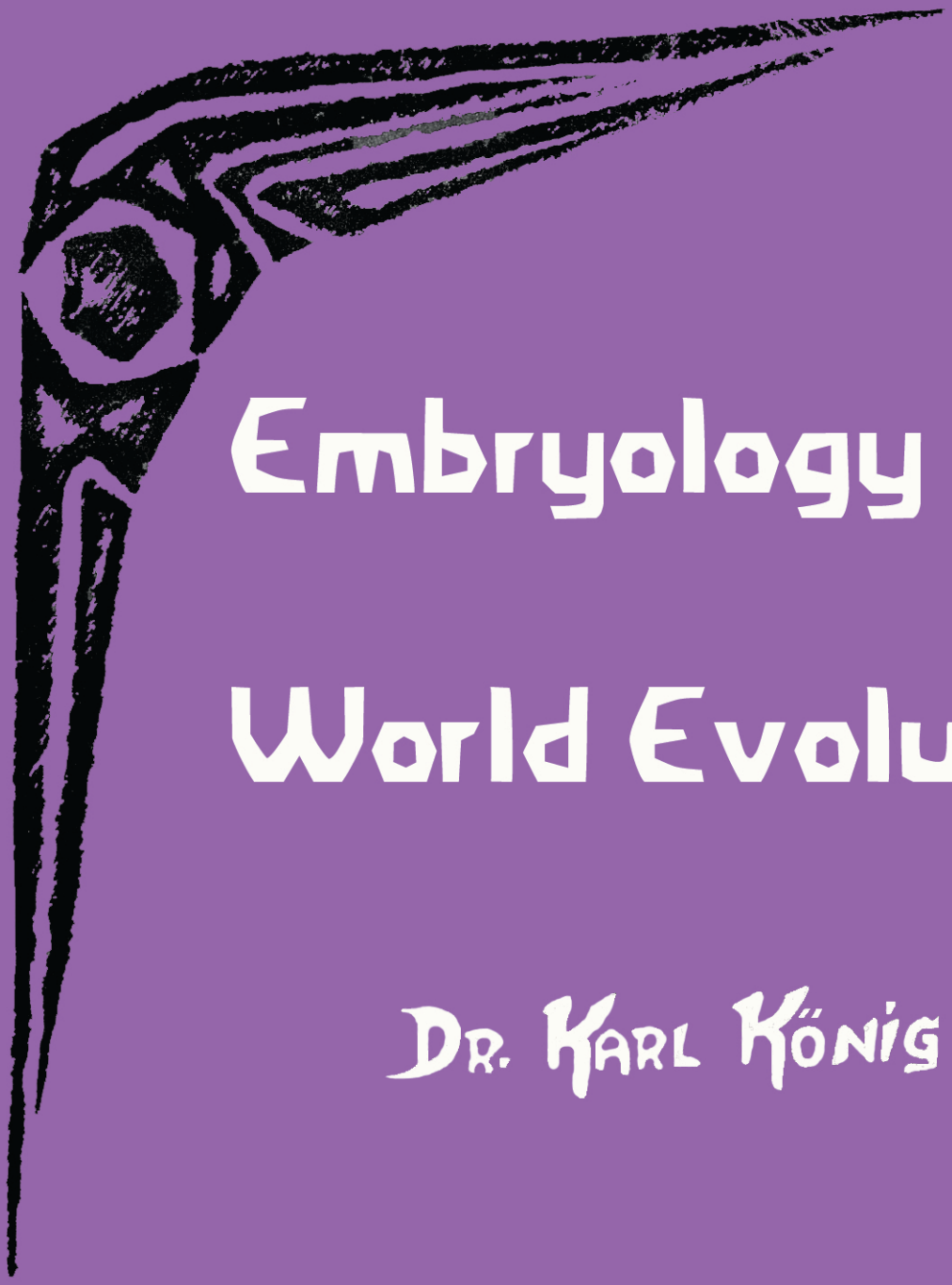

Embryology and World Evolution

Dr. Karl König

Unedited: For Study Purposes Only

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and
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Embryology and World Evolution

BY

Dr. KARL KÖNIG, MD

Dr. Karl König was well known in Great Britain as the founder of the Camphill Movement which has established schools and villages for handicapped children and young people here and in many other countries. He lectured several times to the Faculty of Homeopathy, and a number of his medical contributions have appeared in this *Journal* in translation. Before his death in 1966, he gave six lectures on embryology during two weekend seminars of the Mitteleuro-paisches Studienwerk (Central European Study Initiative) in Freiburg im Breisgau. These lectures were recorded on tape and published in German in a limited edition only lightly edited.

Because Dr. König's work in embryology is of very great scientific importance and should become the basis for re-establishing the validity of the bio-genetic law, we believe that it should be available to a wider readership. We are most grateful for the permission to translate and publish the lectures.

Dr. König was a leading spirit within the school of thought founded by Rudolf Steiner and these lectures may also serve to introduce its work in a field of basic importance to the full understanding of Man.

— ED.

Dr. KARL KÖNIG, MD

Lecture 1, Seminar 1

My friends, it certainly is most welcome that a group like this can meet for a discussion such as this on the subject of embryology and world evolution. It really is quite unique in itself, that there should be scientific discussion of such questions. It is not usually considered expedient to go across from one science to another, for today every individual science has assumed such tremendous proportions that not even a hundred specialists can get the whole picture of that one. I am therefore fully aware that what we are about to do is something unique. Also the following: I do not in the least intend to impart knowledge to you. My only desire is that by the time we part, tomorrow at midday, there may have arisen among us a common understanding of the possibilities which there are for looking at embryology in a new way. And right at the beginning I wish to state, and I am quite convinced of this, that today, in spite of anthroposophy and spiritual science, it is still quite impossible to see and know the truth in the field of embryology. Just as it is generally impossible to crystallize out an absolute, straight truth in anything which goes forward and has its being within the sphere of life. We are always taking one of many points of view, and the picture changes according to the way we look at or view a subject. There is no other way. And so it won't matter whether we maintain this or that; the only thing that will matter is that we work together in a seminar like this, that we try to come and understand each other, begin to see new points of view—and that will not be very easy in this particular case, because half the participants are medical colleagues and the others are not. … It will become more and more possible, dear friends, the more we make this effort a common one. The less you expect: He'll tell us what is what—no, he won't do that. On the contrary, he will ask you to say what you believe, what you assume, in what way one may look at this or that.

Well now, embryology. I would like to start by saying something about the scope of embryological studies and also about the history of embryology, for this is the only way for somehow indicating the framework within which we will be moving. There are many ways of studying embryology, as with anything else. Rudolf Steiner, for instance, did on one occasion demand that *embryology* should be considered afresh in conjunction with *astronomy.* Well, if one considers that on one occasion he did state quite definitely that from the moment of

birth every human being bears the constellation of his birth inscribed upon the surface of the cerebrum, the cortex, so that one might say that we are always carrying our birth constellation with us. If one looks at the course of the planets out there and at the development of the organs within the growing embryo, then one does find some remarkable correspondences, from the moment when one uses not only the microscope but considers things as a whole and studies the coming into being, the formation and transformations of a brain, the budding of a liver, the descent of the kidneys. Then one will find that processes which apply in astronomy lie hidden within this; one only has to crack them open. One might be able to do this if one could get an astronomer interested, so that he would help one understand the concepts which apply in his field. And one could link embryology not only with astrology, but also for instance—and that would be most illuminating—with the whole field of *projective geometry.* This I have attempted to do on various occasions in the past with my friend, the late Mr. George Adams, and we did find promising points of contact here and there, e.g. in the development of the eye, the development of the liver. the development of the kidney. That God geometrizes not only out there, but also right in the human embryo and in the human foetus. All this is extremely complicated and only a mathematician and geometrician of genius will be able to do something of this kind, in collaboration with some embryologists.

There is also the possibility—and that is a wonderful thing—of studying embryology from the point of view of *psychology.* This means to try and learn more and more of how the child's consciousness develops within the mother's womb. A great number of observations have already been made in this field.

We forget for instance that the child, I mean the embryo, or, better, the foetus, is much more awake in the third and fourth months and has a much better and more comprehensive consciousness than at the moment when the foetus begins to kick. Also that the eyes of the embryo are open at first and the lids close later, which indicates that the developing child is then entering into deep sleep and will only begin to waken again slowly, step by step.

I am showing you these various points of view so that you may not get the impression that the one which we shall pursue today is the only one. It is also possible to consider the whole of embryology as a very special and fundamental process of *physiology.* And when I say "physiology," I mean, of course, including *biochemistry*. There again innumerable observations have been made. Unfortunately there are

more speculations and hypotheses than there are observations, but one could rebuild on a completely new basis by using this approach. Indeed, my friends, if this were done sensibly, one could develop a whole new physiology, for nowhere else is it more obvious than just here, in the growing embryo, that it is not the heart which drives the blood, but the *blood* which drives the *heart.* There are already quite a number of blood circulations in the growing embryo before the heart is even linked up with these circulations. Consider after all that the heart does not develop within the embryo itself, but originates above the developing head and only gradually—it takes only a few days, but nevertheless gradually—moves down across the forehead and enters into the body. Do you understand that? Even then it is far from being linked up with the circulation. But the blood flows and the blood vessels bud forth, and it all works and circulates, and the heart does beat, but it beats on its own, quite independent as yet of the blood which courses in and out, flows to and fro.

Here I must point out that in the last 50 to 55 years much work has been done in a field called *experimental* embryology. We have learned a very great deal from these experiments. For instance, that the growing points of individual organs influence each other, and it is not due to any accident if one cell complex, say that from which certain parts of the eye are to develop, is tied up with another cell complex, from which the optic primordia arise; they influence each other very deeply and fundamentally. Well, hundreds and indeed thousands of such observations have been made, and there are many comprehensive volumes on experimental embryology for those who are interested. One of our many possibilities is to study embryology in conjunction with the *history of the earth.* I had to mention all those others, or it would not have been possible to realize that whatever we do take up and study, we take only a *small section* of the whole complex configuration that is embryology, the true embryology.

Now before we go any further and say something about the history of embryology, we must take a look at the two columns flanking the gate to embryology, two columns which are but two different trends of thought in approaching the origin of new life. The one trend is called *preformation,* not only since the eighteenth century, but for much longer. And the other bears the name of *epigenesis.* Those of my colleagues who remember their student days will know what is meant by this. For the others I will try and give a brief explanation. The becoming, all that is coming into being, can be regarded from two points of view. Either we look at it in such a way that we are convinced that that which is

coming into being here before us has its form already preexisting in the egg; it merely grows, unfolds as it grows, but in itself already existed right from the beginning. Because of this, mistaken pietism led men and even naturalists in the eighteenth century to the firm conviction that the ovaries of Eve already contained all the human beings to come, a bit smaller, of course, but there nevertheless in millions of forms. And then it simply unfolded from there, where the good God had put it. That is preformation. Epigenesis is the other column. I leave it to the occultists to find out which is Jachim and which Boas; that does not concern us here. But the point of epigenesis is that out of the void, so to speak, out of chaos, a cosmos is formed step by step through that which is coming into being and through the idea of it. Be this cosmos a human form, a mouse, a fish, a fruit, or whatever.

Those are the two points of view. And we would again, dear friends—at least that is how I see it—be entirely up the garden path if we were to think: Of course, epigenesis is true and preformation is false. Yes, of course, in the form that all future human beings existed physically within Eve it is wrong. But if one looks at it from a different point of view, then it is not quite as ridiculous as it may seem at first. After all, in the last 10 years we have slid back into the worst possible, though unrecognized, preformation theory that one can think of. Since we have discovered what is believed to be the true chemistry of the chromosomes and genes, and not only the chemistry, but the arrangement of the giant gene molecule in this inspired structure of the spiral with every possible variation, which now so to speak governs heredity—there we have preformation, in the ovum and in the sperm, and all it needs now is that in some form or other it all works itself out in the right way cybernetically. So one really should not be cock-a-hoop today and think that we are within the area of epigenesis. That is not so. Both approaches must always, again and again, be seen the one from the other, must complement each other.

