the young person is in a position to develop his or her own independent, intellectual thinking capacity after puberty. The significance of the will element necessary in building brain structures shall also be discussed in section 4.4.

Reflecting on the descriptions above, one discovers that the experience of the seven year old is that of liberty in the realm of thought. The child’s astral body, little by little administering the physical body, is building a physiology capable of mirroring its interests. The child needs time to digest, and make conscious by way of thinking, its own relation to the material encountered in school. The child is no longer just a copying individual. Its newly acquired capacity of self-directed thinking leads to a personalised way of remembering. While the younger child may react when a familiar story is told falsely, the seven year old is able to retell the whole story and frequently on its own initiative. This evokes a feeling of freedom on one hand, but at the same time an experience of being responsible, being exposed and able to misjudge. But all this happens mainly on the subconscious level. As a consequence, the child needs the support of an adult, someone that can be admired and trusted. The teacher should be such a loving authority for the child to develop its will powers; the child dares to act when it feels loved and accepted by the grown up even if it does something “wrong”. The extreme sensitivity of the astral body during these years which may well persist throughout life.
depending on the developmental way chosen, calls for a corresponding alertness from the side of the teachers. In this context Steiner looks upon the body including the brain as a “mirroring” device capable of decoding both impulses from its own astral body working from the “outside” and impulses from other sources of which those of the teacher and nature is important (Steiner 1978b p.47). Also he points to the necessity of the teacher to develop “a sense of intuition” for the child’s situation (Steiner1973 p.62). This sensitivity aspect of Waldorf teaching will be discussed further in section 4.6

3.5.3 Puberty

Puberty represents a next and even more dramatic change in the living-conditions for the youth. Steiner formulates the change with these words (Steiner 1978b p. 239):

> At puberty, the human being is thrown out of the world of spirit and soul [the common spiritualized astrality, my add.] and thrown into the outer world perceivable only to its physical body, to its etheric body (my translation, app.18).

At the age of 12-15, young people are cut off from the immediate access to the common spiritualized astrality of the world which has been surrounding and inspiring them since birth. The feelings associated with this are often those of extreme solitude, nakedness and at times fear. Edvard Munch has given a master’s insight into the feelings of this age in his painting “Puberty”:

![Figure 9. Munch: Puberty, 1893 (from Eggum,1983, p.123).](image)
The implication of Steiner’s saying above is that the astral body becomes autonomic first in connection with puberty. Strictly speaking, the conscious thinking before puberty is in an intermediate stage between its splitting off from the physical body at the seven year change and the reunion with the feeling and will part of the astral body during puberty. In this period it is supported by etheric forces that work in a “soul manner” (“auf Seelische Art”), by which I understand a connection to the astral body. With the puberty then, the astral body looses its direct inputs from the common astrality. And again we observe the previously noted relation: One has to gain freedom from something to be able to objectively understand it. Now comes the time to study “the meaning” in nature; the laws of the natural sciences, ecological relationships, man’s emancipation from nature etc. Roughly from the 12th year on, the focus of the child should gradually be withdrawn from training the ability of reasoning in inner pictures and be directed toward relationships in the outer world.

Having gone this very long way before focusing strongly on facts-teaching, the pupil will have a habit of living safely in its inner astral body. After some turbulence during the years of puberty, this ability is re-established as thoroughness of thinking. Or, putting it in normal terms: ability to concentrate. Since the power of intellectual reasoning grows rapidly when the physiology required has been built up, the speed of learning facts will accelerate in this period. – But there is still another side to it: If the education has been successful so far, the young person will change rapidly at this age, often showing quite new gifts and inclinations of the individuality. The time has now passed when teaching can be based on copying under the guidance of an authority. Everything brought up during teaching must be grounded and explained on the basis of reason. Why is this so? As described by Steiner, the Astral body is now expelled from the astral world but does not mingle with the external physical realities. This means that the outer world must be brought to the youth in a way that enlivens feelings and the will to think things over. Theoretical teachings will not suffice for this task since it demands a thorough treatment by logical reasoning alone, and logical thinking only stirs experience when reaching the end point of its process, i.e. the happiness of understanding. For these reasons teachings must also be phenomenological at this point in life. Only experiencing through the senses can establish a trustworthy link to the physical world for most youths of this age. A more differentiated view with respect to this theme will be given in section 5.3.
3.6 The concept of freedom in Waldorf teaching

The Waldorf schools once coined the slogan “education for freedom”, meant to be a main characteristic of the educational intention of these schools. I will try to show what this saying actually would imply in the light of the above presentation of the human being. First a long, but crucial description by Steiner (1974, pp. 72-73):

The odd thing happens that the intellect seizes and realises what has been developed pictorially between the 7th year and puberty. And the human being does not pick up anything with its intellect which is forced upon it intellectually from outside. The human being picks that up with its intellect which has first grown within it out of other sources than the intellect. And then the important thing happens: One has prepared what is to come after puberty for the soundly developing human: The autonomous realisation of what one already has got. Everything one has conceived in a pictorial form, now comes to life in the process of understanding. Man looks into himself. That is seizing its internal being by its self. Then a coming together takes place of the astral body, working musically, with the etheric body working sculpturally [...] and by this unification the human becomes conscious of its own being in a healthy way after puberty. And as these come together, which represents two sides of its nature, the human reaches a rightly felt experience of freedom. (my translation, my italics, app.19).

The way I understand the above quotation, the etheric body transfers even more of its activity out of the physical body than was already there after the 7th year. This would strengthen the element of reason as a purely etherically bound activity on one hand, but reducing the growth and regeneration ability of the physical body on the other unless additional etheric resources are supplied. Secondly, the feeling and will capacity of the astral body now permeating the liberated part of the etheric body, would account for a stronger participation of feelings and impulses for action connected to the individual reasoning, which to me implies that thinking enters a situation where it may lead to practical realisations. This will be looked into two more times in sections 4.9 and 5.5.
3.7 Summary

1. The astral body inspired by the common astrality works in very close contact with the physical body from birth to roughly seven years. In this period, the etheric body is closely related to the ether forces of the child’s surroundings of which the mother’s represents the main influence.

2. In connection with the expulsion of the first teeth, a part of the etheric body is liberated from the physical body enabling the first reflective thinking and an independent memory. Thinking and memory are both functions of the etheric body. But thought processes of the etheric body has immediate consequences for the astral body and may be activated by it, so this part of the etheric body “acts in a soul manner”, as a part of the astral body.

3. During puberty, the feeling and will are detached from the physical body now as functions of a completely liberated astral body. Also in connection with puberty, this personal astral body is ejected from the general, inspiring astral-spiritual outer world. The personal astral body becomes submerged in the outer world where space and time dominates, but never joins this outer world.

4. After puberty, the astral body merges slowly with the etheric body, but not with the physical body. This happens as a consequence of what the pupil has previously grasped as inner pictures and now brings to the surface and understands intellectually through its own activity. This results in a true experience of inner freedom.

Below, I have attempted to make a schematic representation of some of these main changes occurring from birth on to the end of school time in a case where “education to freedom” has been successful. A representation like this can never display the features described since the entities in question are not separable from each other. For example the astral body would never leave the etheric body (apart from periods of sleep). Still, it may serve as an overview of the developmental aspects focused on in this chapter.
Figure 10. Schematic summary of the human three bodies from birth to approximate age 20.

In the above representation the arrival of puberty is drawn as a sharp line. This does not correspond to the reality (which follows a successive order of change), but it is meant to illustrate the sudden experience of being thrown out, being alone that often occur at some point during puberty. This in contrast to the 7 year change which experientially has a less dramatic character. In this drawing, the astral body is shown to emancipate from the physical body in two steps. This is my interpretation based on the above quotations and in accordance with the often repeated statement by Steiner pointing out the astral body as the carrier of thoughts, feelings and impulses of the will.
4. Interpretation of biological findings from the point of view of Waldorf education

In this chapter I compare basic concepts of Waldorf teaching and the way they were described in chapter 3 to findings in biology. This chapter is mainly built on results of biological research within developmental biology and neurobiology. There are also elements based on psychiatry and personal observations.

4.1 The main rhythm of the astral body

Steiner holds that the astral body repeats a rhythmical change in seven days. If my argument in the previous section 3.4 is correct, i.e. that the astral body has a direct influence on the physiological systems of the physical body, one would expect that the typical functions of the astral body such as blood circulation is subjected to this seven day rhythm in one way or another. This seems to be the case. Below I cite Endres & Schad (2002, pp.136-137):

The weekly rhythm, which for a long time was considered to be nothing more than a conventional cultural rhythm, is also just as much of a biological rhythm. Its special feature is that it is not produced spontaneously by the organism like the other rhythms mentioned so far, but is triggered in reaction to external, interfering stimuli.

To me this saying underscores the astral nature of the rhythm; it is through our astral body, our soul engagement that we meet and react to the external things and other people.

Then the authors go on to the factual implications of this rhythm:

The weekly rhythm applies in particular to the healing of injuries. [...] The red blood corpuscles are replenished from the bone marrow in a weekly rhythm after a person has donated blood or suffered an accident with major blood loss.

4.2 The question of gender

In this section I continue to use the terms male and female in their meanings with respect to the physical body of the genders. Steiner’s view of the human being implies that the etheric body of a woman is male, the etheric body of a man female, while both sexes have a combined female/male astral body. Concentrating on the female gender, the only way I can
understand Steiner on this topic is by assuming that the characteristics normally associated with being female, the female way of feeling, thinking and acting and the female physical body must be interdependent in some way. Using Steiner’s terminology, this means to me that the astral body as the first “body tool” entered by the soulspirit and hence the initiator of the deeper incarnation into etheric- and physical bodies, is imposing its being on the etheric body supplied through the mother at some point during the early stages of embryonic life. This will for some reason result in a male etheric body which is the condition for development of a female physical body. Since Steiner holds that the astral body is “both male and female at the same time”, the question arises as to what happens to these two soul characteristics when a child descends into a physical body. Assuming that incarnation involves leaving out the astral qualities belonging to the opposite sex, and further that there exists a one to one relation in terms of male/female astral power to incarnate as suggested by male/female birth numbers during times of peace, what are the functions of the two gender qualities of a girl’s astral body after birth? I see two possible interpretations:

1. The female part of her astral body conquers the scene and causes her expressions of feelings, thoughts and actions working through her male etheric body, or
2. The male part of her astral body through its occupation with her male etheric body takes control and causes the female soul expressions.

To shed light on this problem, a first question arising from my interpretation of Steiner above must be faced: Why does the astral body, when moving into contact with the physical body not impregnate it with its complete male/female nature, but only one of them? An answer to this question was suggested from a biological standpoint by Michaela Glöckler in a booklet (1989, p.22, my translation, app.20):

If you imagine a 3-4 week old embryo, you will see the following: The so called germ cells start to migrate into the regions of the future genitalia and induce the development of the gonad. At first both sexes set up exactly the same primitive sex cords and ducts (Wolfian and Müllerian) as required for a double gender. And this completely indifferent look of the sex organs lasts until the end of the second month of life.

After studying the embryological bases for this saying, I found that Glöckler was right in the main characterization: Despite the fact that the sex is determined genetically at conception,
something rather unexpected takes place since the whole embryonic period (until the fetal period starts in the 9th week) shows a physiology as if both sexes should develop in one body. There is some dispute, however, as to the duration of this period of indifference. Moore (1977, p. 231) writes that “Before the seventh week of embryonic life, the gonads of both sexes are identical in appearance”, a saying that is also confirmed by Grays Anatomy (1977, p. 1209). But this two week difference in observed facts may stem from another irregularity of the human development which is pointed out by Schad (1986, p.17, my translation, app.21): “Equally old Embryos at this stage can quite normally be differently far developed”.

Some of the study material (Embryo Images Online, Internal Genitalia, 9,10,10a,14 and 16) is shown below:

![Diagram of embryonic development](image)

The primordial germ cells become surrounded by cells of the primitive sex cords. At this stage the gonad is "indifferent," as one cannot morphologically distinguish between the male and female.

<table>
<thead>
<tr>
<th>Species:</th>
<th>Internal Genitalia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Gestation:</td>
<td>9 of 28</td>
</tr>
<tr>
<td>Approx. Human Age:</td>
<td></td>
</tr>
<tr>
<td>View:</td>
<td></td>
</tr>
</tbody>
</table>

Figure 11. gives a drawn representation of the situation at about 3 weeks (left half).
In addition to the mesonephric duct, a paramesonephric duct forms from the epithelium on the surface of the urogenital ridge. In the male, the mesonephric duct is of greater significance, whereas in the female, the paramesonephric duct is predominant.

These micrographs show the urogenital ridge, the cut surface of the developing gonad, mesonephric and paramesonephric ducts, and the mesonephros.

Figure 12. Micrographs of the Wolffian ducts (male, green) and Müllerian ducts (female, yellow). A balanced nature at of the male/female situation at this stage seems to exist. (The photos are from a mouse embryo of 11 days which correspond to the human development after approximately 6 weeks).
In the female, the mesonephric ducts degenerate, while the paramesonephric ducts form the fallopian tubes and uterus.

Figure 13. Roughly in the 9th week, the male (Wolffian) ducts degenerate in the female, while the Müllerian ducts transform into fallopian tubes and uterus.

In the male, the paramesonephric ducts degenerate, while the mesonephric ducts (ductus deferens) lead from the testis to the prostatic region. The prostate is located between the bladder and gut.
I interpret the figures 11 to 13 in this way: The astral body *does* impress the physical body with its male/female character, but only for a short period. Then the genetically determined sex takes over control and the complementary organs nearly disappear as physical reality. Steiner’s research (1979c, p.55) reveals that the astral body and the etheric body first start to co-work on the physical human body at approximately the third week. This incident seems to be followed by immediate impression of the male/female nature of the astral body as seen above. On this background, I find Steiner’s description of the astral body as a carrier of both female and male principles supported. So this answers my first question at the end of section 3.4.1 on why the human being is not bisexual.

The next step in finding an answer to my questions 1 or 2 in this chapter, involve a study where I try to follow the “loosing” astral gender character to see if it is simply expelled or perform physically traceable actions. Whether male or female, the order of development of the three physical systems shows a differentiation with respect to time as treated in 3.4. The nervous system including the brain seems to be privileged and comes first into physical development as soon as the sex is determined. This becomes obvious from the micrographs below, (Embryo images online, Brain, 15, 17 and 18):

**By the beginning of the fetal period, the cerebellar plate begins to acquire differentiated cell types.**

Figure 14. Roughly in the 9th week, the female (Müllerian) ducts degenerate in the male, while the Wolffian ducts connect to the testis and lead into the prostatic region.

Figure 15 As either the male or the female disposition degenerates, the differentiation of the brain starts. Interestingly, this major change where the brain development becomes important has called for a change of name; from the 9th week on the embryo is called fetus.
Development of the diencephalon also entails formation of the hypothalamus and thalamus.

Figure 16. As either the male or the female disposition degenerates, the differentiation of the brain starts. It is interesting to note that these first developmental steps after the determination of the gender include the hypothalamus which is also associated with sexually controlled behaviour. Kimura (1992, p.82) writes “The area in the brain that organizes female and male reproductive behaviour is the hypothalamus”.

The rostral-most portion of the prosencephalon, the telencephalon, expands posteriorly and laterally as the cerebral hemispheres.

Figure 17. As either the male or the female disposition degenerates, the expansion of the hemispheres takes place.
These micrographs seen in a Waldorf educational context clarifies to me that the astral body moves into close contact with the physical body at this stage, a situation largely continued until puberty. But to find out how the astral body relates to the etheric body, further facts must be investigated. For a start: Why is it that the degeneration of the reproductive organs of the other gender is paralleled by a fast build up of the brain? Glöckler (ibid. p. 24, my translation, app.22) has discovered this fact and hypothesizes a possible reason for it. She quotes Steiner:

We owe the impulse for brain development to the sacrifice of the reproductive power of the opposite sex.

What would that imply? What are the characteristics of the reproductive power of the two genders? Perhaps one might say: The man is heavier with more muscular mass. His genitals are directed outward, they exhibit a dynamic character and may produce 1,5 million sperms a day. The woman is lighter built with less muscular mass. Her genitals are directed inward, functioning in a slow but consistent rhythm. All the ova she will have in her lifetime is already there at the time of birth and is then matured one by one until the menopause. These qualities when generalised will also fit the description of the opposite gender: In the case of the woman, this would explain why she is directed towards the outer world with a social focus, she is fast in understanding her own feelings, often creative and productive. She “sees” immediately the feelings and situations of other people. She can easily pick up new thoughts and leave old ones and so meet other people in an open, stimulating way. The man on the other hand, would be more inwardly orientated, but still slower in discovering his own feelings, less occupied with social relations, but often with a trustworthy way of keeping to his ideas and to bring them into being in the course of time. In short, he has the tendency in his thinking to leave the outer world out and to stay and mature his thoughts over long periods without being distracted.

Adhering once again to the general case of the female and reflecting on the fetal changes taking place in the 9th week, one can observe how her male sex disposition degenerate parallel to a fast expanding brain development. From the description of the physical male genitalia and that of the female way of behaviour, it is more than likely that Glöckler is right in her assumption that the forces behind the male reproductive system leave their field of activity
and start developing the brain instead. This “male” brain will then be an organ for the female expressions of soul.

These ideas lead me to forward the following interpretation of Steiner on the initial two possibilities of understanding (1 and 2 above): The astral human being remains undistinguished with respect to sexual differentiation throughout life, both male and female parts are present and occupied with their differentiated tasks. The physical organs of the brain as structured by the astral body of the complimentary gender, however, are primarily capable of receiving and serving the astral qualities of the opposite sex. For a woman, this would then indicate the possibility that the female part of her astral body works unconsciously as governor of the forces behind the female physical body, while her male part of the astral body carries her conscious expressions of soul. The answer to my question can on this background only be the number 2 interpretation: The male part of the astral body of females through its occupation with etheric and physical bodies is the cause of the qualities displayed in the emotions, thoughts and behaviour of women. My assumption that incarnation involves leaving out the astral qualities belonging to the opposite sex is therefore not correct.

4.2.1 Brain and gender

Taking these considerations as a working hypothesis and looking for possible consequences of it, I would expect that there must be sexual differences either in structural build up or in the way males and females use their brain organs. There are indeed neurobiologists who claim that such differences exists, but others again argue that individual differences could be just as big independently of gender. The general attitude at present seems to be that sexual brain differences in the neuronal networks are of little significance if they exist at all. It has been shown, however, that the sexes use their brains differently. Kimura (1992, pp. 86-87) presented relationships between damage to the anterior and posterior left brain half and the liability of the two genders to suffer afasia and apraxia. This would indicate that while women tend to utilize the fast cortex of the left forebrain for controlling speech and hand movements, men tend to use the left hindbrain for the same tasks. This may seem to explain the fact that women outperform men on precision manual tasks involving fine-motor coordination (ibid. p.82) while men are more accurate than women in target directed motor skills (ibid. p.83) which involve the coordination of eyesight and muscle power.
In my own teaching practice in Waldorf schools where the pupils have to write much more than in normal schools since they produce their own textbooks, I have noted that girls are more productive in finding words and in precisely describing their experiences in natural science lessons than boys are. This may not be so in a specific case, but is too frequent to be insignificant.
In the PET scans\(^4\) above, the brain activity of different regions are shown in terms of blood concentration. Connected to what has been said about the astral body in its relation to blood flow (sections 3.4 and 4.1), PET scans can visualize the speed at which blood concentrations move as the focus of task is changed by the astral body. To see something, blood assembles in the posterior parts of the brain, a task that most often favour males, while the task of generating words demand that blood concentrates in the anterior part, an activity where women most often outperform men. Apart from the colours used, these scans give an indication of where the astral body is most frequently at work in the brain, left: in men posterior brain, right: in women frontal brain.

Turning now to a remaining, unsolved question: At what point during development does this sexually differentiated use of the brain start? Funded on the fact that brain development starts at the beginning of the fetal period and that it contains virtually all its neurons at the time of birth after the sex is determined physically, a reasonable conclusion would be that the brain is used in a differentiated manner from the very start. However, if my assumptions above reflect reality, i.e. that the astral-etheric forces of the opposite sex leave their constructional work on the reproductive organs and concentrate on the brain instead, they would be tied up by this individualizing process “in close contact with the physical body” until the 7\(^{th}\) year when the etheric body is partly detached. Since this part of the etheric body is occupied with the brain, I

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\(^4\) PET scans or Positron Emission Tomography involve the use of injections into the blood of the patient of radioactive, positron emitting compounds. The positrons annihilate electrons in the blood flow resulting in emission of gamma rays which in turn are identified by the gamma sensor system and computed to pictures of selected regions of the body, for example the brain.
further assume that it coincides with the part of the etheric body which is liberated to carry thoughts and memory. In accordance with the descriptions in chapter 3.5, this would initiate the oncoming individual access to the brain from the side of the astral body. This access, however, is restricted to the astral forces co-working with the etheric body in “restructuring” the brain, in other words the part of ones astral body with the quality of the opposite sex. The main liberation of the astral body have to wait until puberty as described, and only then the personalized gender specific astral body comes into its full expression. The astral body has to leave its tight cooperation with the physical body to be able to reflect, feel and act out of its own nature through the physical apparatus of the brain. Based on this argumentation, I can see a slow development from the 7th year on where the child gradually conforms to its astral sexual expression which makes a leap into fulfilment at puberty. To me, this would answer the second question in 3.4.1 of how one could understand Steiner’s saying that “one lives like a general being of humanity [not really differentiated by gender, my add.] until puberty.”