And if I may just jump ahead and say something about world evolution, then preformation and epigenesis represent the two standpoints which 130 years ago, for instance, were taken in the Académie française by Cuvier on the one hand and Geoffroy de St. Hilaire on the other. The one, Cuvier, held the point of view that there have been revolutions in earth history, and that with every revolution there was a new act of creation, and that the whole of the animal and plant kingdoms around us is nothing but the result of perpetuating acts of creation which have happened. That is typical preformation applied to earth evolution. Can one grasp this? On the other hand there is

Geoffroy de St. Hilaire who thinks and has thought—and whom Goethe in his conversation with Eckermann welcomed with such joy (I can read you that passage later)—that everything unfolds through evolution. Again, in spite of Steiner's early writings, I think it would be wrong and precipitate to declare ourselves once and for all on the side of epigenesis and look down superciliously on the "preformers." Well, these things too must be mentioned.

Now if we ask ourselves: "Which year was embryology born?" one can say that embryology was born between 1522 and 1524. The historians among you will know that that was the time of Luther, of Charles V, the time of Paracelsus, of Nicolaus Cusanus and many others. I will not go further into that. But three Italian scientists were born one after the other in 1522, 1523 and 1524. 1522 Ulisse Aldrovandi, 1523 Gabriele Pallopio, 1524 Bartolommeo Eustacchi. That is most interesting, for basically these three personalities became the founders of human and animal embryology. Aldrovandi was the first to do something which we now consider pretty obvious, for he took a look by opening the shell of a hen's egg to see how a chick embryo is actually formed and developed. And he noticed that there is no tiny chick in there, but there are very strange, unknown forms which develop gradually from a germ which appears almost chaotic. That was a tremendous step forward in observation; it was not yet an experiment, but it was an observation.

Fallopio, who was born a year later, investigated the human embryo, and he found out that after birth there is a placenta, that the embryo is enveloped in the membranes, and that somehow or other—he did not quite find out how—the blood vessels of the developing child are connected with the placenta and the membranes. That is the second discovery. And Eustacchi was particularly interested in the mouth region and studied animal embryos to see how the teeth develop. And bit by bit he found out. Historically you can therefore see first of all this: Copernicus revolutionizes our picture of the universe and sees the Sun at the center and the planets all round. And the three Italians, Aldrovandi, Eustacchi and Fallopio, they now look into another aspect of the cosmos and begin to experience wonders there.

My friends, one should write a book about this some time, for hidden behind this lie other facts which may be mentioned here—since we are all friends coming together so to speak in the name of Rudolf Steiner. Firstly there is this: It happened because just then, in the '20s of the sixteenth century, the Archangel Gabriel entered his reign. With that begins the history of embryology. It was Gabriel who announced

the birth of the Christ child. And in spiritual history we have a link here. But there is also something else behind this, and that is the following. Fallopio is just as well known to anatomists as Eustacchi, because their names have been given to anatomical organs which they discovered. Fallopio discovered the female tube, that passage which leads from the cavity of the uterus to a point near the ovary. And Eustacchi is well known because he discovered another passage—I did already say that he was particularly interested in the mouth—which leads from the throat up to the ear. And if you look at the human being, dear friends, and see—here is the throat (Fig. 1) and the ear trumpet, i.e. the Eustachian tube goes up there, then it leads here to the inner ear and to the middle ear, and the throat continues here. If you look down, into the female organization, then you find here the Fallopian tube, here the uterus and the vagina, and here you find the ovary, just as there you find the ear.

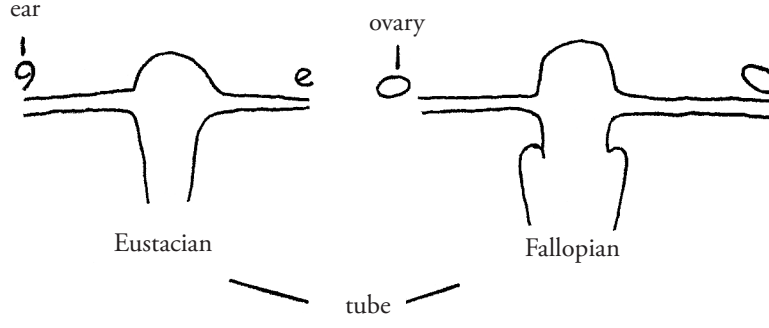


Figure 1

And this is not playing about, for it means that behind the things which we can see there shines forth the archetypal image of something which we should never lose sight of when studying embryology. That to *hear* and to *conceive*—speech and development—are basically the same process, for in the beginning there was the *word.* The word, which creates our human word, and the word which has created our human germ. In the Mysteries at Ephesus they taught this, which I have just said, in another form—much more pictorially and directly, much more spiritually—for there it was said: Speak, man, and through yourself you reveal the coming into being of the world. The coming into being of the world which also is revealed in the coming into being of the embryo, the coming into being of the world which also finds revelation when the human being is speaking. So you see, that is the *birth of embryology.* This mystery is introduced into history a hundred years after the spiritual soul began to stir in human beings. Now man must gain cognition of self. But this can occur only if the coming into being of man is also comprehended.

Forty years later, in 1563, the first autopsy is done on a pregnant woman, and that leads on to all that follows in this field. As usual, there have been men of genius who had already done such things ahead of time. Art historians may tell me that Leonardo da Vinci had already gone to Milan cemetery under cover of darkness and exhumed pregnant women who had died, so that he might find out what processes went on there. But officially, so to speak, without interference from the police, it was in 1563 that a pregnant woman was for the first time examined post mortem and dissected. That is the first big wave, which then brings many further historic waves after it. There is the seventeenth century then, and where the astronomers have the telescope, the anatomists—there were no embryologists at that time—have the microscope. For those familiar with the subject I need only mention such names as Swammerdam and Leewenhoek.

Leewenhoek was the first to see sperm cells under the microscope. Yet at that time, dear friends, nothing at all is known of fertilization. The human ovum is not yet known, and it is still more or less Aristotle's view which is held. He thought that the first germ from which a human being develops is formed from a mixture of male seed and menstrual blood. Gradually, by feeling one's way, the first steps are taken in this direction. The great William Harvey, who discovered the closed circulation of man, also discovers the placental circulation. He knows what he is dealing with there. But you see, the idea of evolution, the idea of a world evolution, a gradual, let us say, a purposeful development, does not yet exist. And indeed in the eighteenth century, after the discoveries made by Leewenhoek and Swammerdam and all the others, there were again notions of preformation, indicating a relapse. Until Caspar Friedrich Wolff—that is not the philosopher Wolff, but the embryologist Wolff—very highly esteemed by Goethe (he was born in 1734, exactly one hundred years before Haeckel, in Berlin, and died sixty years later in 1794)—it was he who really established the epigenesis of embryonic development. Wolff was one of those who understood Goethe's archetypal plant, and there is a passage in which Goethe says about him: "and I am glad to be able to say that for more than 25 years I have learned from him and through him. I hope that Fate will permit me to put down in detail how I have for so many years gone with and by the side of this excellent man, how I have striven to discern his character, convictions and teaching, how far I have been able to agree with him, how I felt spurred to go beyond him, but shall never lose sight of him and always remain grateful."

Well, one must mention all these people, otherwise one has not the right to take even one step further. This step points towards Herder

and Goethe. Through these two, an entirely *new* aspect is brought to the knowledge of embryology and world evolution of their time. But first it is not Goethe, but *Herder* who takes the lead. In him awakens the idea of evolution. It is inherent in him and from childhood he has had the conviction that he is destined for something very great. It is not for me to describe Herder's life for you here, but there is something I would like to draw your attention to, and that is an extraordinarily significant meeting which took place between Herder and Goethe in the hotel "Zum Geist" (The Spirit) in Strassbourg in 1770. There the 21-year-old Goethe meets Herder who is five years older, but already has more experience and is much better known. Herder is working on a treatise which—and this is why I mention it—again is connected with our subject of discussion. It is a thesis for the Berlin Academy, "On the Development of Speech." Goethe, the young Goethe, takes a tremendous interest in this treatise, for it is in this treatise that the idea of evolution, the idea of something coming into being, the idea of man unfolding and developing, and out of himself—out of his soul—giving birth to speech, is put forward for the first time. Well, this notion that man and mankind develop and unfold was ready and pre-existing in Herder as a comprehensive world view. Goethe got it from him and took it across into the *organic* sphere. And it may certainly be said that the *origin of Goethe's natural scientific studies* is to be found there in Strassbourg, in the encounter between Goethe and Herder.

It arose from the notion of evolution. This can be seen quite clearly from what Goethe said, at the end of his life, when on 2 August 1830 he welcomes that dispute between Cuvier and St. Hilaire at the Académie française. He says to Eckermann: "Now Geoffrey de St. Hilaire is definitely on our side and with him all the significant scholars and followers in France. This event is of tremendous value to me. And I have the right to feel jubilant about the final victory in an issue to which I have devoted my life and which pre-eminently is also my own." Goethe had never been that effusive. This shows how deeply he felt about the idea of evolution, the idea of epigenesis, which through Herder and through the influence of the spirit of his age had for him become quite matter-of-course.

My friends, something else of great importance happened at that time when the dispute Goethe was speaking of took place in Paris. At that time Charles Darwin, 21 years old, was sailing round the world on the ship *H.M.S. Beagle*. During these three or four years spent on the *Beagle* he develops a new approach. The idea of evolution, which had come to life for Herder and Goethe, is a matter of course to him, and

he now tries to find *explanations* for something which to Goethe was still an *idea* and a *concept.* Darwin proceeds to rationalize this concept of evolution and arrives at the *theory of natural selection;* he arrives at the struggle for survival. No need to go into this further, we all know it. At that same time, one year before Darwin starts on his journey, the greatest embryologist known to us, Carl Ernst von Baer, publishes in 1828 the standard work for all future embryology, his work on the development of the hen's egg. It still is a pleasure to read this book today. A pleasure because in it personal involvement, enthusiasm, spiritual soul and objective observation all come together. Without this book, further embryological studies would be unthinkable.

A hundred years after the birth of Caspar Friedrich Wolff, two years after Goethe's death, Ernst Haeckel is born. As a young man and pupil of Johannes Miiller, he takes up Darwin's ideas and transforms them from a rational view into a comprehensive world view. In him at last, in Haeckel, arises the true concept of the phylogenetic tree, and in conjunction with this concept of the phylogenetic tree, he takes up an idea originally conceived in the twenties by the anatomist Meckel, but then completely forgotten. This idea concerns us here. It is the *biogenetic law.* My friends, when one says it like that now, it does not seem in the least unusual to us, expressed, as Haeckel did try to express in many different ways, in the form that ontogeny, i.e. embryonic development, is a recapitulation of phylogeny, of the development of the race and of the world. When one says it just like that now, that ontogeny and phylogeny are related, that that which unfolds within the body of the mother—be it a human or an animal mother—or unfolds in the development of mother earth, something we can see more or less obviously in the development of any germ, something which for hundreds and thousands of years, indeed through millions of years, has occurred as epigenesis, is a comprehensive vision and probably one of the greatest ideas ever thought. Rudolf Steiner mentioned this so often, and I don't want to quote from his book now—the absolute devotion with which he spoke of Darwin, Haeckel and all the other evolutionists. It was Steiner who tried to help to get these ideas through. And thanks to him we were gradually able to understand that in spite of the trends which have developed from this, men like Darwin, men like Haeckel did indeed work for the renewal of Christianity. This is quite obvious from what Rudolf Steiner says in the first of his lectures on the Fifth Gospel in Kristiania. There he draws attention to this.

Now, the conception of *The Riddle of the Universe* at the end of the last century, this idea, this formulation of the biogenetic law, was even

for scientists one of the fundamental ideas over which one could still grow enthusiastic, which could still fire the heart—until the beginning of this century, when for the first time the early embryos of man, apes and higher animals were investigated. And it was found—the rest I shall mention later, what led to it—that in fact it is not quite as simple as Haeckel had imagined. For it is not absolutely true that during the development of the germ there is first the morula, then the gastrula develops from the morula, and then the individual organs develop step by step from the gastrula (Fig. 2). So that from the fertilized egg here—I am now speaking for the laymen—there develops through cell division, so it was thought, a *morula,* a mulberry, or you might also say blackberry-like form. And that water collected inside this group of cells, so that then the cells were only on the outside, in several layers, and the morula became a hollow structure, the *blastula.* And that then through invagination somewhere on one side this blastula developed into a *gastrula,* and the invagination became the primitive mouth and primitive gut. That was the picture which Haeckel's first primitive studies produced as the archetypal form of every ontogeny. And this led him to say: First there were unicellular organisms. From the unicellular developed primitive organisms with several cells; then those became multicellular and, through invagination, something like the simple plant-animals, for instance. But it was found, on investigating the human being, the monkey and the embryos of the higher mammals, that this is not all so. The matter is much more complicated. The process goes in quite a different direction, and, because "what must not be cannot be," it was rigidly concluded that the biogenetic laws were an attractive hypothesis, but really nothing more. Well, I was there myself, when these things happened.

At that time, in 1925, '26, '27, I was a demonstrator at the Institute of Embryology in Vienna. I know what a shock it was for us to see

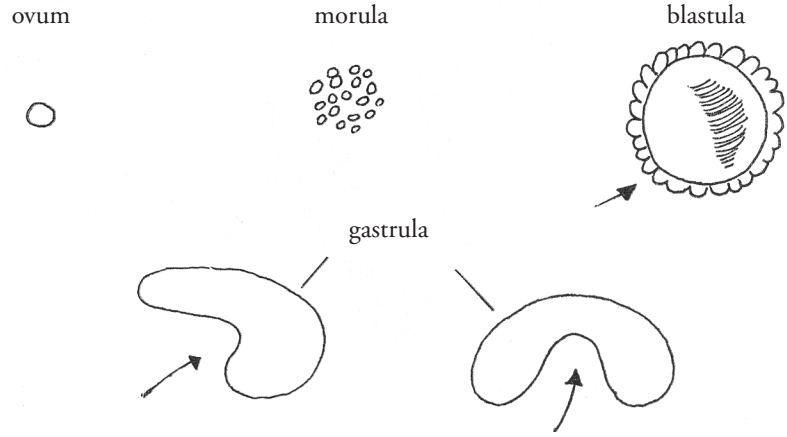


Figure 2

those early human germs of the second and third weeks of embryonic development through the microscope. Quite incomprehensible, dear friends, because the opposite of what we had so far been allowed to think was revealed. The embryo itself is not even visible during the first two and a half weeks; it is not developing. What *does* develop (and a similar thing happens with the monkeys, which we were then studying, and also with some variations in the higher mammals) are first of all the *enveloping organs.* Only when these enveloping organs are established and developed to a certain degree will the first embryonic form suddenly begin to appear, as though out of nothing. That was quite a shock for us in those days. Now it is entirely taken for granted, because one no longer has the courage, the inclination or intention to ask: *What is the meaning of that which is developing here?*

My friends, today we have got so far, and one can only state this with the greatest reverence, gratitude and respect, that during the last thirty years the whole of the early embryonic development of man has become known, i.e. we know human ova—as they are called—of almost every single day, the first, second, third, fourth days after fertilization. We know exactly how many cells have been formed on the fourth day, how many on the sixth, the eighth, et cetera. It is also openly revealed to us when the ovum is implanted in the mother's womb. Even more is apparent to us, namely the fact that it is possible to develop the human embryo *artificially.* If the Pope himself, John XXIII, had not intervened, that experiment would have been carried beyond the twenty-eighth day.

All this can be done today. One does not know where it will lead, and it would be difficult to say; but these things are no longer possibilities—as they were forty years ago—for everything has become a certainty; we know that. The beginnings lie there where, through Oskar Hertwig, his pupils and many others, the ovum was recognized and experimentally described, where fertilization and the meaning of fertilization were demonstrated, and this insight was achieved. Now we know it exactly: Every human being begins as a fertilized ovum, and that is all there is to it. Here and there religious prejudices still linger, but to us scientists they really don't come into it. So why should one not experiment with the human being just as one does with animals? And that has become quite the thing today, particularly through genetics. We have therefore arrived at the point where the mystery has been *revealed.* Where the mystery is no longer seen as a mystery, but as something ordinary, banal, banausic. And what did the mystery turn out to be? It is a cell with forty-six chromosomes. In these chromosomes are many, many genes, and today one is already trying more or

less to influence these; it is thought that their biochemical nature is more or less known, because a construction has been found which is not exactly realistic, but impressive. That and no more is Man. Well, such views must be taken up, one must get to know them, because simply to refuse to consider them would be a sin. There is only one thing to be done about them, and that is to try and develop another approach, where one tries to see the mysteries of becoming in a new way, by once more looking at the mystery that has been revealed. And that is what we shall try to do.

Lecture 2, Seminar 1

My friends, the morning was just an overture. Now let us try to get right into *medias res* and first of all consider the processes which lead to fertilization, i.e. not yet embryonic development as such. There are in man—and in the higher and partly also among the lower animals, but we'll limit ourselves first of all to man—two bearers of fruit: man and woman. And it is so, that these two are fundamentally different in their constitutions, and that a deep gap exists between man and woman, such a deep gap as is not found in any animal species—except the very highest mammals, and they again have got it from man. We are, so to speak, confronted by two poles of human existence, and these certainly have presented us with plenty of problems from the beginning.

Now it is so, that the actual fruit-bearing organs, too, are different at the two poles, the ovary in the woman, and the testicle in the man. I would like to say a few words about their anatomy and physiology, just indications, because I have the impression that in a course like this, one should try to indicate approaches, and then it will perhaps be possible to work out this or that from these viewpoints. The ovary is a relatively stable organ. The testis, the testicle, is from a certain time onwards, namely from puberty onwards, a tremendously vital organ. Everything the testis produces is always new. Millions and millions of sperm cells are, one might say, continuously begotten and created within it. It is a fountainhead of continual and unending vitality. On the other hand, when a girl is born, the ovary already contains the total number of germs, only some of which will gradually develop in the course of her life, and the one or the other of which may be fertilized.

You see, we must really look at such a polarity—not new to us, if we have studied medicine—and then something else will become apparent in connection with it. The ovaries lie within the body, they are, so to speak, more or less held in position at the end of the abdominal cavity, though remaining in a state of suspension. That is the gesture of the female pole. The testis on the other hand emerges from the body, it breaks out of the outer form of the abdomen and descends, must move downwards, when the man reaches maturity. With that—and it may sound strange to you, what I am going to say now, but it is so—the testis falls under the influence of gravity. Fundamentally it becomes a limb, not a perfect one, but nevertheless a limb. That gives you some indication of the form-giving and physiological forces behind these two

organs. There is a quality of suspension, maintenance, bearing power, preservation in the female organism; and something of a fountain-head which is yet under the influence of gravity and has wrested itself free from the body in the male generative organ.

It would not be going too far therefore for me to say—reminding you of the sketch I drew for you this morning when speaking of the two anatomists Eustacchi and Fallopio—that from the point of view of comparative anatomy, and also pathological anatomy, it is so, that the ear and the ovary, the eye and the testis bear a deep relationship to each other. There are certain eye diseases which affect men only, e.g. color blindness, but quite a few other things as well, for this very reason that the eye is specifically male and the ear very much a female organ. In the head, or rather, the face, this is combined in every human being; but where the synthetic power of the head succeeds, the analytic power of the body fails. I am referring to a description given by Rudolf Steiner in his first lecture of the Curative Education course, that something seen in synthesis above falls apart in analysis below, and one of the greatest universal analyses to be found is just that which appears in man and woman. Up there—if I just sketch the basic structure of the face (Fig. 3)—it is like this, that here we have the ears and here the mouth, and that together this represents really nothing else but something moon-like, feminine, receptive. Within it we see eye and nose as something sun-like, vitalizing. These two are torn apart, and down below become, so to speak, the male and the female power.

The head – synthesis

Figure 3

Now, I have not told you all this just because it is interesting. I have told it to you so that we may get some background picture for what happens in the ovary, as yet merely in preparation for fertilization. From birth, or we might say from the embryonic period onwards, this organ contains a very great number of what are called primordial follicles, or primary oocytes. This means that the tissue of the ovary contains a great many such egg cells (I don't remember the figure at the

moment, as far as I can remember there are 6,000 on each side). At first these egg cells are small, but they gradually develop and mature. And this process of growth and maturation, which occurs after puberty and is connected with menstruation, this maturation process is of interest to us. I'll proceed step by step. We spoke of the primordial follicle, which is an egg cell with a fairly large nucleus. You know what a cell is and what a nucleus is, I do not need to explain that. Around this cell forms a layer of other, smaller cells (Fig. 4) and the whole is called the primordial follicle. At the moment when it begins to mature the ovum grows a little, the nucleus becomes a little less visible, but also grows;

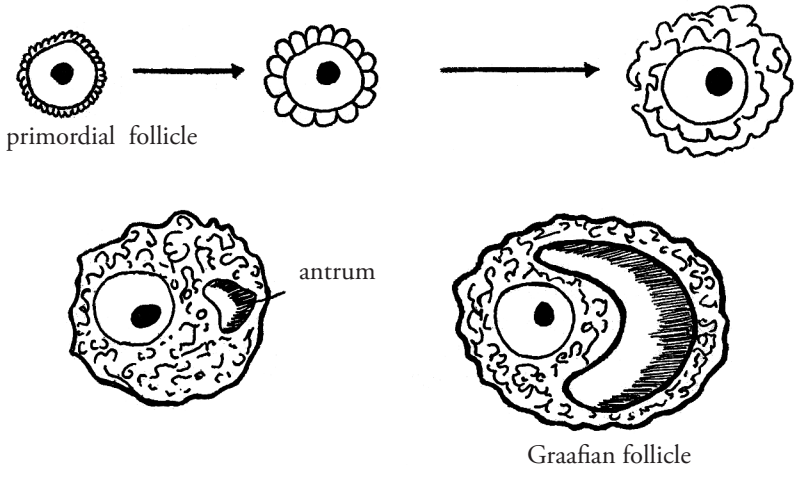


Figure 4

and the cells around this ovum become more cubical. One might say the whole thing begins to shoot and to sprout. Lots and lots of cells gather around this one, single, big egg cell. The egg cell is only just visible at this stage; when it grows a little more it gets about the size of a pinhead, which is just visible. These cells continue to increase and finally form several complex cell layers around the ovum. The next step is as follows: Here again is the ovum, now a bit larger, with its nucleus, and around it this cell complex which by now has got rather big and is much thicker on one side. All this happens within the ovary. Now a cavity, called the antrum, develops in there. And then it goes further. The antrum expands to form a kind of semilunar space and all around it there are cells everywhere. That is called a Graafian follicle. So we have a largish structure in which a cavity filled with fluid has developed, and the ovum, surrounded by small cells, projects into this hollow space like a peninsula. That is most interesting, not only because the whole thing is called the Graafian follicle, first described by the Dutchman

de Graaf in the seventeenth century, but because anyone who has an eye for it will suddenly see: that it is the same type of structure as for the primitive ears and balancing organs of the lower animals. Again a relationship which I merely wish to indicate. Basically the anatomical structure of that balancing organ looks exactly the same as the Graafian follicle.

Then the fluid pressure inside the Graafian follicle increases more and more, and the ovum is released. You must visualize it like this, that the Graafian follicle moves with its upper edge close to any one surface of the ovary, and then this follicle bursts and the egg enters into the oviduct, into the Fallopian tube. How is not exactly known. Probably in that the end of the tube lies against the ovary and sucks the egg up. At any rate, we now know quite definitely that this egg lies within the tube, that it is capable of being fertilized—how, we shall discuss later—and that this is the preliminary stage leading to fertilization.