4.2.2 Sex differences related to the use of the brain and their consequences for teaching practices

What consequences should these findings impose on teaching practices? The findings of 4.2.1 apply after entering puberty, i.e. to the 11-12 year olds and above. On this background it should be evident that teaching after puberty must be different for the two sexes since the girls obviously are favoured by a shifting situation of learning where they are given the opportunity to exercise their linguistic abilities, formulate material in their own words and have a vivid exchange of views in a socially stimulating atmosphere. This would also call for a faster progress in terms of treated items. Phenomenological teaching must be faster and include colours, smells and a shifting scene where possible. The boys on the other hand should have more time to go deeply into material which engages them and a teaching based more strongly on visual aspects. Also, they often need a more supportive follow up.

This would not necessarily require separated classrooms and specialised teachers for some classes, because it is also important that the genders follow each other in this life period. Steiner suggests that the boys are present and watch the girls’ classes and vice versa to some extent. In my opinion it should also be possible to work in mixed classes if the teacher is able to alter his/her way of teaching repeatedly in favour of boys, then girls, and so on.
4.3 The breathing process related to teaching

As pointed out in section 3.5.2 Steiner emphasizes the significance of the breathing during all stages of development. He urges teachers to watch the child’s progress, connection to its class situation and well being by noticing how it breathes. And again his main concern is the physiological aspect of the child’s progress (Steiner, 1980, p.25, my translation, app.23a):

The main actions in the upbringing should therefore consist in the observation of everything which rightly organizes the breathing process into the process of nerves and perception.

By this Steiner addresses methodical measures capable of preparing the astral body which is of “air nature” to govern the physical nerve system out of its free individuality. This as opposed to what would happen if the nerve system instead takes control over the breathing process, which may result in nervousness and fear. What implications would that have in terms of physiology? In this context, hormones must be regarded as belonging to the circulatory or rhythmic system of the astral body, but as neurotransmitters they are also main influential elements on the nervous system. From Schad’s discovery of the heterochronism displayed by the three systems - nervous, rhythmical and metabolism-limb system – we know that the nervous system is very fast, acting in milliseconds to a second, while the hormone system uses minutes and thereby places itself in an intermediate position between nerve and metabolic action in terms of speed. To me, this defines hormones as possible mediators between breath and brain, as regulators that should be gradually controlled by the breathing as a result of self-governed feelings and thoughts after the 7th year. I am aware of general ideas of hormone secretion and control of which rhythms play a part. But I would still try to look into this complex matter taking a somewhat mechanical stance.

An introduction to some anatomical facts may be of help in trying to find reasons for this choice. In figure 21 below, a drawing focusing on secondary effects of breathing is shown. By breathing in, the diaphragm is forced downwards thereby increasing venous blood pressure underneath it. The blood is forced against the blood sinus in the lumbacal region of the spinal cord which in turn launches the cerebro spinal fluid (CSF) of the blood into the spinal duct, thereby creating a flow of CFS up and into the brain.
Figure 21. The breath affects the flow of cerebro spinal fluid directly (Vogel, 1979).

The intracranial pressure (ICP) normal in adults sitting or standing averages -10 mmHg but “is a dynamic phenomenon constantly fluctuating in response to activities such as exercise, coughing, straining, arterial pulsation and respiratory cycle” (Wikipedia, 2008a), the lung respiration clearly affected by all the other influences mentioned here. Below in figure 22, a closer look at the paths of the CSF within the brain makes explicit that the pressure variations of this fluid directly affect the pituitary gland (or hypophysis) as it steadily flows past it. Also the hypothalamus, situated immediately under the front part of the third ventricle and largely controlling and inducing the hormone production in the pituitary, is subjected to the pressure differences exerted upon it by the expansion and reduction of this ventricle.
Figure 22. Pathways of the cerebro spinal fluid (green) relative to the pituitary gland (brown) and the brain ventricles during CSF renewal.

According to the Monro-Kellie hypothesis, “compensatory mechanisms are able to maintain a normal ICP for any change in volume less than approximately 100-120 milliliters” (Wikipedia
Even 30% of that volume would be sufficient to account for the expansion observed in MR images of the brain ventricles of adults breathing in properly. From these descriptions it should be possible to see that the pituitary and the hypothalamus are both subjected to a constant “massage” from the CSF, greatly influenced by the breath rhythm provided this is deep enough and distinct enough.

Figure 23. The anterior pituitary hormones. TSH, ACTH, FSH and LH (ICSH) are tropic hormones that stimulate other endocrine glands (Tabers cyclopedic medical dictionary).

In response, the other endocrine glands produce hormones that affect metabolism. For example, TSH stimulates the thyroid gland to produce secondary hormones which inhibit the release of calcium in the blood (Tabers cyclopedic medical dictionary). In addition to the hormones shown in the chart in figure 23, the pituitary is also known to produce endorphins, and from its posterior lobe to liberate oxytocin which increases contractility on smooth muscle of the uterus and vasopressin which induces contraction of smooth muscles of the blood vessels.
The following argument can show that there of necessity must be a close coordination between breathing activity and the pituitary hormones acting on metabolism: When breath rates are increased, more oxygen is absorbed by the lungs and more CO$_2$ is released. This demands a faster metabolism which has to be initiated by increased tropic hormone release. An easy way to achieve the coordination called for, would be by directly influencing the pituitary via the CSF.

Endorphins are produced during “strenuous exercise, excitement and orgasm” (Wikipedia 2008c) all of which involve deeper breath and increased breath rates. It is recognized that deep rhythmical breaths during birth labor increases the strength of the uterus contractions and that this is accompanied by increased amounts of oxytocin being liberated from the posterior lobe of the pituitary. Although I have seen no study confirming that the deep breaths are causing the liberation of oxytocin, it appears likely since oxytocin is produced in neuron cell bodies of the hypothalamus and is just stored in the posterior pituitary (Wikipedia, 2008c). Saying this, I assume that an increased pressure on a closed volume of the hormone would increase the amount penetrating the hormone-blood membrane, while the lowering of the pressure would result in a refill from the hypothalamus. More recent findings have shown that oxytocin-containing cells innervate respiratory-related phrenic motor neurons in the paraventricular nucleus of the hypothalamus, a region known to be involved in respiratory rhythm generation (Mack et al., 2002) This makes explicit that the hypothalamus acts as a hormone producer and a controller of respiration at least in part by means of the same cell network, cells which would then be a physical site where the rhythmical system meets and communicates with the nervous system.

Based on the above anatomical facts and reflections, it follows that the hormone producing nerve cells of the hypothalamus and the pituitary is at least one place where the breathing process meets and influences nerve centers. Breath rhythms will also influence all of the brain through the expansion-contraction of the four brain ventricles, but this rhythm need not be simultaneous with the breath rhythm experienced by the brain cortex and the pituitary since the ventricles are fed with CSF through the central duct of the spinal cord. I fund this on the fact that there is a continuous renewal of the CSF going on, old fluid being absorbed in the superior sagittal sinus while new fluid is supplied from arteries in the choroid plexa of the ventricles (see figure 22). And this renewal would also be depending on the pulse rate of the blood.

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On this background the idea in chapter 3 that the “air nature” of the astral human being, here represented by the lungs, has to work via the etheric, “water nature” of the CSF in order to reach and influence the physical nerve system, may be observed as physiological reality. But, as is most often believed in relevant literature, this could also function the opposite way. I.e. the nerve system could govern the hormone production and so respiration and metabolism. At the 7th year change, when teaching starts “certain forces become more soul spiritual [astral, my add.] […] and work in the systems of breathing and circulation” (Steiner, 1978b, p. 158).

The tales and stories of this time in school leave the child to its own reflections, a liberty to exclude what it can not combine with its field of interest. This thinking and feeling process will naturally have an effect on the child’s breathing, and since the thoughts and feelings are the child’s own, they create an attachment to the nerve system and the brain bearing its personal signature.

4.3.1 Eating and breathing as interrelated processes of life

But there are also more obvious reasons why the breath process should be watched by the teacher. Though not often reflected on, the lungs are actually main excretory organs. The exhalation takes twice as long as the inhalation for people of little physical activity which is normal during classes when sitting all the time. This shows that our body puts greater emphasis on getting rid of wastes through the lungs than to inhale fresh oxygen. The amount of CO₂ liberated in 24 hours by the lungs is roughly 1,1-1,2 kg for an adult. Adding moisture and other gases given off through the lungs, the total weight may exceed 2 kg in 24 hours.

Consider a child coming to school with an empty stomach. Since the body has no great need to process nutrients and therefore to get rid of CO₂ through the lungs, heart rate and lung activity will soon run at a minimum. Metabolism reaches a low level, hormone release is reduced which increases the probability that neurotransmitters and enzymatic activity on brain synapses do not function optimally. The result of this is a drowsy, non attentive state of mood that hardly serves the child properly in its learning process.

4.4 Brain plasticity and will

Rudolf Steiner is to my knowledge the first scientist who used the term plasticity in connection with the brain (Steiner, 1978c, p.61). By this denotation he meant the property of the brain to change as a response to what the child experienced and wanted to learn. He was
of the opinion that structures of the brain acquired during the first seven years, though of great importance for the rest of life, could be reorganised to some extent later in life provided the person engaged its will in learning activity.

Until the end of the 1980’s, however, neurologists in general were convinced that the body representations in the cerebrum cortex as determined during the years of cortical mapping consisted of a fixed set of neurons adhering to the same function throughout life. Kandel and Hawkins (1992, p.60) write this in an article in *Scientific American* where they also present findings by Jenkins, Merzenich, Ochs, Allard and Guic-Robles (1990), one of the first teams that demonstrated what has later been referred to as brain plasticity. According to this article “Merzenich and his colleagues have now demonstrated that cortical maps are subject to constant modification based on use of the sensory pathways”. As the first step in all learning consists in the use of the sensory pathways, I will go into this finding in some detail.

![Representation of the Surface of the Body in the Cortex](image)

The text in figure 24 gives a short summary of the procedure and results of the work by Jenkins et.al. (1990). In their original report in the *Journal of Neurophysiology* they
hypothesize that “these studies manifest operation of the basic adaptive cortical process(es) underlying cortical contributions to perception and learning”. A subsequent study by members of the same laboratory (Coleman lab.) at the university of California, San Francisco (Recanzone, Merzenich, Jenkins, Grajski, and Dinse, 1992) showed even more intriguing results as seen from a pedagogical stance. In this study adult owl monkeys were trained to detect differences in frequency of a tactile flutter-vibration stimulus above a 20 Hz standard. All stimuli were delivered to a constant skin site restricted to a small part of one finger. In this study, two control groups were used one of which were passively stimulated. The results confirmed the previous findings except that the passively stimulated monkeys showed no alterations on receptive cortical field size or overlap. Referring to this study, Manfred Spitzer leaves the following comments in his book Lernen, Gehirnforschung und die Schule des Lebens (2003, pp. 154-155, my translation, app.23b):

The experiment just described was repeated under the same conditions with one exemption, the monkey was given as much juice and as often as it wanted. Everything else remained the same. [...] The result: It learned nothing [...] The cortical maps remained, despite often repeated inputs [...] unchanged.

After reflecting on these results, he concludes: “Something must be incorrect with the simple theory that experiences structure the brain” (my translations). His answer to this conclusive question is that there will be no cortical reorganisations unless a state of selective attention is reached. By this he means a state of attention in which a high level of activity resides in the actual area of the brain. Such a high level of activity would be synonymous to a large number of firing neurons, a state which I believe coincide with the condition for long term potentiation (LTP) which Kandel & Hawkins (1992, p.60) suggest could in part explain memory by increasing the number of pre-synaptic terminals in neurons.

In everyday language, I would describe this state of activity as one of great interest, i.e. the situation where the pupils engage their will to solve a problem. Only then could one expect that physiologically based learning takes place at an acceptable pace. Founded on the above findings, it seems to be a common idea among neuroscientists that learning has to involve changes in neuron responses, synaptic network density and the strength of synaptic connections (Kandel, 2006, p.200).
This would support the view held by many Waldorf teachers. A physical brain organisation responding to the astral body would be the only means for an individual to express itself, and therefore the primary aim of learning, though the mechanisms by which this expression takes place may as yet not be known.

The general teaching consequence of the findings in this section is of course the necessity of an inspiring motivation that can trigger the will and initiative for the school tasks. Secondly, the rhythmically repeated training is a must for brain changes to occur. A third observation is that faster brain changes seem to take place when activating the sensory pathways through body contact. If this is the case also for humans, it would indicate a need for the use of the body when leaning.

It is of great importance to develop this ability of willpower together with the individual freedom, the certainty of being in charge in ones own life before leaving school at 18-19 years of age. The neurologist and psychiatrist Gerald Hüther underscores the importance of a decisive will in this way (Hüther 2006a, p.99).

We humans have a brain which largely programs itself as a result of the way we use it. Accordingly we have to decide how and for what we want to use it. If one does not make a decision of this kind, the final networks of the brain will automatically be determined by the genetic predispositions and the circumstances under which we grow up and live (my translation, app. 23c).

4.5 Memory

The endeavour to find the sites of memory in the brain has occupied very gifted and creative scientists during the greater part of last century and still does. One of the best, Eric R. Kandel (2006) has given an interesting account of this research in his book In Search of Memory. Referring to findings by Edgar Adrian on the characterisation of neurological signals, Kandel (ibid p.79) writes “that signals sent from motor neurons in the brain to the muscles are virtually identical to signals conveyed by sensory neurons from the skin to the brain” and he elaborates on this by adding:
Thus, a rapid train of action potentials down a particular neural pathway causes a movement of our hands rather than a perception of coloured lights because that pathway is connected to our fingertips, not to our retinas.

The implication of this is that neuronal signals whether sensory or motoric are “virtually identical” whether you see something, hear something, feel something through your fingers or move a body part. Adrian writes that the nerve impulses are not only identical they “obey the same all-or-nothing principle” (ibid p.79) by which he describes the uniformity, the either-or nature of such impulses. If the commonly believed cause of memory is the brain changes associated with learning described above, then how can widely different perceptions be conveyed to the brain by identical signals and cause widely different memories? And, in the light of the findings of the Coleman laboratory, what would be the reason for the two sets of monkeys exposed to identical signals to the fingertips not developing the same changes in the brain if these identical neural signals actually carry the perceptual impulses? To me this would be non-logical reasoning. A solution to this dilemma would be to accept the existence of the astral body. Since the astral body is present in the whole human body and can move its centre of consciousness anywhere in it, all nerves must be regarded as sensory. If I want to raise my arm, the conscious centre of my astral body is in my arm and so senses what my brain centred thoughts wish to do with it. This would explain the direction of the signal in all cases and why all nerve pathways work by the same signals; they are all sensory. And perhaps should these signals be regarded as nothing more than a sign that the astral body moves along the surface of the neural pathways carrying the relevant information from the organ to its own processing centre around the brain.

Further reading in Kandels book reveals skilled methods and interesting research programmes but no convincing evidence that the brain is the site of memory. On the contrary, Kandel refers to a finding of his (ibid., p.200): “In the ensuing papers, we established that memory does not depend on self-exiting loops of neurons”.

Based on the idea presented in 3.5.1 that memory results as a continuation of a physical impact to the organ of perception, a next problem arises: How can memories be formed directly as they actually do, if for instance you solve a problem by reflection, having no perceptual input whatsoever? Clearly, viewing thinking in itself as an organ of perception as treated in chapter 2 would partly give an explanation for this. But what causes the physical impact or what replaces it? A possible way of explaining this is attempted below in 4.6.
4.6 Sensitivity and mirror neurons

One of the more difficult sides of Steiner’s main views on teaching becomes apparent when he claims that (Steiner 1980, pp. 26-27, my translation, app.24a):

[...] you will not become good educators and teachers if you only watch what you do, if you do not watch what you are.

This saying has been interpreted as an urge for self-development, that a teacher must be in a process of continuous development in order to guide children in their growth processes. This obviously has a bearing on the teacher’s attitude when meeting her children; the acceptance of their temporary problems knowing one’s own faults and shortcomings. But I still believe this quotation of Steiner has a much wider meaning since he also repeatedly emphasizes the importance of experiencing from the pupil’s point of view, of being able to intuitively comprehend their instantaneous feelings and thoughts. Reaching such a goal would offer the possibility to respond to what is actually there in the classroom and not to a theoretical idea of what the children have to learn that day. Naturally, the teacher would also need a particularly wide view of the world, its culture, history and scientific ideas in order to do this, because it may not be in the curriculum at all what they are interested in. And their genuine interests are always the best motivation when initiating learning. In accordance with the treatment of the astral body in chapter 3, I will now look into scientific findings that could widen the view of this theme of the astral body and its sensitivity.

An experiment carried out by Günther Haffelder at the Institut für Kommunikation und Gehirnforschung, Stuttgart, presented during a congress in 2001 (Hoppe 2002), gives an account of generally neglected capacities of any child. Haffelder has developed a specialised diagnostic technique within electro-encephalography (EEG) called EEG spectral analysis. Aided by this equipment his institute has carried out several studies based on the same idea: two teachers are to teach the same pupil without knowing of each other. One of the teachers was told by the scientists that his pupil was highly gifted, while the other got the information that his pupil came from a special school and had difficulties in learning. As the teachers presented the pupil with equally difficult tasks, it turned out that he solved the problem presented to him by the one who believed him to be clever without difficulty. As the second teacher entered the room, however, he started to get massive irritations in the brains beta
frequency domain (14 Hz +), which has to do with logical alertness and outward concentration. The technique used interprets this reaction as fear-blockage. The results were that the student either failed to solve the problem presented or only managed to solve it with great difficulty.

Emphasizing the consequence of the teachers thoughts and what he represents to the pupils, Haffelder writes in an article in Co’med (1998, p.12, my translation, my italics, app. 24b):

Quite a central role in connection with improvement of school learning plays the way the teacher thinks and his way of communicating with the pupils. [...] As these processes and interconnected functions finally can be demonstrated by measurements [...] they represent a central task for any teacher in his work for optimizing his own personality as a teacher.

These experiments demonstrate to me the sensitivity which may impede or help in the normal social setting in school. This subconscious effect greatly influencing the relation between teacher and pupil can only be controlled if the teacher is constantly aware of her own emotions and thoughts, and at the same time opens her genuine interest for the children’s situation. In other words that the teacher watches what he or she momentarily represents as seen from the pupil’s point of view. From the stance taken in this chapter, the explanation for this sensitivity is the stretching out of the astral body to meet that of the other’s, an extension of ones being I believe was also observed by Maurice Merleau-Ponty (1994, p.45) when he wrote “When I say that a thing is on the table, I always place myself in the table or in the thing [...]”

As briefly mentioned in chapter 2 another interesting field of research evolving now is that of mirror neurons. In particular the fact that intentions seem to be perceived and understood very rapidly by the set of neurons shown in figure 25. Before starting experiments with humans, Rizzolatti’s group had worked with monkeys and had revealed that sensory input is not even necessary to discharge these neurons which nevertheless establish the meaning of an act (Rizzolatti et al. 2006, p.34, my italics):

These experiments confirmed, therefore, that the activity of mirror neurons underpins understanding of motor acts: when comprehension of an action is possible on a non-
visual basis, such as sound or mental representation, mirror neurons do still discharge to signal the act’s meaning.

This suggests that the idea of intuition may have found a physiological foundation.

Figure 25 Understanding intentions activate mirror neurons (From Rizzolatti et al.2006 p.34).

In the experiment illustrated in figure 25 video clips were shown to the volunteers. The researchers wanted to establish whether human mirror neurons would distinguish between grasping a cup to drink, as suggested by the ready-for-tea context (figure 25 upper clip row), and grabbing the cup to take it away, as suggested by the cleanup setting. "Our results demonstrated not only that they do but also that the mirror neuron system responded strongly to the intention component of an act (ibid p.35).” One of the suggestions the authors make is that (ibid p 32):

Mirror neurons may also underlie the ability to imitate another’s action, and thereby learn, making the mirror mechanism a bridge between individual brains for communication and connection on multiple levels.
This research gives a view on the sensitivity a teacher should prepare for and deal with as a practitioner. The brain-researcher Joachim Bauer, like Rizzolatti, frequently uses the word intuition in connection with mirror neurons. In one of his latest books he describes the function of these neurons in a social setting with the following words (Bauer 2006b, p.86, my translation): "As we become aware of the intentions, emotions and feelings of another person, we gain a spontaneous, intuitive knowledge of what moves this other person.” If I understand this rightly, the mirror neurons perceive directly, i.e. without trains of action potentials moving along the sensory pathways. This would explain to me how memories could also be formed directly, with no sensory signal from any organ of perception. In my formulation the astral brain senses intuitively the answer to a problem, an intention or a connection and causes a triggering of the mirror neurons if successful, in this way replacing the physical impact normally needed.

4.7 The too rapid progress

Waldorf schools do not aim at fast progress understood as many facts learned in a short time. Waldorf teachers have to concentrate on the physiological development, the brain inclusive, to reach a level of intellectual maturity before seriously going into this type of training. There are of course difficulties in going through this long procedure letting the inner pictures build up the brain as described in chapter 3. Parents often object when things take too long, and the children themselves may experience that their comrades in public schools know things they have not heard of. Still, this dwelling in the childhood has vital benefits. Gerald Hüther (2006a, p.52, my translation, app. ) puts it this way:

> The less structured the brain is at the time of birth, the slower it develops after that and the longer it takes until all its networks are finally fixed, the greater the possibility to affix own experiences and individually discovered conditions for its use in its matrix.

An aim of political authorities in Norway has with few exceptions been to initiate learning of intellectually demanding topics at earlier grades. An example of this is the compulsory teaching of mathematics in Norwegian kindergartens established autumn 2006 (Aftenposten.no 2008). The way I interpret Hüther’s above conclusion, this tendency will lead
to a larger number of people with a reduced chance to exploit the benefits of their own experience.