My friends, I have to describe and explain these things in detail, for otherwise we shall not get at the true insights. Now, if we look at all this, what does it tell us? First there is a cell and this cell becomes surrounded by many cells, and then the whole thing begins to sprout. After this process, fluid develops in there, the fluid takes on a lunar shape and finally, when all this has happened, the egg is released. There, my friends, we have nothing else but those preparatory stages of earth development which lead to a repetition of something that has happened before, namely the evolution of Saturn, Sun and Moon. Consider: There was once the beginning of all earthly existence, there began this creation, there arose, created and formed out of warmth, the human germ as the old Saturn. This went through all the various stages—you know how it is described in *Occult Science*—was finally taken back into Pralaya, reappeared, went through a second incarnation, the Sun incarnation, acquired the properties of air and of light, other substances, etheric elements, were added into and unto it. Again the whole was withdrawn and then reappeared. The Moon evolution began, and when this was completed, and after a further state of Pralaya, the development of the Earth began. In *Occult Science,* Rudolf Steiner describes it like this and I will read it to you: "At the end of the interval" (i.e. at the end of this Pralaya between Moon evolution and the beginning of Earth evolution) "the Beings who had taken part in the evolutionary processes on Saturn, Sun and Moon reappear, endowed with new faculties. Through their former deeds, the Beings who stand above man have attained the power to advance his evolution to such a degree that during the Earth epoch he will be able to develop

a form of consciousness which is one stage higher than the picture-consciousness that he had during the Moon epoch. But first man must be prepared to receive this new gift. During the Saturn, Sun and Moon evolutions, he has incorporated into his being the physical body, the life body and the astral body. But these members of man's being have been given only such faculties and powers as enable them to live in a state of picture-consciousness; they still lack the organs and the form and figure which would enable them to perceive such a world of sensory external objects as pertain to the Earth period. … This preparation takes place in three preliminary stages. During the first, the physical body is brought to a level of development that enables it to undergo the necessary change into a form and figure which can provide the basis for objective consciousness. This preliminary stage of Earth evolution may be described as a repetition of the Saturn period at a higher level. For in this period, as during the Saturn time, higher Beings are working on the physical body only. When the development of this physical body is sufficiently advanced, all Beings must once more pass into a higher form of existence, before the life body, or ether body, can advance in its turn. The physical body has to be re-cast, as it were, in order to be able to receive, when it unfolds again, the more highly developed life body. After this interval devoted to a higher form of existence, there follows a kind of recapitulation of the Sun evolution at a higher level, for the further development of the life body. And then—after a further interval—the like is done, in a recapitulation of the Moon evolution, for the astral body."

My friends, if we approach our subject on the basis of these words by Rudolf Steiner, then we can begin to understand why these things are as they are. For certainly all this is not essential merely for the release of the egg. What for, after all? The egg could simply move to the surface, the tube takes it up, and there we are. But there is first this, and then that, and then a third, and that is a Law, because behind it all lies that mighty evolution to which we all owe our existence. There one begins to get a glimmering as to what processes are in reality involved, if we study those very basic preliminary stages which are repeated, over and over again, in every woman between puberty and old age.

But, you see, there is one thing we must understand. This evolution does not occur in the male, because the male is not the bearer of past earth history. Woman, as it were—and do not misunderstand me, I am only putting it like this to make myself understood—woman bears within her the Earth Memory. The whole of it is now inscribed right into the physical, it is inscribed and has become the Word of the Past,

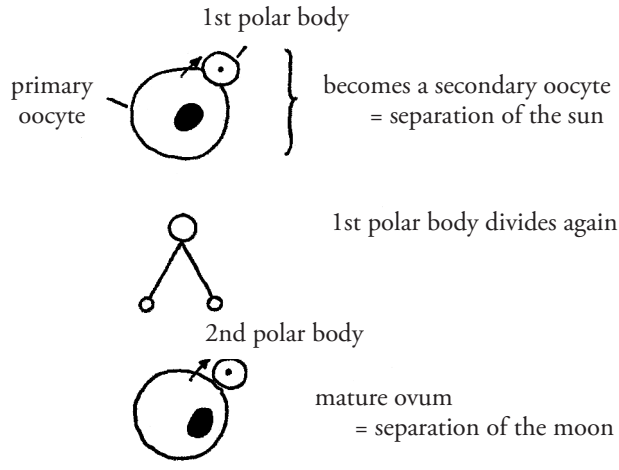


Figure 5

so that this Word which has become Past relates the human organism, as it were, back to the original beginnings from which it arose. But that is only one thing. If we now ask ourselves, how does the egg itself develop? What is happening and taking place there? Well, here we have the oocyte and inside it the nucleus, and in the course of this development which I have just described a separation takes place there as well. From the original oocyte, the primary oocyte (Fig. 5) separates a small, independent nucleate cell, very much smaller in size, the first polar body. And the moment the first polar body has separated, we have the secondary oocyte. The polar body itself splits up again into two small cells. The oocyte continues its development and forms yet another polar body, the second polar body. At that moment it becomes the oocyte of the third order, or mature ovum. And only this oocyte is capable of being fertilized. It has become capable of fertilization because the separation of the second polar body involved a "reductional division," so that now the ovum contains not 46, but 23 chromosomes. That is one way of looking at it.

But there is also another, as follows. There we have a cell, and during this whole evolutionary process the first polar body is formed, and then a second polar body, or polar cell, if you like, is formed. What has been going on? My friends, again this is nothing else but what Rudolf Steiner describes as the evolution of the earth. He tells how soon after this recapitulation of the old Saturn, the old Sun, the old Moon has occurred, the Earth becomes more and more the dwelling place of the developing human beings, though they are still entirely suprasensible. The souls of the human beings look upon what is happening there, which is still entirely within the spheres of warmth

and light. Light not yet visible, warmth not yet perceptible, everything still, as it were, remaining in the realm of the spirit, which is that astral world into which we enter when we pass through the gate of death. But during this stage of Earth evolution, when there are some signs of consolidation, when something watery begins to come into being, one tremendous first intervention does occur, and that is the separation of the Sun from the Earth. In embryology we may say that a last remnant of what happened then, with the separation of the Sun, is the formation of the first polar body. How small that looks now, ridiculously small, and yet it may be called the final echo of that tremendous event. This we may visualize as follows, that higher Beings had to leave the Earth, as it were, to let it take a further step on its own, and moved away with their own substance, with light, sound and life substance, to form what was to become the Sun. But this led to a hardening process, something which Rudolf Steiner describes like this: "Had evolution gone on in this way, the Earth would needs have hardened under the influence of its solid element. Suprasensible cognition, looking back on these conditions, perceives how the human bodies grow more and more solid when their souls depart from them. After a time, human souls returning to Earth would no longer find any suitable material with which to unite. … Then an event took place that gave a new turn to the whole of evolution. Everything which might conduce to a permanent hardening in the solid substance of the Earth was eliminated. This was the time when our present Moon left the Earth. The influences that contributed to permanence of form and had hitherto worked directly from within the Earth, now worked indirectly in a less powerful way from the Moon." That is the second tremendous step, that is the step of forming the second polar body, for now the reductional division has occurred and at last the ovum is capable of being fertilized.

Two sentences further on in *Occult Science*, you read: "As a result, a divergence now appeared in the physical organization of human beings, and this must be regarded as the beginning of the separation into male and female. The delicately constituted human forms that previously inhabited the Earth had brought forth the new human form, their descendant, through the interaction within them of two forces—the germinal force and the life-giving, quickening force. These descendants now underwent a change. In one group of them the germinal power of the soul and spirit was active." (The germinal force of the spirit! "Practice spiritual memories." That is what this oozyte of the third order is really saying. It has now gone through it all.) "In the other group, the quickening germinal force is more active"—and, you

see, what is Rudolf Steiner describing? Nothing else but that now the human bodies have become the germinal power on the Earth freed from the Moon. And a spiritual germinal power now receives—and I am keeping to the picture—the approaching cells (Fig. 6) which until then—and I am quoting Rudolf Steiner—had had to take refuge on the surrounding planets because they found no bodies to inhabit on the Earth. Anyone who has looked down a microscope and seen the sperm cells swarm towards the ovum cannot help seeing in that a picture of what once happened on the spiritual, psychic and physical level when hundreds of thousands of souls streamed back again to the Earth. And now, with fertilization, we have got to the beginning of embryonic development proper. Do you see what I mean? It begins only now.

The preformationists are convinced that now, when the two come together and fuse, everything that will be needed is there already. Rudolf Steiner has told us otherwise. Through him we know that at that moment, when the sperm enters the ovum, the whole becomes a chaos, and that this chaos will only gradually give way to a formed cosmos. That is as far as I want to go with this for the moment.

My friends, we have now come to that moment in the evolution of the world, of the Earth, when after the separation of the Moon human beings can find a dwelling place on Earth again because the body substance has become pliable and is once more at their disposal. I quote from *Occult Science:* "Owing to the separation of the Moon, the human body had become pliable for a while; but the longer it continued to grow on Earth, the more did the hardening forces gain the upper hand, until at length the part played by the soul in organizing the body became more and more circumscribed. The body fell into decay, whilst the soul ascended to other—spiritual—modes of life." So you see, it still won't really do and something new has to happen. "It can be perceived how the powers which man has acquired during the Saturn, Sun and Moon evolutions gradually come in to participate in his further development whilst the Earth is evolving in the way just described. First the astral body—still containing the life body and the physical body dissolved within itself—is kindled by the Earthly fire. Then this astral body separates into a finer, specifically astral part—the sentient soul—and a coarser, etheric part, which from now on is affected by the Earthly element. The etheric or life body, hitherto latent, makes its appearance. And while in the astral human being the intellectual and the spiritual soul are developing, the coarser parts, receptive to sound and light are incorporated into the ether body. Finally, when the ether body condenses still further, so that it develops

from a light body into a fire body, or body of warmth, evolution has reached a stage where, as described above, the parts of the solid earth element are incorporated in the human being." You see, nothing is as yet solid, all is still in the sphere of the etheric world, the etheric elements, in fire, in light, in sound, in life. "Having condensed to fire, the ether body can now unite—by virtue of the powers of the physical body that have been implanted in it—with the substances of the physical Earth which are rarefied to the stage of fire. But it is no longer able by itself to introduce the airy substances into a body which in the meantime has grown more solid. And this is where the higher Beings who dwell on the Sun come in and breathe the air into man's body. Whereas by virtue of his past man has within him the power to permeate himself with the Earth's fire, higher Beings have to guide the breath of air into his body." Man can no longer do it on his own. Something quite new happens. Higher Beings intervene in evolution. In the Bible this is expressed in that Jehovah breathes the breath, or eternal life, into man.

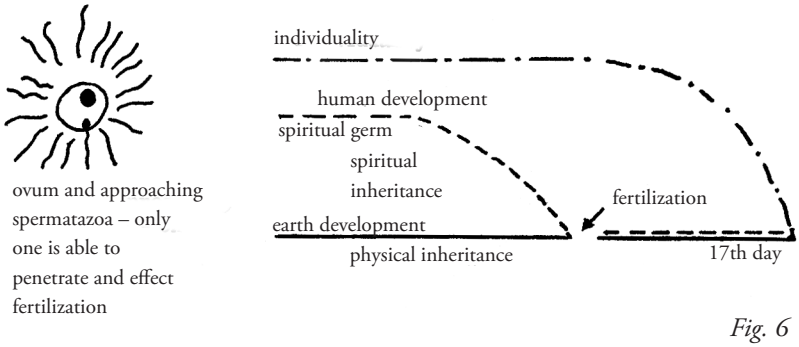


Fig. 6

My friends, we must now try and visualize what that means. For surely, and I am just putting this to you as a first intimation, the point is that now this Earth evolution—the preliminary stages of which we have been describing—must become a human evolution. We have not even mentioned man so far. For indeed it is only now that man comes into it. And the preparation for the becoming of man must proceed in such a way that the breath of the heavenly Beings can flow in. That is, man can no longer do it on his own, cannot incarnate himself; something new, some divine influence, is added. And we may say that the first steps of human development mean simply that there has to be a repetition of that condition which once occurred in order to prevent the decline of man on earth. And this early condition is nothing but that now all development goes in the direction—and now I put it quite plainly—that the embryo has a placenta. That is what it needs now. Can we understand that? The embryo can no longer take

in the breath on its own. This must come from the representative of those powers, from the one who represents the Earth evolution here on Earth, and that is the pregnant woman. Only because a placenta develops at this stage, a placenta that—I won't say becomes the organ of nutrition for the embryo, because that is much too complicated—is an organ linking up with something higher. Indeed one may say that now there is a Sun organ, the whole of development must be orientated in this direction. For only if this happens will man, the incarnating human being, be able to grasp the essential point.

Now, to get on a bit with our subject, I would like to draw your attention to that very interesting line (Fig. 6) which Rudolf Steiner calls the "spiritual germ." The spiritual germ, my friends, is that structural partner of our individual existence which at the moment of fertilization combines with the physical germ. And I may point out that the spiritual germ is not man, not the individuality, nor is it the astral body or the ether body, but that it is the basic form of the physical body of every human being, the basic form of the physical body. That is of course closely connected with Karma, for whether I have blond hair or black, green eyes or blue, broad or narrow shoulders—that depends a little on heredity, but it also depends on my personality. Here the two heredities meet, my spiritual one, which I bring with me, and the other, which I receive through the Angel from my parents (Fig. 6).