4.8 Puberty and neurophysiology

In terms of the interpretation in 4.3.1, one could also see a cause for the normal attraction between the sexes: the longing for a completion of ones astral being, the half of which is excluded from physical appearance in this life having no physical network to support it. But exactly this lacking quality is displayed by the opposite sex in its one-sidedness. Referring to the alterations described in 3.3 and 3.5 connected to the seven and fourteen year status, this attraction can also be seen to undergo two major changes between childhood and adolescence. The first is related to the detachment of the etheric body with the liberation of the first intellectual abilities. This results in a slowly growing awareness of the longing, but it is more of a theoretical nature since it is realized as thought only. During puberty the feelings and will capacities are liberated from the physical body and joins the thought processes, thereby bringing the longing for the opposite sex into real life by the feelings which, react momentarily to the incidents. The cause of the body changes in puberty must in this context be sought in the liberation of the astral body resulting in its much stronger capacity to work from the outside with the lungs and from there on into the brain. As a secondary effect the hormone changes become functional.

In puberty, the time has passed when teaching can be based on copying under the guidance of an authority. Everything brought up during hours of teaching must be grounded on reason:

The liberated astral body does really not belong to this world. The human being is thrown out of its own world and will only take its place in the [physical] world when this world can give reasons for its existence. (Steiner, 1978b, pp.240-241, my translation, app.25b).

Taking this seriously, the teacher will have to demonstrate the reality of the physical world in a way that convinces the youth not only of its existence in all its aspects but also of its value. This is where phenomenology comes in. As cited earlier Rizzolatti et al.(2006, p 32), have found that direct, inner comprehension of the experienced outer world is mediated via mirror neurons of the pre-motor cortex. This finding suggests that phenomenological methods are
faster and much more convincing in building up the youth’s trust in the outer world than purely theoretical teaching is. The method demands the active observation of the phenomena, however. What this youth group expect to see, hear and feel during school hours are not necessarily of interest to them. In fact they are often convinced that they already know everything they need to know, so the world has little new to offer them. This means that the teacher will have to make conscious to the pupils what is actually to be seen and what is not in a specific observation to build up the confidence in the accuracy of our senses and thereby conveying the un-outspoken truth that you can trust your senses researching the world if your observations are precise. If this succeeds, the astral body of the youngster can leave the self focused occupation often seen in puberty and stretch out to experience the world in a conscious, self directed process; also described , I believe, by Merleau-Ponty above.

The other dramatic change of puberty as described in 3.5.2, involves being thrown out of a common astral world. This results in the feeling of having lost something, of being alone. Out of a Waldorf way of looking at it, this could be explained as follows: The complete astral reality of the youngster responsible for building its physical mirroring apparatus in the brain is now splitting into two parts. The personal astral body withdraws from the common astrality and continues to communicate with the part of the brain it once built. The common astrality on the other hand is no longer present. This would imply that regions of the brain are left without mirroring tasks; they have no longer a “client”. If this way of reasoning is correct, one would expect that neurons and synaptic networks in the brain should be left non-functional, at least for some time until the personal astral body gains control of the whole brain.

There is in fact research work which may support my expectation to this end. Bourgeois & Rakic (1993) has documented a decrease of 40 percent in the density of synaptic contacts of the primary visual cortex in the macaque monkey occurring between age 2.7 and 5 years. They noted that “Around the time of puberty, however, synaptic density decreases more rapidly to reach the adult level [...].” More recent findings by the Laboratory of Neuro Imaging at the University of California, Los Angeles (LONI 2007) using fMRI with children show that:

Just before puberty, children lost up to 50 percent of their brain tissue in the deep motor nuclei. These systems control motor skills such as writing and sports. This loss
moves like a wildfire into the frontal lobes in late teens. We think it is a sign of rapid remodelling of brain tissue well into the teens and beyond.

If the authors of this web article are right in their assumption, this remodelling process would match my expectations exactly as to the restructuring needed in the brain to enter a situation of individual freedom after puberty (see the summary 3.7 and figure 10). This idea underscores once more the general physiologically based view of Waldorf teachers with respect to the age groups 16 to 19: *Abilities not used and developed will be lost.*

4.9 Pictorial teaching and freedom

Freedom in a Waldorf context demands a pictorial way of teaching during the first school years as established in 3.6. This time constitute a thorough meeting with early traces of man’s cultural development. Myths and legends, fairy tales, songs and poetry from historically past cultures are worked through to build cultural understanding by means of an inner pictorial world. These pictures aim at representing feelings, ideas and ways of ethical action which were once ideals of humanity, and so has a potential to grow with the child into its later existence. With this cultural cargo and the resulting physiologically based habits of using the brain, and then I primarily think in terms of myelinated ganglia, the child after puberty may reach a stage where it experiences its freedom. I repeat Steiner’s criteria for freedom in 3.6:

The odd thing happens that the intellect seizes and realises what has been developed pictorially between the 7th year and puberty. And the human being does not pick up anything with its intellect which is forced upon it intellectually from outside. The human being picks that up with its intellect which has first grown within it out of other sources than the intellect. And then the important thing happens: One has prepared what is to come after puberty for the soundly developing human: The autonomous realisation of what one already has got. Everything one has conceived in a pictorial form now comes to life in the process of understanding. Man looks into himself. That is seizing its internal being by itself. Then a coming together takes place of the astral body, working musically, with the etheric body working sculpturally [...] and by this unification the human becomes conscious of its own being in a healthy way after
puberty. And as these come together, which represents two sides of its nature, the human being reaches a rightly felt experience of freedom.

This merging of astral and etheric bodies is the condition for gaining the personal freedom aimed at by the Waldorf schools. But this happening is by no means something that just takes place out of its own necessity. Contrary to what we seem to believe to this end, the neurologist and psychiatrist Gerald Hüther writes the below sentences on what he thinks is already a danger to the stability of the communities of the western world. He considers children who were not allowed to dwell long enough in their mythical [by which he means inner pictorial] consciousness (Hüther 2006a, p.117, my translation, app.26):

[..] a person who only went through his mythical phase of consciousness in a very reduced and superficial way, will later hardly succeed in developing an autonomous self-reflecting I-consciousness. Without a personal consciousness he will in a way be trapped in (and dependent of) the thoughts unconsciously picked up from others and not reflected upon.

Hüther claims that the number of self-centred pseudo-autonomous children, as he calls them, is growing. Looking closer at the above sayings, I note that Hüther uses the word self-centred which to me points to a situation of reduced personal freedom. Furthermore he calls these children pseudo-autonomous, meaning as if autonomous, signalling a superficial autonomy where no real experience of the self-driven individuality persists. Comparing this to Steiner’s criteria for individual freedom above, it becomes apparent that this “rightly felt experience of freedom” may be what these children lack. And Hüther also names the cause for this highly unwanted problem: the inadequate time spent developing inner pictures during the “mythical” phase of childhood. This exemplifies to me the consequence of a too intellectual (intellectual understood as not pictorial) teaching during the first years in school in Steiner’s saying: “We disconnect the soul [the astral body, my add.] from the body when we educate the human being intellectually.” (Steiner 1973b, p.126, my translation).

With reference to figure 10 in chapter 3.6, the resulting relation between the astral and the etheric body would be one where the etheric body continues to support thinking the way it did before puberty, but where thoughts, emotions and impulses of action would have no proper connection to the physical body. This means that the physical body would not be an
instrument that responds precisely to all intentions of the person in question. Figure 10 could in such a case possibly be looking like figure 26 below.

Figure 26. A situation where the astral body does not unify with the etheric body after puberty
5. Discussion and conclusions

5.1 The question of gender once more

In the previous chapter I drew conclusions as to how Steiner could be understood in his treatment of the general differences between the sexes. This conclusion was largely funded on physical findings of embryonic research showing to the eye what seems to be a balanced development where none of the sexual rudiments, neither male nor female, take the physical overhand until approximately the 7-9th week of pregnancy. Looking at the same questions from an evolutionary point of view, however, and considering only the genetic and hormonal side of this part of embryonic development, the answers to these questions will attain a different character. The biologist Markus Lindholm (2008, my translation, app.27) held a radio lecture March 8th on NRK P2, ”Are men an illness?” where he commented on this way of seeing the gender question:

The genetic base underlying the formation of men are gathered in a single chromosome, the Y-chromosome, while a number of important female sex-characteristics are gathered on a complimentary chromosome, called the X-chromosome. X- and Y- chromosomes are not in any way equals, however. While the X- chromosome is a large unit containing more than fifteen hundred genes, the Y-chromosome could hardly be called a chromosome at all. The actual chromosome body is only a deformed rudiment containing some fifty genes, only one of which, the Sry-gene, is of importance in its power to release the male sex. But there is more: For all humans independently of sex has an X-chromosome. To a certain extent everyone is female. But as real women have a second X-chromosome; men only possess the little rudiment of a chromosome as a partner for their X-chromosome.

And he draws this conclusion from these facts:

After what has been said, it is clear that the two sexes are not equal magnitudes. The female is a stable structure everywhere and with a greater reproductive autonomy, females are probably closer to a supersexual, universal form of existence. Brought to its extreme, there is possibly only one sex: the male (My translation, app.28).

I find Lindholms arguments supported by an article called Defeminization and masculinization, Wikipedia (2008d):
Sexual differentiation in mammals is biased towards developing as a female, so that it has often been said that female is the "default" developmental pathway, in the sense that elimination of any of several gene actions necessary for formation of male genitalia leads to the development of external female genitalia (though development of functional ovaries requires effective action of several less understood sex-specific genes). Two processes: defeminization, and masculinization, are involved in producing male typical morphology and behaviour. Disruption of either of these processes in males produces female-typical development. The opposite is not true, disruption of normal sexual development in females does not lead to male-typical endpoints.

A brief version of the female default paradigm can be stated as follows:

1. A set of specific genetic instructions must be present and a series of differentiating events mediated by hormones must occur in order for a mammalian zygote to become a fully reproductively functional male.
2. To a large extent, each step builds on the previous. If anything goes wrong at any of the first four steps, the subsequent pathway of development results in female anatomy and behavior.
3. No ovarian organizing gene homologous to Sry has been discovered. Both sexes are exposed to maternal estrogen prenatally. No hormones have yet been discovered that are necessary early in life to produce female sexual development. Estrogen seems not to be necessary until puberty for purposes of differentiation.

One may ask what males are left to contribute after the presentation of these biological facts. Lindholm has a biologically based answer to this also (ibid): Men cause the variation, the potential for changes in evolutionary development. This view is held by Steiner as well (1975, p.188, my translation, app.29):

If the female principle were in control, humanity would develop by repeating the same characters. Children would always resemble their parents, grandparents etc. Everything by way of forces contributing to equality sticks to the female. Forces changing the equality, causing the differences sticks to the male principle. [...] The male principle works individualizing, the female on the contrary generalizing.
Lindholm humoristically adds in his lecture that from a biological point of view Eve in the Bible surely came before Adam, her female principle being the base also for the existence of males.

On this background, I have to conclude that what I assumed to be an equal physical representation of the double-sexed astral body until the 9th week of embryologic life, does not represent the truth. The female principle of gender must be regarded as the base for physical existence. Therefore the astral body of the female must be more influential than that of the male.