Now things really begin to get complicated. What is the spiritual germ? My friends, the spiritual germ is a form of infinite magnitude. The spiritual germ is as big as the universe itself, to begin with. And this spiritual germ is born, given form and shape and structure, by myself, i.e. by what remains when I have gone through the gate of death, after the review of the past life, when I have passed through the Kamaloka, when I have gone through the lower Devachan. What then remains as eternal individuality, that begins, at about the midnight hour between death and new birth, to weave the spirit germ. All the hierarchies, says Rudolf Steiner, all the souls which we met in our past lives and those which we shall meet, take part in this process. They weave our form but—and some won't like this—this form is supra-individual, it is nothing but the human form per se. If there were nothing beyond the spiritual germ, we should all be so much alike. But that is not the case. This spiritual germ—and perhaps I may indicate this—then combines with our eternal individuality and with an astral body in the Moon sphere. There, ego, astral body and spiritual germ are present. From out there, too, we then try to bring our parents together, to influence them to give us the prescribed constellation. Then, at the moment when fertilization occurs, the spiritual germ drops down and in its human

form—you know what I mean—combines with the physical germ (Fig. 6). Now two have come together, the spiritual germ and the physical germ. But a vacuum has appeared where the spiritual germ was before, and into this vacuum enter forces which become the ether body, and it is this ether body which then gives its individual stamp to the universal form of the spiritual germ of man, and brings out the Karma which belongs to us. These three, the ego, the astral body and the ether body, are those which then descend on the seventeenth day. But by that day the development must be such that a house is prepared for the three, so that they may move in.

The next steps in the development of the germ, my friends, are quite simple. I am now going back to the fertilized ovum. We know the preconditions. Let us now examine what happens within the maternal organization. And we can more or less say: After fertilization, probably one or two days after fertilization, the egg has moved through the Fallopian tube—we know what that is now—into the cavity of the womb. At the same time the egg begins to divide, into two, the two into four, et cetera. This whole process which now sets in is called blastogenesis. And this blastogenesis is two-fold from the beginning, so that on the one hand the cell structure of the embryoblast is developing, and on the other the cell structure of the trophoblast (Fig. 7). Let me tell you at once what the difference is. The embryoblast is the cell structure from which the embryo will gradually develop. The trophoblast is the structure which makes it possible for the embryo to "settle in," to embed itself within the substance of the maternal womb. This structure, which we have got here, now becomes active because the quickening germinating power, as Rudolf Steiner puts it, flows into it through the germ. It begins to spread, and again the trophoblast is the activator, the embryoblast is the one that listens, let us say the Ear. Today we are able, for instance, to give the exact number of cells to be found in the embryoblast and trophoblast on each day. And here we come across something of great interest for those with a feeling for mathematics, for arithmetic, geometry. After 72 hours the total number is no more than 12 cells. These are the 12 blastomeres, and one of them is embryoblast and 11 are trophoblast. At the beginning of the fifth day, there are altogether 5 embryoblasts and 55 trophoblasts, at the end of the fifth day 88 trophoblasts and 8 embryoblasts. So it becomes apparent that there is a permanent relationship of 1 plus 11, which is 12. Whether that is exact, or correct, I cannot tell you. I can only read it in the literature which I am sure is scientifically correct and proper. Thus we may perceive that even cell division is governed by an immutable law.

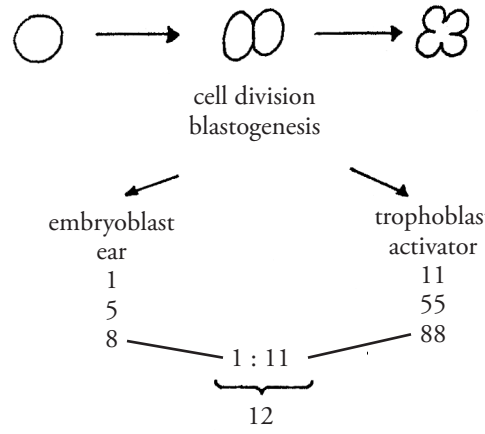


Figure 7

Well, that continues, and gradually a clear difference develops between the embryoblast and the trophoblast. This comes out fully on about the seventh day, and on that day, or about that day, the developing seed is implanted in the wall of the uterus. Before that it still sleeps within the fluid sphere of the uterine cavity. But at that point it attaches itself and the trophoblast breaks down the maternal tissue and invades further and further. It then looks something like this, that here we have the embryoblast (Fig. 8) which already contains a small cavity, and round the embryoblast develops the trophoblast. The whole is surrounded, permeated, filled with the spiritual germ. The human form is at work within it. A few days later, sometimes only hours later, the following develops. On one side the cells of the embryoblast increase in number and size, but the cavity also grows, and around this cavity the trophoblast grows into very tiny, delicate developing villi. This cavity that has developed is called the chorionic cavity. And this white thing around it, that is the chorion. Chorion and trophoblast are two different things. Is that clear? Though the chorion and the trophoblast have become very closely united (this just for my colleagues).

Now a further step. You see, there is as yet absolutely no trace of an embryo or of any embryonic structure. But now we see how here the embryoblast divides and forms two small vesicles, an upper vesicle and a lower vesicle. Again that may have quite a different form. You must always visualize the whole at the same time. Now a fibrous system develops in the chorionic cavity. It is no longer merely fluid, but some structure develops within this fluid. Form has entered. The upper vesicle becomes the amnion. The amnion is that envelope in which later on the embryo is held entirely floating in water. The lower vesicle becomes what is called the yolk sac. You see, still nothing about

an embryo, although it is already the thirteenth or fourteenth day of development. Now it goes on (Fig. 8). Everything grows even larger, and the yolk sac sends forth an evagination, which I'll come to in a minute. All around lies the chorion. Now something condenses from the cells, and this thickening here around the allantois becomes the so-called primitive strand, the beginnings of what later on will become the umbilical cord. So you see, in a few weeks the trophoblast around the embryo, around the seed, will have disappeared, and can then only be found as placenta, with the umbilical cord leading to it. What is this about? We have, dear friends, the chorion, we have the allantois, we have the amnion and we have the yolk sac (Fig. 8). Here they are, the four enveloping structures of the embryo. Fully developed by the seventeenth day. Fully developed so that now, on this day, the individuality of the human being may unite with this house which has been built here. For into the chorion enters the ego, the astral body comes to dwell in the allantois, the ether body lives in the amnion, and the yolk sac forms, as it were, the foundations of physical development—which we shall discuss later. This is something which must first of all be grasped. What is developing there, how it develops, how it relates to phylogenesis and world evolution, that I will not touch upon at the moment, for I have the impression that too much of a good thing might prove rather indigestible. But that we should still come to speak of it, that I would consider important.

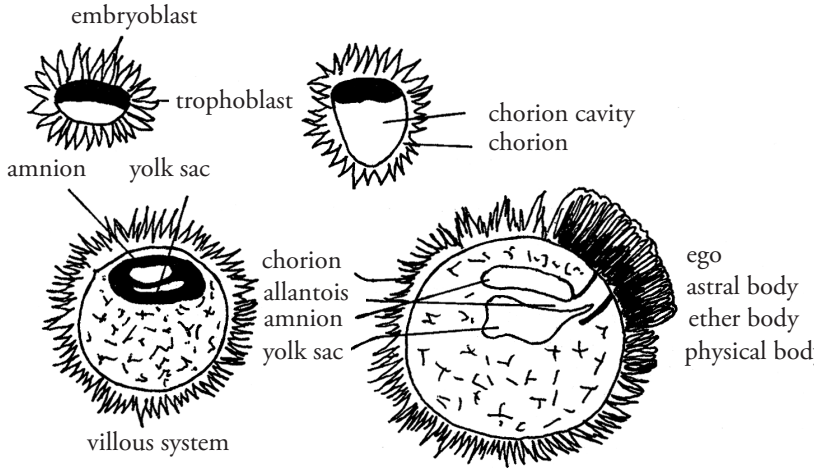


Figure 8

Lecture 3, Seminar 1

My friends, the things we are discussing will have to come to a temporary conclusion this morning. And I would like to emphasize the word temporary, for I see it all as only a beginning and hope that it will be continued in some form and at some time with a group such as this. You have no doubt noticed that everything I have attempted to describe has been only an attempt, and what I have to tell you this morning will be even more so simply an attempt, much more so indeed. Perhaps you will permit me to tell you something personal about this, because it used to be the custom—before something else entered into science at the end of the nineteenth century—that the investigator, the man in search of knowledge, always wrote down something of his own life when he published anything. Read Carl Ernst von Baer, read Carl Gustav Carus and all those great men, and you will see that they always added something of themselves.

It is now forty years since I started to concern myself with the subject of the biogenetic law and its relation to early embryonic development. In those days I was an assistant at the Institute of Embryology in Vienna. Believe me, this theme was always disappearing underground, coming up and then disappearing again. But one thing has become clear to me in these forty years, and I want you to understand this, particularly the younger friends and colleagues. Please do not think that there is only one interpretation; there are always many interpretations. And if today I am going to show you one and then hint at another, and even a third, this does not mean that the one is better than the other, and the second worse than the third. It all depends entirely on the point of view from which one is looking at things.

Furthermore, in dealing with organic forms, one should never forget a fundamental discovery made at the beginning of this century in Prague. First in philosophy, then taken over into psychology, and just as alive today, though not taken as seriously as it should be—the Gestalt theory. Basically it is not a theory at all, but simply the multiplicity of the human ego, which can see the phenomena of this world in two, three, four, five different ways, depending on the background against which it sees them. I can look at phenomena from the point of view of human genesis, I can look at them from the point of view of world evolution, I can look at them from the point of view that there are a physical, an etheric and an astral body and the ego. In the devel-

oping embryo we see cosmic images which cannot be pinned down. These images call for truly imaginative thinking. We must learn to look imaginatively, which does not mean to give rein to fantasy, but to look until suddenly one begins to hear, to perceive, from the form and the structure, what the gestalt has to say, to sing, to tell. And then there can be no dispute. Just think, how marvelous! For if another says: "Well, yes, but it looks different to me," we are now able to say: "Marvelous, I take off my hat, for it is not I who is right, nor is it you, but the world is so wide and human consciousness so narrow that in one of us, or the other, in a third and in a fourth, arise many, many different approaches to interpretation.

These are not different possibilities, but the different forms which the imaginative element takes in the one or the other of us. It is most regrettable that among those who call themselves followers of Rudolf Steiner one still comes across people who simply believe that they have got the only true dogma, and that anyone who does not acknowledge this dogma is in fact a fool. That it is not even worth trying to talk to him. Well, that is simply stupid, because it goes against everything that Rudolf Steiner really wanted from us, which was not to repeat what he told us, but to re-create it, give it new life, out of the powers of our own ego, our own individuality. Anyone who has not got the courage to do so should never dare to call himself a follower of Rudolf Steiner. Forgive me for laboring the point, but it is of tremendous importance, particularly with regard to embryology.

Last night, and quite deliberately towards evening, I was showing you how development was moving towards the seventeenth day and the four membranes: the chorion, the amnion, the allantois and the yolk sac. This was in fact a teleological abstraction. But one always has to start somewhere. I said, and you believed me, that first of all the four enveloping organs must develop, to create a dwelling place for the physical body, the etheric body, the astral body and the ego organization, which are descending. And so I left all other things aside and went straight for my goal, the seventeenth day. Meanwhile something has struck me about that seventeenth day. I have known this for a long time, but I have only just realized it again. In chapter seven of the First Book of Moses (and after that I shall read something from the eighth chapter) we find a marked reference to the seventeenth day: "In the six hundredth year of Noah's life, in the second month, the seventeenth day of the month, the same day were the fountains of the great deep broken up, and the windows of heaven were opened." Then, in chapter eight, after the Flood was over, we read: "And the ark rested in the seventh

month, on the seventeenth day of the month, upon the mountains of Ararat." So twice over the seventeenth day is abruptly brought to our notice, and this is of great importance. Again I do not know why it has to be the seventeenth day, but if Moses gives that number in Genesis, it must mean that this seventeenth day probably had great significance in the ancient mysteries (unfortunately we are unable to ask Rudolf Steiner at present). Oh, and lest I forget, we shall hear some more about the seventeenth day in the discussion, something that may be of considerable moment in our penetration of a configuration like this, of the seventeenth day.