5,2 Memory and the brain

Memory is closely connected to the experience of one’s own individuality and therefore “[..] loss of memory leads to loss of contact with one’s immediate self, with one’s life history, and with other human beings” as Kandel & Hawkins (1992, p.53) expresses it. The two authors report on the same page that

[..] until the middle of the 20th century most students of behaviour did not believe that memory was a distinct mental function independent of movement, perception, attention, and language. Long after those functions had been localized to different regions of the brain, researchers still doubted that memory could ever be assigned to a special region.

As the idea of the brain as the site for memory seems to be the common conviction among researchers within neuroscience to day, I have been looking for their reasons to believe this.

So far I have found no good argumentation for attributing memory to the brain by any well known neuroscientist I have read. There are of course a large number of experiments behind the idea, the majority of which involves brain surgery with impairment of memory as a consequence. For example the bilateral removal of the hippocampus and neighbouring regions of the temporal lobe as a treatment for epilepsy has a marked influence on memory. Also removal of the medial portion of the temporal lobes has been shown to lead to a loss of the ability to form new long-term memories (ibid, p.53). I therefore assume that the influence from the many experiments where brain organs have been destroyed followed by loss of one variety of memory or other, has opened for an understanding of the brain as the site of memory. Seen from the point of view supported in this paper, however, looking at memory as
an integral part of the etheric body, though in close cooperation with the body, memory would have to work from the outside into the brain as explained in connection with the 7 year changes. And it would need no neural system for storing information. Seen from this angle, the experiments mentioned represent no indication that the brain is the site for memory. To me this is merely like destroying the ethernet card of a computer and claiming that the card is the site of the internet since the machine no longer can perform anything new related to the net.

But there are naturally more challenging results of memory research for the view I have presented. For example Gazzaniga (1999, pp. 135-136) refers to findings from research designed to find out how false memories are formed:

When presented with new information, people usually remember much of what they experience. When questioned, they also usually claim to remember things that were not truly part of the experience. If split-brain patients are given such tests, the left hemisphere generates many false reports. But the right brain does not; it provides a much more veridical account.

Gazzaniga goes on to explain how he interprets these and other results:

[The left hemisphere] is constantly looking for order or reason, even when there is none – which leads it continually to make mistakes. It tends to over-generalize, frequently constructing a potential past as opposed to a true one.

In this experiment memory functions are interwoven with cognitive reasoning from the left brain half of the subjects being tested. As explained in 3.5.1 my understanding of memory depend on two main factors both associated with the actions of the astral body relative to the etheric body in its relation to organs of the body: The rhythmical fading out of the perception(1) paralleled by thoughts(2) associated with the percept. The process of reclaiming a memory would therefore involve reproduction of the rhythmical representation of the perception by the etheric body triggering a “new birth” of the thoughts belonging to it in the astral body. In the above experiment the right brain hemisphere is clearly responding mainly to perception as pointed out by Gazzaniga (ibid. p.136): “the right [hemisphere] simply attends to the perceptual aspects of the stimulus” which in my context means an unbiased ability to recall true memories since it obviously lacks the tendency to let thoughts not
coherent with the original experience interfere during the recalling of the percept. So in the case of the right brain half, the etheric body seems to act as an undisturbed deliverer to the astral body which then brings the memory into consciousness. In the case of the left, more intellectual hemisphere on the other hand, the perception is not given priority in relation to the fast acting cognitive processes. According to Gazzaniga, Margaret Funnell’s work “indicates that the left hemisphere actively places its experiences in a larger context”. And, as quoted, thereby easier loses track of the perceived world which results in the forthcoming of false memories. I interpret this as a “drowning” of the rhythmical presentations of the etheric body by the over-productive thought processes of the astral body.

A conclusion to these questions of memory is therefore that I find the belief of the brain as the site of memory not supported by actual findings. Further, based on extended development of the right brain half, true memories would result as a consequence of a well trained ability of perception.

5.3 Neurobiological foundations for phenomenological teaching

The paper by Gazzaniga (1999) points to the interesting fact that the left brain half, generally made responsible for the greater part of individual logical thinking, language and speech, has the tendency to produce false memories. False memories or even slightly imprecise recollections of experimental observations and the thoughts nourished at the time of experimenting would not be sufficiently good for formulating scientific theory. Even though the left brain half “actively places its experiences in a larger context” this would not be of any help if the elements of this context are partially irrelevant. This underscores in my view the necessity to balance intellectual teaching with artistic training which would enhance perceptive ability and contribute to the development of the right brain half and so the tendency to preferentially trigger true memories. Since the right hemisphere “excels at visual–motor tasks” (Gazzaniga 1999, p.130), training visual arts and using phenomenological methods in the natural sciences would presumably improve the function of this brain half. And the Waldorf schools practice this form of education.

As a supplement to what has already been presented in chapter 2 and also in section 4.6 on the function of mirror neurons, I will add a few comments. These findings demonstrate the ability
of large areas of “intelligent” neurons of the brain cortex to act as receptor devices for thoughts, emotions and impulses for copying acts. This is what must be expected from an astral body which, as pictorially characterized by Edvard Munch, has the ability to move freely out of the body at night, to stretch and overlap with other peoples astral bodies or uniting with a natural phenomenon and so work into the physical body from the outside.

5.4 The breathing process revisited

As worked out in 4.3, the possibility exists for a teacher to experience from the way a child breathes how its situation is. The problem of doing so, however, may seem immense. If you have 25 children to watch, how can you possibly acquire a reasonably correct impression of the way everyone breathes? For most teachers even the thought of developing everyday phenomenological observations to the extent required for this task is somewhat scary. First of all it would require a perfectly relaxed mastering of the curriculum so that focus can be directed towards the situation of the single child. Secondly, a systematic record must be held for each pupil so that the children one wants to know a bit more of that day really gets the attention necessary. Then during the pupils work with their written texts, the teacher would need to make sure to help those in question that day in particular. Such observations are not of an intellectual nature, it is not a question of counting the number of exhalations per minute for example, but without pressing oneself onto the child, to try and feel “what it is like to be you” for a short moment. In this state of empathy, the teacher may experience rather more of the child’s nature and developmental situation than could be expected at first. The genuine interest in the children’s well being is the opening condition here, an interest I believe all teachers share independently of school system and principles of education. As I tried to describe in 3.4, our feelings are not only detectors of the immediate, but do quite normally extend to copying other peoples experience of the instant (4.6). This functions even in looking at pictures of others facial expressions such as Ekman’s in figure 8 and may be tested out for oneself. There exists also neuroscientific evidence for this copying tendency among humans. In the article by Rizzolatti et al.(2006, p.35) a framed heading reads: “When people use the expression “I feel your pain,” they may not realize how literally it could be true.” Later (ibid., p.36) the authors describe two ways of becoming conscious of another’s feelings: one requiring reasoning and the other resulting from “direct mapping of that sensory information onto the motor structures that would produce the experience of that emotion in the observer.” This corresponds to my rare successful experiences when trying to focus on someone’s way
of breathing: I may suddenly be aware of that person’s emotion and although the neurons in my brain may map the other’s brain reaction, I experience the feeling through my lungs.

5.4.1 The master stage; using the lungs as a diagnostic tool

In a more specific context addressed to the Waldorf teacher in her striving to become “an artist of teaching” which Steiner regards as necessary, the conscious use of emotions deliberately generated for the situation, involves heart and breath control as well. Antonio Damasio writes in his book *The Feeling of What Happens* (2000, pp.49-50): “One partial exception to the extremely limited control we have over the internal milieu and viscera concerns respiratory control [...].” He then goes on to describe a case he believes is an exception: “the brilliant pianist Maria João Pires told us the following story: When she plays, under the perfect control of her will, she can either reduce or allow the flow of emotion to her body.” As I have explained in 3.4, this would affect pulse rate and breath immediately by the action of the astral body which work through the feelings into the lungs. Damasio, in his concern with the pianist designed an experiment to test out whether this really could take place. He notes:

Maria João was wired to the complicated psycho-physiological equipment while she listened to short musical pieces of our selection in two conditions: emotion allowed, or emotion voluntarily inhibited. [...] In the condition of “emotion allowed”, her skin conductance record was full of peaks and valleys, linked intriguingly to varied passages in the pieces. Then, in the condition of “emotion reduced”, the unbelievable did, in fact, happen. She could virtually flatten her skin-conductance graph at will and change her heart rate, to boot. Behaviourally, she changed as well. [...].

This displays in my view the normally developed ability of artists having passed the amateur level to use themselves, mainly by the way of the lungs, to establish or reduce emotions vital to their work. With this ability under some degree of control so that personal emotions can be “switched off”, the breath acts as a diagnostic tool for other peoples emotional situation when focused on. This ability can, I think, be reached by anyone if education of teachers would focus strongly on phenomenological training; a condition I believe will be necessary in future courses on teaching.
5.5 The question of the free will

In chapter 3.6 an aspect of freedom relevant to Waldorf teaching has been briefly mentioned. As I understand it, this freedom is one of thoughts, emotions and activity, i.e. a freedom of the astral body in its power to express itself harmoniously through its own physical body. This means to me that the will is free within the limits of personal ethical responsibility when the upbringing has fulfilled its aim as described in 3.6. Joachim Bauer (2006b, p.163, my translation, app.30), having studied recent findings in neurobiology which seem to contradict the possibility of a free will, deal with the question in a somewhat simpler way:

A free will can only be questioned […] :

1. if illness or injury has reduced the function of the frontal brain.

2. if a serious mental illness [...] obstructs the neurobiological and psychological self organizing process necessary for making free decisions, or

3. if extreme atypical living conditions leads to a nearly complete lack of choice among possibilities [...] normally available.

Benjamin Libet’s discoveries in the early 1980s, however, raised the question to many researchers of how a free will could exist at all. In his “Mind Time – The Temporal Factor in Consciousness” published in 2004,

Libet showed that in an experimental situation in which subjects were asked to perform a simple voluntary action - raising a finger - these acts were preceded by a rise in electrical activity in the area of the brain responsible for the causation of this action, called the “readiness potential” (RP). But the striking discovery is that while the RP is activated 500-550 milliseconds before the action, the subject’s awareness of their decision to act occurs only 150-200 ms. before the action. (Crane, 2008, p. 1)

Tim Crane, a philosopher at the department of philosophy of the University College of London has studied the debate following Libet’s finding and refers to articles like “The Illusion of Conscious Will” by the psychologist Daniel Wegner, the title describing the conclusion drawn by many.

The odd thing is that Libet himself never interpreted his experiments as evidence against the idea of the free will, “he points out that although the tendency to press a button may be building up for 500 milliseconds, the conscious will retains a right to veto that action in the last few milliseconds.”(Wikipedia, 2008e).
Continuing the debate from a Waldorf point of view, I see no reason to doubt the finding of Libet. There exists a time interval of some 350ms between the neural activation in the brain and the instant when the subject becomes aware of his decision. Based on my treatment of the astral body in this paper, it seems to me that the view of the brain as the \textit{producer} of will and consciousness is the main obstacle for an understanding of this finding. As pointed out by Thomas Meyer in an article in \textit{Der Europäer} (2007, my translation, app.31), where he refers to Libet's work, “Is the process of the brain possibly induced by an immaterial process?” To me that is clearly the case, the cause is the astral human being acting from the “outside” on the brain.

Libet also gives his view of a possible immaterial process not necessarily tied up in the human brain:

\begin{quote}
The transformation from neuronal patterns to a subjective representation would appear to develop in a mental sphere that has emerged from that neuronal pattern. [...] My view of mental subjective function is that it is an emergent property of appropriate brain functions. The conscious mental cannot exist without the brain processes that give rise to it. However, having emerged from brain activities as a unique ‘property’ of that physical system, \textit{the mental can exhibit phenomena not evident in the neural brain} that produced it. (Wikipedia, 2008f, my italics)
\end{quote}

Though not clearly outspoken by Libet, I take this as an indication that he believed in something like an astral body (mental), capable of emerging from the brain and show phenomena not traceable (or not simultaneously traceable?) in the neural brain.

Steiner is to my knowledge the first who discovered that the brain had to be given a preparative treatment, a “priming action”, possibly resulting in something like the “readiness potential”, before the thought becomes conscious in our normal state of consciousness. In January 23, 1914, he expressed his finding as follows (Steiner 1980c, p.74, my translation, app.32):

\begin{quote}
The one who advances a little in the way of occult perception, will be able to distinguish between the two phases of soul activity. He can trace how he first has to prepare his brain when he wants to think something, and not only need to seize the thought. Having prepared it sufficiently so that it mirrors, then he has the thought.
\end{quote}

And further down the page:
So we have to distinguish between two phases: First the work on the brain from the side of the soulspirit; then perception results after the astral body has prepared the brain. This preparative work on the brain remains unconscious for people in general, they only experience the mirroring.

Reminding the reader that Steiner regards thinking as an organ of perception as discussed in chapter 2, this would mean that conscious perception (corresponding to the mirroring) of one's decision in Steiner’s view only results after this preparative treatment has been performed. If this preparation leads to what Libet has denoted a “readiness potential” of the actual neurons, it would have to come earlier than the conscious experience of the decision to act in our normal state of mind. Libet's argument in favour of the free will which consists in the possibility of vetoing the decision immediately before performing the act, would likewise be explained by Steiner’s description above: the astral body after arousing the neurons in question might equally well ease them by cancelling the act, and this would work faster since a cancelling would not involve planning a sequence of muscular operations by thought in the cortex.

Like Bauer, but based solely on this finding by Libet of the readiness potential occurring before the conscious decision, I therefore conclude that this much debated finding does not influence the question of the free will in any way.
6. Findings and shortcomings

My question for this thesis was to investigate the extent to which Steiner’s basic concepts related to the human being are compatible with findings of biological and neurobiological research. After the outline in chapter 3 of what these basic concepts are in my interpretation, I addressed research papers and books of interest to teachers mainly within the neurosciences. A number of these findings I could not interpret because the descriptions of the experimental conditions were to scarce or lacked information crucial to my way of working into the matter. Such lacking information would demand expert’s insights as to how advanced apparatus work and may be influencing persons under test or putting restrictions to the way experiments have to be carried out. Those I had to leave. But given a thorough description of the circumstances relevant to the experiment which widely oriented and experienced researchers usually supply you with, I could surprisingly often understand the results in terms of these basic concepts of Waldorf teaching, though my interpretations may seem controversial to researchers of the field.

The findings of chapter 5 convince me that relevant answers can be found to questions within biological research when working out of concepts like the astral end etheric bodies. Uses of these concepts of Waldorf pedagogy, however, do call for extreme caution when dealing with problems involving so many parameters as the gender question. Looking back, I must admit that my background within zoology and animal evolution is not broad enough to cope with so comprehensive tasks. Still, I have found that in some cases like in the question of the free will, it is possible to explain controversial problems in science in a simpler way by these concepts and I believe that in other cases additional viewpoints of this kind may help direct research to a faster understanding of the phenomena.

In addition to the findings of chapter 5, I have discovered relationships I was not previously aware of. One of these was the possibility to follow the sequence of “fading out” of a perceptual light experience described in 3.5.1 (Memory and perception). This is the closest conscious experience of a rhythmical fading of a percept that I believe may be tested out by anyone, and which to me demonstrates Steiner’s concept of memory formation. This involves an almost musical colour experience, conveyed I believe, by the astral body into precisely shaped, but regularly changing formations which could be attributed to the etheric body. Experiences of this kind have brought me closer to an understanding of Steiner’s
characterisation of the astral body as “working musically,” and the etheric body as “working sculpturally” as cited in section 3.6. Taken seriously, this finding would open for a wider comprehension of musical qualities applied in educational practice in their possible capacity to develop thinking, feeling and will. Also the understanding of formative, sculptural elements should be regarded.

A dilemma encountered working with the question of memory was that Steiner when lecturing to teachers on basic concepts does not distinguish between the words Gedächtnis in German (possibly memory in English) and Erinnerung (possibly recollection in English), (Steiner, 1977b, p.50 and p.52), while in other lectures Steiner uses Erinnerung as something deeper and fundamental whilst Gedächtnis refers to more recent thought-based memory (Steiner 1973c, p.42). This part of my paper is therefore not satisfactorily treated as seen from an advanced Waldorf stance. Still, it is within the scope of my decision to limit the work by concentrating on sayings which are often repeated in Steiner’s works or, to my knowledge, seem to be commonly accepted among experienced Waldorf teachers.

In connection with early puberty the 11-12 year old gradually loses contact with the element Steiner denotes the common astrality. As interpreted in section 4.8, this would result in the loss of a client to the brain and so networks of neurons would be left with nothing to perform. The finding that during puberty the brain suffers loss of synaptic density and even death of brain tissue would therefore be a possible logical consequence of the astral forces reducing their engagement with the physical body. Such findings therefore suggest that the concepts used in Waldorf education can explain phenomena in human biology not accessible to the traditional views of the human being. So, as a conclusion to my main question, I find Steiner’s concepts compatible with findings of biological and neurobiological research, but applying them rightly may demand extensive knowledge of both ways of valuing the actual phenomenon.

The saddest, least promising finding is to me represented by Gerald Hüther describing the increasing tendency towards ‘self-centred pseudo-autonomity’ which in his view could have been avoided by letting the children dwell for a longer time in their ‘mythical’ phase. Hüther (2006a, p.117, my translation, app.33) is of the opinion that these children “in the meantime have developed into a considerable danger to the stability of all western communities.” Whether this situation is due to lacking insights on behalf of the school authorities or teachers,
a consequence of using DVD’s and television replacing inner pictures with outer ones, or if it simply relates to the general nervousness of modern society leaving too little time for the basic needs of the child, remains an open question for future research to decide. However, since the most fundamental idea behind the Waldorf schools in my view is to contribute to personal freedom in terms of a self-governed astral body with the artist’s capacity to allow or inhibit the flow of emotions to the body depending on one’s own ethical thought perception, this finding of Hüther underscores the need for Waldorf education in present day society.
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Appendix

App.1:
Nur wer ganz erfüllt ist von so grundfalsche Vorstellungen, wie diese ist, dass man von den Wahrnehmungen durch verständiges Nachdenken zurückgehen müsste auf die Ursache der Wahrnehmungen, der kann die Frage noch in der Weise aufwerfen, wie es die heutige Physik tut.

App.2:
Wo ein Wille ist, ist auch ein Weg, und wenn der Wille stark genug ist und derselbe Weg immer wieder benutzt wird, entsteht daraus allmählich eine Strasse und irgendwann sogar eine Autobahn, auch im Hirn. Und weil es dann immer schwerer fällt, diese eingefahrene Bahnen später wieder einmal zu verlassen, sollte die Entscheidung, wie und wofür man sein Gehirn benutzt, mit viel Umsicht und Bedacht gefällt werden.

App.3:
Erkennen heißt: zu der halben Wirklichkeit der Sinnenerfahrung die Wahrnehmung des Denkens hinzufügen, auf das ihr Bild vollständig werde.

App.4:
Die Aufgabe der Erziehung, im geistigen Sinn erfasst, bedeutet das In-Einklang-Versetzen des Seelengeistes mit dem Körperleib oder dem Leibeskörper. Die müssen miteinander in Harmonie kommen, müssen aufeinander gestimmt werden, denn die passen gewissermaßen, indem das Kind hereingeboren wird in die physische Welt, noch nicht zusammen. Die Aufgabe des Erziehers und auch des Unterrichters ist das Zusammenstimmen dieser zwei Glieder.

App.5:
Was ein lebendes System auszeichnet, ist nicht die Kompliziertheit der in ihm ablaufende Prozesse, sondern seine Fähigkeit, all diese Prozesse so zu steuern und zu lenken, dass das betreffende System auch noch dann erhalten bleibt, wenn es nach den Gesetzen der Physik oder Chemie eigentlich zerfallen müsste.

App.6:
Die alte und noch immer weit verbreitete Vorstellung, ein Lebewesen sei lediglich eine besonders kompliziert aufgebaute Form von Materie, die sich mit physikalischen oder chemischen Gesetzmäßigkeiten beschreiben lässt, ist daher für das Verständnis und die Analyse lebender Strukturen unbrauchbar. [...] Was also jedes Lebewesen besitzen muss, und was es erst lebendig macht, ist ein in seinem Inneren angelegter Plan, eine seine innere Organisation lenkende und seine Strukturierung leitende Matrix, also ein inneres Bild von dem, wie es sein müsste oder werden könnte.

App.7:
Gedanken gehen so vor, dass sie den physischen Leib nach dem 7. Jahre nicht mehr berühren. Indem der Mensch denkt, denkt er nur im åtherischen Element, das seinen Leib ausfüllt.
App. 8:
Der Mensch ist eigentlich nur dem physischen Leibe nach Mann oder Frau. Während der physischen Körper männlich ist, ist der Ätherkörper weiblich und umgekehrt […] Der Mensch trägt das entgegengesetzte Geschlecht als Ätherkörper in sich.

App. 9:

App. 10:
Es ist von der allergrössten Wichtigkeit, festzuhalten, dass das Prinzip der Geschlechter im Menschen erst mit seinem eintritt in die Welt […] auftritt. […] Aber eigentlich muss eingesehen werden, dass der Mensch bis zur Geschlechtsreife als allgemein menschliches Wesen lebt. […] Erst der Astralkörper ist männlich und weiblich zugleich.

App. 11:
 […] bis zum Zahnwechsel ist eine Einheit des Seelisch-Geistigen und des Physisch-Ätherischen da. […] Was früher mitgebildet hat bei der Bildung der Zahnform, das sondert sich ab in idealer Steigerung der Kraft, wird Gedächtnisbildung, Gedächtnistreue uzw.