The abstract picture which I have been presenting to you, my friends, must be called an abstraction because it refers to one aspect only, to the ontogeny which is very much in the foreground. What interested us was what happens up to the seventeenth day, the day on which the ego, astral body and ether body descend, following the spiritual germ which descended before them. The physical germ and the spiritual germ have in mutual interaction produced the fourfold enveloping structure. Now the eternal being of man with its suprasensible envelopes enters into it, fills it, the etheric aspect dwelling within the amnion at first—this soon changes—the astral aspect living at the point where the allantois is attached, and the ego aspect entering into the chorion, to begin with, acting only from the periphery. All around the trophoblast is actively working its way into the maternal tissue. Here I am trying to give you pictures of this ontogeny. But I am describing the foreground only. All that, my friends, if the biogenetic law is true, all that is at the same time a recapitulation of what has happened before. If we no longer look at the developing structure from the point of view of ontogeny, but now consider it in the light of phylogeny, then that amnion, that yolk sac, allantois, extraembryonic mesoderm and chorion become something quite different. I can say that now, for this is what we learnt yesterday.

You see, there is not only a developing form obeying the laws of ontogeny. If our way of thinking is the right one, and also in view of the past history of the world, then Original Man himself must, if one may put it like this, here present himself to us. Might we ask what this original man looked like? Let us leave this picture of original man as an open question for now, and first of all try and bring the abstraction of the four membranes to life: From the moment that they develop and take shape, all these membranes or enveloping organs are filled and surrounded with blood. If you were to ask me how this blood develops, I would have to say in every sort of way. You see, the fact that in the

adult human being, and in the child soon after birth, blood is almost without exception formed only in the bone marrow, that is a final state. Fundamentally even that which takes shape as original man is already developing out of the process of blood formation. If you were to ask: But which part of the blood develops first? I would have to say, everything—blood corpuscles, capillaries and blood vessels, blood serum—it is indistinguishable. Everything is still so much alive, so much at the formative stage, still on wings, swelling, sprouting, shooting—so that blood vessels are transformed into corpuscles, corpuscles into blood serum, blood serum into blood corpuscles, blood serum into blood vessel—constant change, taking new shape and form. At that stage every part still has the function of blood formation. Well into the embryonic period, the liver, the cerebral meninges, all sorts of organs are forming blood cells, because they themselves may be said to have developed from the blood. Only you must not think of this blood that I am now talking about as an organic, material substance; it is the blood force which is at work here. And from the blood the chorion and everything else that is coming into being there might be said to coagulate, and even that which then carries its activity right into the maternal tissue, the trophoblast, my friends, is nothing else but the blood force.

Let us visualize again how it all started (Fig. 9). We had the ovum which had divided into a number of cells. You remember, 11 plus 1, 55 plus 5, et cetera. This stage we called the morula, speaking of Saturn, and now we may say: "In the beginning God created the heaven and the Earth. And the Earth was without form, and void, and darkness was upon the face of the deep." Thus it is written in the first chapter of Genesis. "And the Spirit of God moved upon the face of the waters." That is what we can see now. What was without form and void is permeated with the entity we have called the spiritual germ, again I am just indicating it in the human form. That is the First Day.

Then a call comes. "And God said, Let there be light, and there was light. And God saw the light, that it was good, and God divided the light from the darkness. And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day."

We shall try in vain to discover what that light is. But the moment we look at the blood and the formation of blood the way I have tried to describe it, we can say at once: Let there be *light.* And the *blood* develops. My friends, it may look fanciful at first, but let us look at facts—you must realize that this is not the blood which flows in our

veins, that it is still something other than Goethe's "special liquor." It is still universal blood that will only divide into separate forms such as human blood, animal blood, lower animal blood and plant blood later on. It is blood in which chlorophyll and hemoglobin are still a single common substance, I would say, with differentiation into magnesium content and iron content still to come at a later stage. For that is the mystery of light, so far barely understood, that in chlorophyll it is transformed, that out of the blood our own light may be born as the inward light. Until we see that *light* is the universal force behind the blood, forming it out, unless we look at what is beginning to emerge here and hear the words: Let there be light!—we do not really perceive what is happening here. "And God divided the light from the darkness. And God called the light Day, and the darkness he called Night." This is not yet alternation, the one taking the place of the other; what we are looking at here is living, weaving, creative, constantly forming blood on the one side, and on the other—darkness.

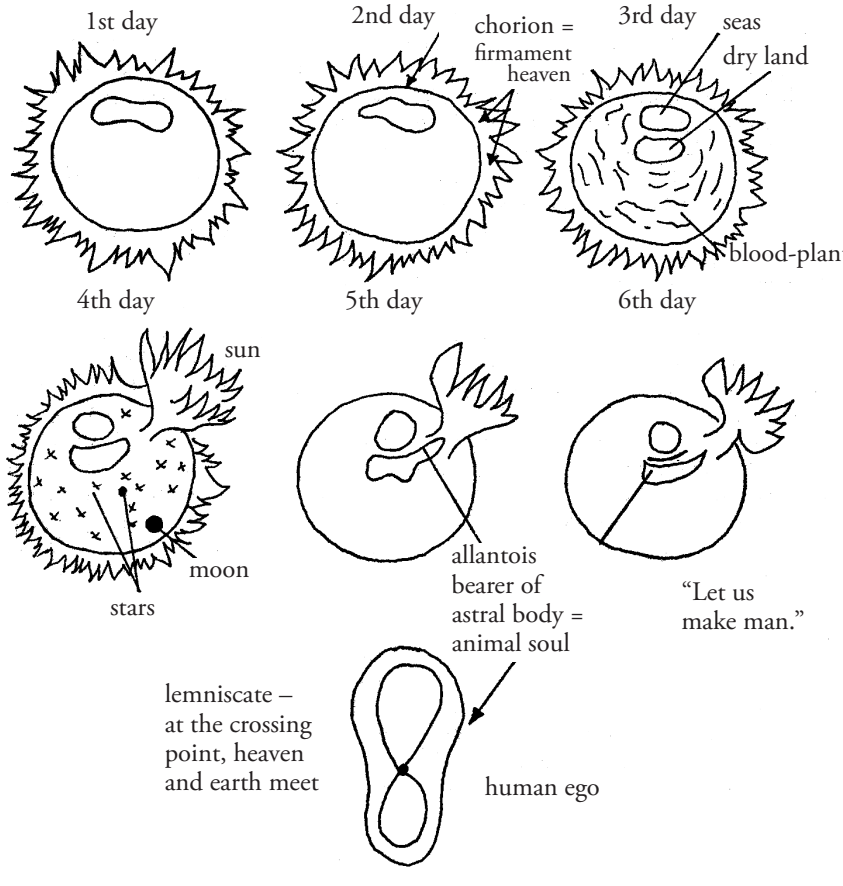


Figure 9

Now you may give form, give shape; you may see the trophoblast being formed out, the embryoblastic cell tissue being formed out, with some hardening already coming in, but still only very tentatively, within the fluid and airy spheres. Now comes a further step, and on the Second Day we read: "And God said Let there be a firmament in the midst of the waters, and let it divide the waters from the waters. And God made the firmament and divided the waters which were under the firmament from the waters which were above the firmament; and it was so. And God called the firmament Heaven. And the evening and the morning were the second day." The chorion now is the firmament. Beneath this firmament Man is woven, in the form of the original man—that is the only way to put it. Above this firmament, i.e. beyond it, lies what the ancients called the crystal spheres, where it goes over into something that for the developing form is of the nature of Heaven. The all-bearing, warmth-giving, carrying mother's womb—that has become Heaven here.

And now listen. "And God said, (that is now the Third Day), Let the waters under the heaven be gathered together into one place, and let the dry land appear; and it was so. And God called the dry land Earth; and the gathering together of the water called the Seas, and God saw that it was good." No need for me to tell you, you only have to look: In there the waters are gathered in one place, the amnion, so that beneath it the dry land may appear, the yolk sac, that is the earth. Up there the amnion, down there the yolk sac. Now we already have the seas and the earth, and all around down there is the whole of the atmosphere. This, my friends, is now filled with the fibrous system I have already mentioned. But not only that, but all around here appears light, appear blood and blood vessels; all is alive and sprouting and shooting, there is no end to it. And now something very special develops, for that blood begins to take shape all around, here around the yolk sac, and if you read on in Genesis—and you must learn to think imaginatively—"And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit, after his kind, whose seed is in itself," et cetera. These are not the flowers we see outside, it has little to do with those. This is the universal plant world described by Rudolf Steiner in one of his lectures. In an atmosphere filled with silica, green forms will appear and disappear, over and over again. In a similar way the plant beings might be said to be making their first attempts at writing here, bringing them into the developing earth atmosphere. That is still blood, that is still man, that is still animal, that is universal earth existence, and in this will develop step by step that milk which once nourished us all at

that stage. You see, now this begins to quicken with life and you will see why I said that yesterday I gave you an abstract picture. Gradually we begin to understand it.

Now the Fourth Day: "And God said, Let there be lights in the firmament of the heaven … to give light upon the earth; and it was so. And God made two great lights: the greater light to rule the day and the lesser light to rule the night. He made the stars also." Well, if you look at these fibers here, seen in the right way they look like stars. Later on I will tell you more in connection with this. Then I must mention one most extraordinary thing, so far observed only eighteen or twenty times, I believe: A small globe separates from the yolk sac, becoming the moon, one might say, in these starry heavens, and it is during this stage that the various elements of the body stalk develop. This body stalk grows more and more towards the sun, which is the placenta. What more do you want? There those two arise.

Now we come to the Fifth Day and it was written: "And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven." Here come all the animals, in the same way as the plants developed. And again we may see it, for here arises the allantois, which I told you about. The allantois is the bearer of the astral and therefore closely bound up with the animal world. If you study the development of the allantois in animal embryos, in birds, for instance, or in amphibia and reptiles, you will realize that this is indeed the structure in which we may see the archetypal creation of all that is animal.

Then comes the Sixth Day, beginning with the word that first of all the animals are created, and then one comes among the animals, as the shepherd among the sheep, and God says: "Let us make man." And now man is created. At this stage man is no more than that archetypal form we have been considering. That double figure, the lemniscate, where heaven and earth meet, where a crossing point develops which then also takes form physically in the primitive pit. Into this primitive pit the human ego enters outside and here on the seventeenth day. That, my friends, is one interpretation of what may be regarded as the development of original man, of the earth, heaven, the whole of existence. Once more let me add: I have had very good reasons for taking Genesis rather than *Occult Science* today. In Genesis everything is given in visual images, so that we get an immediate impression of what in *Occult Science* is developed step by step, sentence by sentence, in concepts.

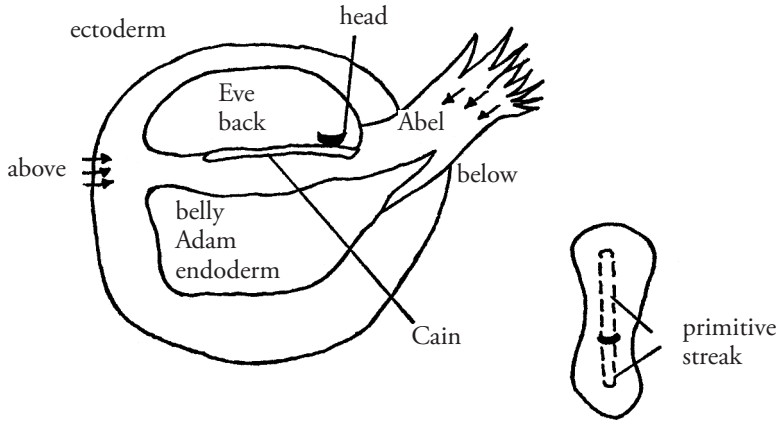


Figure 10

My friends, let us look once more at those primordial images we have been considering. I'll draw it a bit larger on the blackboard (Fig. 10). These are the amnion and the yolk sac. Don't tell me that these organs look somewhat different in some textbooks. I know that. It isn't that I'm not interested, but if we try and pin it down too much, the living form is distorted, and after all, it may be seen quite differently. Let's leave it at that for the moment. The point here is the word: "Let us make man." How did "God" do this? Let us together take another look at that form we spoke of, with the primitive node. On the underside of the amnion we would see this sort of shape (Fig. 10). About here the primitive pit develops. The primitive pit, also called blastotorus, develops from the primitive node. And this primitive pit breaks through, develops further, and becomes a rod. That is the primitive process which you may also call the primitive streak. Thickening also occurs in the other direction, towards the back. The primitive streak, coming from the pit, gradually becomes hollow, forming a tube. Please do not think that this is an actual tube, it is only that the outer substance is somewhat denser than the inner. That is all. Basically then, we get the following: A finger-like form grows into the space between the amnion and yolk sac. That is the ego, the I, and with that, the human form is determined. For here the head will develop—I am just making a little mark to indicate the position, because it is not there yet—here the back, here the belly. This single figure establishes man in his archetypal image. Now, if you were to ask: What is that? again there would be no single answer, but many different ones.