App. 12:
 […] bis zum Zahnwechsel ist der ätherische Leib dicht, ganz dicht mit dem physischen Leibe verbunden. Dann sondert er sich etwas ab; […] Wenn der Ätherleib sich abgesondert hat, wirkt das, was früher im physischen Leib gewirkt hat, auf seelische Art.

App. 13:
Da wirkt alles Seelisch-Geistige so, dass es eigentlich in physisch-leiblichen Prozessen besteht, und alle physisch-leiblichen Prozesse sind zugleich seelisch-geistige; das Ganze wird beim Kinde in Bezug auf die plastische Ausgestaltung des eigenen Leibes vom Kopfe aus dirigiert.
App.14:
Da werden gewisse Kräfte mehr geistig-seelisch, [...] Sie wirken nicht mehr in
demselben Masse in den stofflichen Vorgängen wie früher, dagegen abgetrennt von
dem Körperlichen in das Atmungs- und Zirkulations-System.

App.15:
Wie das Denken dem physischen Organismus verbunden ist bis zum 7. Lebensjahre,
so ist bis zum 14., 15. Jahre, bis zur Geschlechtsreife, das Fühlen, und das Wollen eng
mit dem physischen Organismus verbunden.

App.16:
Kein Gedanke wird aufbewahrt, sondern etwas anderes wird aufbewahrt, an dem der
Gedanke sich immer wieder neu entzündet.

App.17:
Das Erinnern beruht nämlich nicht darauf, dass die Gedanken hinunterziehen in die
Seele, sondern dass aus dem, was physisch wirkt auf Auge und Ohr, eine Fortsetzung
in das Leibliche hineingehört, dass ein Parallelvorgang zu dem Denken da ist, und das
dieser Parallelvorgang Rhythmisches zurücklässt, [...].

App.18:
[...] der Mensch wird mit der Geschlechtsreife aus dem geistig-seelischen Leben der
Welt herausgeworfen und hineingeworfen in die äußere Welt, die er nur mit
seinem physischen Leib, mit seinem ätherischen Leib wahrnehmen kann.

App.19:
Das Merkwürdige tritt ein, dass das, was in Bildern entwickelt worden ist im
kindlichen Alter zwischen Zahnwechsel und Geschlechtsreife [...] dann erfasst wird
mit dem Intellekt. Und der Mensch nimmt mit seinem Intellekt nicht etwas auf, von
dem, was man ihm zwangsläufig von außen intellektualistisch beibringt, sondern der
Mensch nimmt dasjenige auf mit dem Intellekt, was erst selber in ihm auf andere
Weise gewachsen ist, als durch den Intellekt. Und dann tritt das Bedeutsame ein: Man
hat vorbereitet, was hinter der Geschlechtsreife bei den gesund sich entwickelnden
Menschen liegen muss, das Selbstbegreifen dessen, was man schon hat. Alles, was
man in Bildern begriffen hat, lebt aus dem eigenen inneren Hervorquellen
verständnisvoll jetzt auf. Der Mensch schaut in sich. Das ist ein Ergreifen des
Menschenwesens in sich selber durch sich selber. Da findet ein Zusammenschlagen
statt des astralischen Leibes, der musikalisch wirkt, mit dem ätherischen Leibe, der
plastisch wirkt. [...] und durch dieses Zusammenschlagen wird der Mensch seines
eigenen Wesens nach der Geschlechtsreife in einer gesunden Weise gewahr. Und
indem so zusammenschlägt, was zwei Seiten seiner Natur darstellt, kommt der
Mensch nach der Geschlechtsreife durch dieses nun erst erfolgende Begreifen
desjenigen, was er früher nur angeschaut hat, zum richtigen inneren Erlebnis der
Freiheit.

App.20:
Wenn Sie sich einen 3-4 Wochen alten Embryo vorstellen, so sehen Sie das Folgende:
Es beginnen die so genannten Urkeimzellen in die Region der zu bildenden
Fortpflanzungsorgane einzuwandern und die Entwicklung der Keimdrüsen zu

App.21:
Gleichalte Embryonen dieser Zeit können, ganz normal, verschieden weit entwickelt sein.

App.22:
Wir verdanken den Impuls zur Gehirnentwicklung dem Verzicht auf die Reproduktionskraft des anderen Geschlechtes.

App.23a:
Die wichtigsten Maßnahmen in der Erziehung werden daher liegen in der Beobachtung alles desjenigen, was in der rechten Weise den Atmungsprozess hineinorganisiert in den Nerven-Sinnesprozess.

App.23b:
Das eben beschriebene Experiment wurde bei gleichen Versuchsbedingungen wiederholt, jedoch mit folgender Veränderung: Der Affe bekam so oft und so viel Saft, wie er wollte. Alles andere blieb gleich [...] Das Ergebnis: Er lernte nichts [...] Die Landkarten waren trotz häufigen und wiederholten Input [...] unverändert geblieben.

App.23c
Wir Menschen jedoch haben ein Gehirn, das sich erst durch die Art seiner Benutzung gewissermaßen selbst programmiert. Wir müssen uns also entscheiden, wie und wofür wir es benutzen. Entschließt sich ein Mensch, gar keine derartige Entscheidung zu treffen, so werden die endgültigen Verschaltungen in seinen Gehirn automatisch durch die genetischen Prädispositionen und die Gegebenheiten bestimmt, unter denen er aufwächst und lebt.

App.24a:
[...] Sie werden nicht gute Erzieher und Unterrichter werden, wenn Sie bloß auf dasjenige sehen werden, was Sie tun, wenn Sie nicht auf dasjenige sehen, was Sie sind.

App.24b:
Eine ganz zentrale Bedeutung im Zusammenhang mit der Verbesserung des schulischen Lernens haben die Denkweise des Lehrers und seine Kommunikationsweise mit den Schülern. [...] Da diese Prozesse und Wechselwirkungen nun endlich messtechnisch nachgewiesen werden können [...] und nehmen eine zentrale Aufgabestellung für jeden Lehrer in seiner Arbeit an der Optimierung der eigenen Lehrerpersönlichkeit ein.

App.25a:
Je unfertiger das Gehirn zum Zeitpunkt der Geburt ist, je langsamer es sich anschließend entwickelt und je länger es dauert bis all seine Verschaltungen endgültig geknüpft und festgelegt sind, desto umfangreicher sind die Möglichkeiten, eigene
Erfahrungen und individuell vorgefundene Nutzungsbedingungen in seiner Matrix zu verankern.

App.25b:
Denn dieser freigewordene astralischen Leib, der ist eben nicht von dieser Welt. Aus seiner Welt ist der Mensch herausgeworfen, und er will sich in diese (physische) Welt nur hineinstellen, wenn diese Welt es begründen kann, dass sie auch da ist.

App.26:
[...] einem Menschen, der bereits die Phase des mythischen Bewusstseins nur in sehr abgekürzter und abgeflachter Weise durchlaufen hat, wird es später kaum gelingen, ein autonomes, sich selbst reflektierendes Ich-Bewusstsein aus sich selbst heraus zu entwickeln. Er bleibt gewissermaßen ohne ein eigenes Bewusstsein gefangen in (und abhängig von) den Vorstellungen, die er von anderen Menschen unbewusst und unreflektiert übernommen hat.

App.27:
Det genetiske grunnlaget som utløser dannelsen av menn er samlet på ett enkelt kromosom, y-kromosomet, mens mange viktig kvinnelige kjønnstrekk er samlet på et tilsvarende kromosom, kalt x-kromosomet. X- og y-kromosomer er imidlertid ikke på noe vis likeverdige. For mens x-kromosomet er stort og omfangsrikt, og inneholder mer enn femten hundre gener, er y-kromosomet knapt noe virkelig kromosom i det hele tatt. Selve kromosomlegemet er bare en liten deformert rest, og det inneholder knapt femti gener. Og bare ett av dem - det såkalte Sry-genet – er av betydning, i kraft av å utløse dannelsen av hannkjønnet. Men det er mer. For det er jo nemlig slik at alle mennesker, uansett kjønn, har et x-kromosom. Til en viss grad er vi kvinner, alle sammen. Men mens ordentlige kvinner har enda et x-kromosom, har menn bare den nevnte lille kromosomresten, som makker til sitt x-kromosom.

App.28:
Etter alt som er sagt er det klart at de to kjønnene ikke er likeverdige størrelser. Hunnkjønnet er overalt en stabil struktur, og med sin større reproduktive autonomi står hunner trolig nærmere en overkjønnslig universell eksistensform. Satt på spissen finnes det kanskje bare ett kjønn, nemlig hannkjønnet.

App.29:
Würde das Weibliche die alleinige Oberhand haben, so würden sich die Menschen so entwickeln, dass in ihnen die gleichartigen Charaktere immer wieder und wieder zum Vorschein kämen. Es wäre immer das Kind den Eltern, den Grosseltern usw., ähnlich. Alles an Kräften, was die Ähnlichkeit bewirkt, das haftet an Weiblichen. Alles, was die Ähnlichkeit verändert, was unterscheide schafft, das haftet an Männlichen. [...] Das Männliche wirkt individualisierend, spezialisierend, trennend, das Weibliche dagegen wirkt generalisierend.

App.30:
Ein freier Wille ist nur dort in Frage zu stellen [...]
1.wenn Krankheit oder Verletzung die Funktion des Frontalhirns beeinträchtigt haben.
2. Wenn eine schwere seelische Erkrankung […] den neurobiologischen und psychischen Selbsorganisierungsprozess, der für eine freie Entscheidung notwendig ist, nicht möglich macht, oder

3. Wenn extrem atypische Lebensverhältnisse bei einem Menschen dazu geführt haben, dass ihm in einer gegebenen Situation die üblicherweise vorhandene Auswahl an Handlungsmöglichkeiten […] nicht zur Verfügung steht, sondern in massiver Weise eingeengt ist.

App.31:
“Ist der Gehirnprozess möglicherweise durch einen immateriellen Prozess in Gang gesetzt worden?”

App.32:
Wer im okkulten Wahrnehmen ein wenig vordringt, kann die beiden Phasen seelischer Tätigkeit Auseinander halten. Er kann verfolgen, wie er zuerst, wenn er irgend etwas denken will, notwendig hat, nicht bloß den Gedanken zu fassen, sondern ihn vorzubereiten; das heißt, er hat sein Gehirn zu präparieren. Hat er es präpariert soweit, dass es spiegelt, dann hat er den Gedanken […]Wir haben also zwei Phasen zu unterscheiden: Erst vom Geistig-Seelischen aus die Gehirnarbeit; dann kommt die Wahrnehmung zustande, nachdem für diese Wahrnehmung durch die Seele die vorbereitende Gehirnarbeit getan ist. Beim gewöhnlichen Menschen bleibt die Gehirnarbeit ganz im Unterbewussten, er nimmt nur die Spiegelung wahr.

App.33:
.. eine pseudoautonome Selbstbezogenheit, die […] inzwischen zu einer erheblichen Gefahr für die Stabilität aller westlichen Gesellschaften geworden ist.