This is not just one single process, for a great many different things happen in such a development. If you read the first chapter of

Genesis to the end and have the patience to start on the second chapter, then you will come across something that is a nightmare for the clergy, and particularly theologians. For there we read: "Thus the heavens and the earth were finished, and all the host of them. And on the seventh day God ended His work which He had made; and He rested on the seventh day from all His work which He had made. … These are the generations of the heavens and of the earth when they were created, in the day that the Lord God made the earth and the heavens. And every plant of the field before it was in the earth, and every herb of the field before it grew." So first God creates all the plants, and then suddenly we read that no trees and plants had grown yet.

Now you see, the same thing applies here. I am now, so to speak, rubbing out our first image of the dwelling, rubbing out the second image, provided by Genesis, that we had before us one or two hours ago. And going a bit deeper, one might say: There is the original man, the archetype later shown to us. There is Adam, there is Eve. The two together are the whole human being, there is as yet no separation. This is why I am so very much against calling this ectoderm and that entoderm at this stage, as modern embryologists do. For you see, first the primitive pit must widen and become the neural groove. The neural groove is the site from which the notochord will exert its influence (from the notochord the primordia of the vertebral column develop later on, and it is the notochord which will give us the power of being upright after we are born). This is the stage when at last one may say that the human being is beginning to make an appearance. That is to say, that at the moment when between Adam and Eve, between allantois and yolk sac, a third is coming into being—I have no hesitation in calling it Cain—at this moment the first flash of triality is seen in this duality. This triality represents what we shall gradually come to call the ectoderm, entoderm and mesoderm.

Since we are speaking of Adam and Eve, you will of course ask: And where is Abel? Evidently, if the records are correct, then they are correct and Abel comes into being. It is he, whose offering is received by the one above, it is he who makes it possible—if you remember what I told you yesterday—for divine powers to bring their influence to bear. These link him up with the sun. Abel is slain only down below, up above he begins to live. That is one way of looking at it. But there is also quite another way. For you know, just as the first creation is followed by a second, now in this second creation we hear of the Garden of Eden. I am just giving you a brief description, to outline the point of view; you can read it up for yourselves.

You will remember that there are four rivers in the Garden of Eden. Now, if you study the early beginnings of the vascular system in the embryo you will see those four rivers. You will see the stream coming from the chorion, the stream coming from the yolk sac, then all the streams passing around the amnion, and finally the first beginnings of the actual stream within the embryo. Do read that up again. It is marvelous to dwell on such things. "And a river went out of Eden to water the garden; and from thence it was parted, and became into four heads. The name of the first is Pison: that is it which compasseth the whole land of Havilah, where there is gold." That is the light which is as yet wholly undifferentiated, and may, as blood, become plant, animal or man. "And the gold of that land is good: there is bdellium and the onyx stone. And the name of the second river is Gihon: the same is it that compasseth the whole land of Ethiopia. And the name of the third river is Hiddekel: that is it which goeth towards the east of Assyria. And the fourth river is Euphrates." You must look at it in the pictorial language, the imagery of these pictures. And that is how it goes on, my friends.

There are always new ways of interpreting these pictures, but now, after these various indications, there is one important thing I wish to put to you. It is the following, and I am putting it to you because I have the feeling that this could and should be the starting point from which a continuation of the seminar may be developed. You know, we are always talking about the threefoldness of man, but I do not think that we are sufficiently clear about the fact that this threefoldness, as we know it, exists in man only after birth. If one asks, how is this in the embryo? What happens when we look at the embryo and ask: Wherein lies its threefoldness? Well, we cannot say: in the head, the rhythmic system and the limb system. That will not do, it would be quite wrong. If we really look at the embryo—and let us forget the primal stages we have been discussing and take an embryo at the end of the seventh or eighth week—then we see how tremendously the amnion has developed (Fig. 11). There the placenta has arisen, with the remaining chorion left bare, because everything is concentrated in this point. From it has developed the umbilical cord, growing inwards towards the embryo. The embryo itself lies and lives in here, the primordia of the limbs are there, beginning to develop, the head is large, the heart an enormous bulge, the liver has already developed, and blood vessels, everything is more or less there. And all around, I am sketching it in like a kind of foundation, all around lies the amnion and the amniotic fluid. Now, if we look at this and ask: Where do

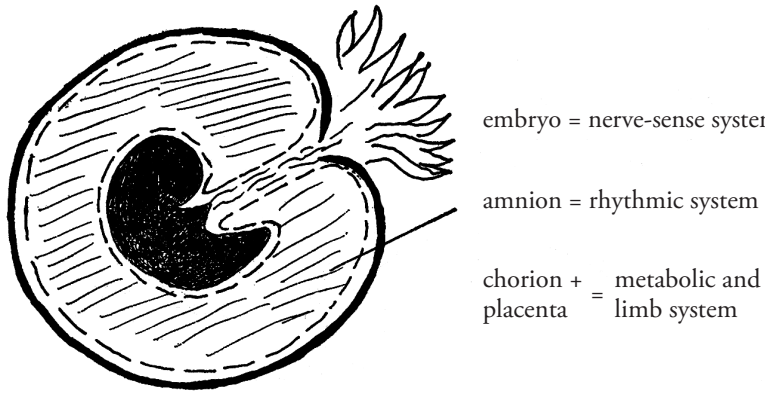


Figure 11

we see the threefold structure, I think there is only one answer: The form representing the embryo itself corresponds to the system of the nerves and senses. All around it lies the amnion, pulsating like a heart. There is no still water which is merely deep, it is water absolutely full of movement, pulsating, renewing itself again and again; it pulsates in such a way that one may well call it a heart, and a lung, a breathing, pulsating lung and heart organization. So once more the amnion has become something different: the rhythmic system. The chorion and the placenta are in this context basically the organ representing the system of the metabolism and limbs.

Why do I put it like this? Again in order to show that the laws pertaining to embryology are no different, except that these laws are seen to operate in quite different ways. Just imagine it like this—that you let your head, with its sense organs still enclosed, with nervous organs which are still functioning in an entirely different way, sink down a little; that your chest organization expands and begins to pulsate all around this head, and that all around the whole of it we get the paternal power of the motor and metabolic sphere that nourishes us. You will immediately experience that the type of consciousness in there must be quite different from the waking consciousness we possess in the daytime. In there, it is not only dark, you see, but there is no air to breathe, nor is there any eating or drinking in there. We must wait until after birth. Then light will awaken the sensory and nervous system, the air will make the rhythmic system into the system we have after we are born, and through the substances of the earth the system of the metabolism and limbs will become what it is to be. Through light, air and earth will develop an above, middle and below. Here at

last it is revealed that the ectoderm is the foundation of every sensory and nervous system, the mesoderm of every rhythmic system, and the entoderm of every system of metabolism and limbs. But at the same time the ectoderm is to quite a considerable extent centered in the head organization, whilst entodern and mesoderm unite. This triality must be recognized.

Having seen that, let us return once more to the picture of amnion, yolk sac and that element already known to us as the yolk canal, which we spoke of and also called Cain. At this point the following happens: The underside of the amnion begins to thicken, the upper surface of the yolk sac begins to thicken, and from the primitive groove the myomeric system begins to develop and gradually divide into sections, i.e. the primitive vertebrae are beginning to appear—I won't go into that now, but just mention it.

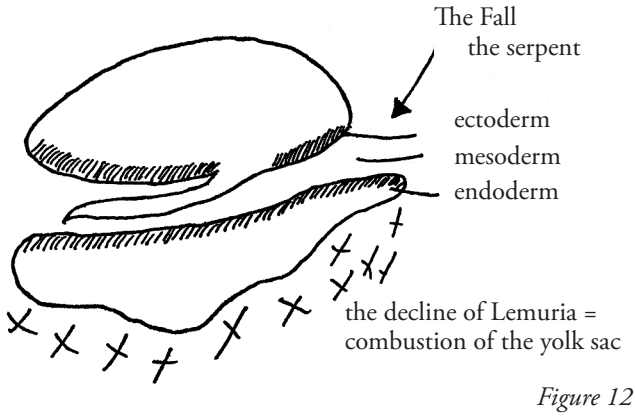


Figure 12

So you see, here is the ectoderm, here the endoderm and here the mesoderm. We might say that when Cain appears between Adam and Eve, we get the very first beginning of the threefold human being. Many weeks of embryonic life have to pass before this being, in response to light, air and earth, becomes head, chest and the system of metabolism and limbs. Then the power of uprightness will become apparent in the lower man, speech will develop in the middle man, and the light of thought will appear in the upper man. The origins lie at that point. Now, if you ask me, what point is that in earth history, rather than in original man? There is only one answer: the point of the Fall. There you see the serpent. And now, at the moment when this I, this finger, develops, at once the nervous system appears, to hide it away and cover it. Now the gut begins to close up, still containing the yolk sac to some extent, but then—and I am following this up—the gut closes, and

what does the yolk sac do? It is burned up in the catastrophic fires of Lemuria. And when all that is over, and we already have the primordia of the nervous system, the gut, the mesoderm, the backbone, when the liver is already sprouting forth and the spleen coming into being, when here, behind the ears, the early kidneys, the pronephros, develop, when the heart is entering from without, then man is recapitulating the transition to Atlantis. The whole of the embryonic development following upon this stage is nothing less than a recapitulation of the whole of Atlantean development. And when the trumpet blasts of the birth pangs sound, then the child is born as the new Ark, on the waters which flow from the mother. Every newborn child is basically an ark. In it, man may once more take hold of himself in his becoming. That is basically how one should look at it. I have the impression that this establishes a certain span of time for what we call ontogeny and phytogeny. We see the Fall, we see the end of Lemuria, we see all the Atlantean periods with their early races. But actually, what Noah did and what happened with the Flood, that actually happens all over again with every human birth. The small child, as it grows up, begins in Ancient India, having at that stage the wisdom of the seven Rishis. And gradually it grows just as stupid as we grown-ups have become.

POINTS FROM THE DISCUSSION

DR. KÖNIG: "To begin with the spiritual germ is neither male nor female, its physical form is both male and female. But at the moment when, according to the law under which we make our appearance, we become *woman,* we attract the masculine aspect of the etheric, i.e. preponderantly warmth and light ether. On the other hand, if we are coming down as a *man,* we attract the feminine aspect of the etheric, where the life and sound ethers preponderate. That is all."

A SPEAKER: "During the interval we made a brief excursion into philosophy. Now, looking at the processes you have described to us, I can see how stage after stage of separation, or of a certain polarization, manifests itself, for instance, when this firmer part, surrounded by the chorion, becomes distinct from the environment, when heaven and earth are separated, and light and darkness. It seems to me that here we see something pictorially which also perhaps occurs in the sphere of thought. I mean that something like this always occurs in Idealism—that something is established, and in contrast to it develops another, say the I to the you, and then those two can act and interact in a new

way. Could one put it like this, that a whole sequence of such divisions are occurring in order that the two may then work together in a new way? Then the question arises: Is there any kind of counterprocess to this sequence of separations and new combinations, a way in which something is taken back? I mean, is there an involution, as one might perhaps call it, opposed to evolution, so that the moon is taken back again, and the sun is taken back again, just as it is in the process of world evolution? In short, is there, in the sphere of life, also something of a retraction? Where would one find this?"

DR. KÖNIG: "I think that is a marvelous contribution that you have made. I would not even say: Could one see it like that? I would say quite definitely that one cannot see it in any other way, for everything we have put forward have in fact been thoughts and ideas, only that they have been presented in pictures. Nothing else. Only they are divine thoughts and ideas. And if you take the idealistic philosophers—think of Hegel or Schelling, or of Hegel's thesis and antithesis—then it's all there. Involution is taking place all the time. Here again, it is only because something is taken back that something new can develop. The allantois, for instance, initiates the body stalk, to put it very crudely, in abstract form. At the same time it is the archetypal image of all animal development. And it is something else again. It disappears. The umbilical vesicle, which has a whole tremendous circulation of its own developing around it, disappears, dissolves entirely, simply goes away. Instead the amnion spreads all around, enveloping the whole embryo and becoming the 'heart' of the embryo; for the amnion pulsates, it is swallowed, enters into the mother, is reproduced again, is a continuous coming and going, and then, at birth, it stops. Only the animals have the wit to eat their own membranes, man does not do so, because he steps out from there. So it goes all the time. Structures are established, rebuilt, taken down. To quote one of the best known examples, just look at the way the circulatory system develops. First it looks like a lyre, so many vessels on the right and the same on the left. Then everything on one side melts down. Only the other side develops, becomes asymmetrical. So it goes on, blood vessels come, blood vessels go. It is terribly wasteful, awful, a squandering of building material and of ideas, but without that nothing would become of it."

A SPEAKER: "You did say, to begin with, that almost nothing has remained of Haeckel's idea of phylogeny in conjunction with ontogeny, particularly with regard to the embryonic stage. But we did see that in the beginning cell division does take place, that the morula exists, and

now this whole phase is called blastogenesis, and then you said that scientists speak of entoderm and ectoderm. That would indicate that a gastrula will also develop."

DR. KÖNIG: "But it does not. This is exactly why one now no longer speaks of phylogeny. But one still speaks of comparative anatomy. You see, that is something quite different. Here and in the animals one sees entoderm, ectoderm, et cetera, and realizes that they are the same. But that has no phylogenetic explanation, one just says: That is the same sort of substance, the same form and the same structure. We do not know where that comes from. That is the difference."

A SPEAKER: "I would like to add a little on the mathematical phenomenology of the number seventeen. A rectangle, a triangle, a square and a hexagon can be constructed with ruler and compass. Strangely enough the next form with which this is possible is the polygon with seventeen corners. Just a few words. It is the series $2^{2n} + l$. Construction is only possible if this number is a prime number, so that we get the sequence 3, 5, 17, 257. That could be constructed too. With the others one does not know whether the number is prime or not."

DR. KÖNIG: "Yes, one can see one thing. Seventeen equals three plus twice seven, and seventeen equals five plus twelve. So that here one has the spatial aspect and man, and here the time aspect. Something is beginning to manifest here."

A SPEAKER: "We now have substances which can prevent something we spoke of yesterday, the maturation of the ovum. In view of what we have been discussing, one would have to consider: What is happening there? A memory reaching back into the past is erased. And the question arises: What consequences will this have for the body and for man?"

DR. KÖNIG: "Well, I don't think I can say anything very much on that at the moment. But yes, I do think that the formulation used by Dr. Werner, that these contraceptive drugs prevent the 'recollection of the spirit,' does give us a starting point from which we may gradually approach this question. For it is the same for all of us, that we ask ourselves: What happens there, when the evolution of the ovum from the primary follicle into the Graafian follicle is interrupted. And conversely, when its development is accelerated, which also happens today, and quins, septuplets are produced in litters, not born. All these are urgent questions facing us today."

A SPEAKER: "With regard to Mr. Werner's question. If recollection is stopped in the physical sphere, the goal of Ahriman is achieved, as Dr. Steiner described it in the *Osterimaginationen*[1] and Ahriman is indeed holding man down on earth. Through this man is cut off. Not only in his consciousness, but also in the earthly world."

DR. KÖNIG: "I consider that a very important contribution. These things interfere much more deeply than we anticipate."

1. English translation in *The Four Seasons and The Archangels,* published by the Rudolf Steiner Press, London, in 1968.

Lecture 4, Seminar II

My friends, it is most satisfactory that we are now able to resume the course which started last October. Then I tried to show you what fundamentally is the first act in that great drama of man's coming into being, as we see it in embryonic development. When I say, the first act, I mean that it was indeed only the first act of a drama that takes four complete and separate acts until the moment of birth is reached. This is not a broad hint that I want to come back and talk to you three times more. But today and tomorrow I want to consider only the second act with you, no more. If we were to have the third act as well today, we would not be able to go into sufficient detail and really get a notion of what is happening during embryonic development.

The title of the first act should have been: *the embryonic membranes.* We found that these embryonic membranes do not yet tell us anything about the embryo itself. They form the environment in which the embryo will be able to grow and live. That is one of the fundamental laws of both embryology and world evolution, that it is not the center which arises first, with the environment developing from it. The environment is there first, and the center takes shape within it.

I want to emphasize this, because all too often nowadays it is forgotten. People think it is they who make themselves, but really, that is a very stupid way of thinking. We do not make ourselves. We are formed out of our environment. Anyone who thinks that the embryonic membranes are all that ever surround us has got the wrong idea. When a child is born, it comes forth from those enveloping membranes, but only to be at once received into another enveloping cloak, the social environment. There is the immediate family and the wider family circle, one's people, and then the whole of mankind. And this is what the first act of embryology teaches us: Look at those enveloping structures and try to understand that it is they that give us form. That is the wondrous thing about human embryology. I pointed out to you that the miracle lies in the very fact that no embryo is developing. This is different from most animals. They are much too precipitate, and having been precipitate they now face the world as incomplete forms—though on the other hand rather over-specialized. Man differs in that he shall be capable of going further, effacing the future.

From the membrane organism (I'll briefly recap for those who were not here last time) now develops the second act. It may just be

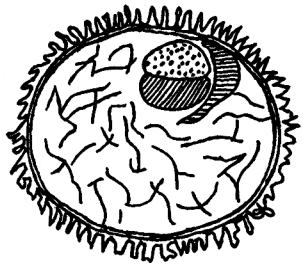


Figure 1

established that the primary germ layers—what these are, we shall see later—are the very first embryonic structures. With the germ layers begins the development of the human body. It will still be a long time until there are any individual organs. The germ layers are universal organizers, organizers that later give rise to specific organs. This is the blueprint, more or less, of the form that is to be; everything is still very small, barely visible to the naked eye, and enveloped in that organization of membranes that we have discussed in such detail. Let us sketch it once more. By about the end of the second week, on the 14th or 15th day, we have the following: Putting it schematically, we have here the encircling chorion; here the villi, embedded in the uterine tissues of the mother; and inside is a brood-chamber, though this brood-chamber is entirely filled with mesenchymal substance. I have told you that this mesenchymal substance is really the universal substance from which everything takes shape and form. In there lies the endocyst, with two clearly differentiated vesicles, the one above, the amnion, and beneath, more densely woven, the yolk sac. And so we have: the outer envelope, and we may more or less call that the heavens; then the endocyst, which is the earth of man, or man on earth. This has undergone differentiation into the above and the below. My friends, if you visualize this picture again and again, if you take it as a basis for meditative, imaginative thinking, then you will get an insight into how the world came into being. The two are linked, not by a cord, there is as yet no umbilical cord—but by a structure called the body stalk, linking heaven and earth. And in these processes we are able to see the whole tragedy of what we know as the Fall.

My friends, let me recall this once more. I shall enlarge the amnion, and here I sketch the yolk sac—this is no longer the 14th or 15th day; we are getting to the 16th, 17th and 19th days (Fig. 2). Please take it that this distance here is about 2 mm. You see, it is not always size or measurement that counts. Even on the smallest scale infinitely great things may happen. Here the primitive pit develops, and from

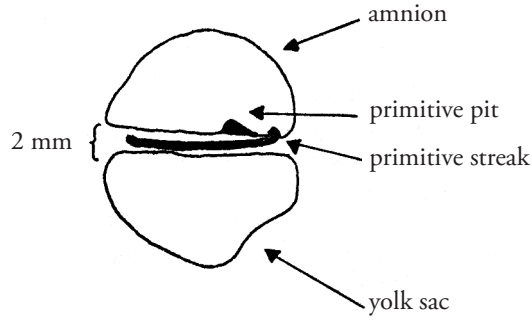


Figure 2

it the primitive streak like this. Primitive pit and primitive streak—extending here between the amnion and the yolk sac—and I told you that this is where the embryo is coming into being. Michelangelo's painting in which the finger of God touches the finger of Adam is the most marvelous artistic vision of what is happening here. Intuitively, though not apparent to our senses, the finger of God may be added to this picture here. And this is the gesture for the coming into being of man. Man may be said to make his first gesture at the embryonic stage by forming the letter I. If we open the amnion and take a look at what is happening here, we would find that structure, that form, which we called the embryonic shield. And there, though only a streak to begin with, is the original form of man. First barely perceptible, it later thickens and develops into the chorda dorsalis (notochord), that strand around which the first somites will appear shortly. And then this groove becomes a tube, a hollowed-out rod. Images that come to mind are: the rod of Moses that becomes a serpent to confound Pharaoh, the rod that makes water come forth from the rock, the rod of iron with which we uphold our humanity and which enables us to call ourselves "I." At this moment, when man has been through the Fall, has had to take that upon him—and I think we should be eternally grateful for that—at this moment the first act of the drama of the development of the human being comes to an end. Now—and I am changing back to earth evolution—comes all that still has to happen during the Lemurian epoch in conjunction with the Fall. The continent of Lemuris

primitive streak
becomes the dorsal cord
as a tube is formed
("the iron rod")

Figure 3

perishes in the catastrophic fires and a new humanity develops on the new continent of Atlantis. The story of the germ layers is the second act, but that is the story of the transition from Lemuris to Atlantis. That gives you your bearings with regard to world evolution.

Now we must ask ourselves: What in fact are the germ layers? It is not too clear when in the history of embryology the term did first come up. I am inclined to think that the concept is among those due to Ernst Haeckel. In his gastraea theory, Haeckel tried to demonstrate his conception of how the germ layers evolved in the history of the earth. Let me tell you right away that today the gastraea theory, like all theories, has many adherents but also many opponents. It is in fact no more than a rather absurd hypothesis of the sort of notions that were very much the vogue in the nineteenth century. In his gastraea theory, Haeckel saw things like this: The big question, for him, as it still is today, was the following: How in earth evolution did unicellular organisms become multicellular ones? And he imagined that all sorts of different cells joined together to form a cell layer, as they do, for instance, in those plant-animals, the coelenterates. He thought that many cells joined up in this way to form a uniform cell layer. We may be sure that that is no more than just a hypothesis which was needed at that time. Haeckel thought that a gastrula would be formed out of this stage, and that gastrula is a form one sees everywhere.

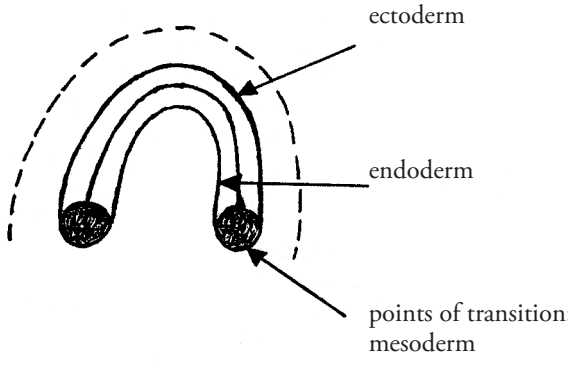


Figure 4

In having the primitive gut (archenteron) here and the outer covering layer here, we already have two important germ layers, the ectoderm without, and the first primitive gut, the endoderm, within. This gives us an idea of the two basic germ layers. In man, however, they develop in an entirely different way.

There is one thing I must tell you, and it is most important in this context: Only the higher animals have enveloping membranes—those

membranes that form the first act of world and of human evolution. In the coelenterates, in the invertebrates, enveloping structures develop in quite a different way and form. But the germ layers, those universal organizers, are found throughout the whole of the animal kingdom and in man. Except for the unicellular organisms—and really they are not animals, but just a shadow cast on the wall, something that came into being at a very late stage, as the result of deterioration—there are no animals which do not have ectoderm and endoderm. That is, they have an outer, covering, encompassing part, the ectoderm; and they would not be animals did not an inner part take shape within this outer, covering, encompassing part. And so I say: The ectoderm is an enclosing element, but now it is not membrane, but skin, integument—whatever it may be—which encloses; and the enclosed develops an inner layer towards the inside, an internal element. At the point of transition from ectoderm to endoderm cells develop which combine the external and the internal aspects. At that point something new, a third element, arises from the polarity of the two. In here the third germ layer develops, and this is the mesoderm. Those are the three germ layers which are found in most, indeed I would say, all animals, including the plant-animals. The mesoderm may be regarded as the child that develops when ectoderm and endoderm come together. If I were to use the terminology of modern zoology or of psychology, I should say: These are the erogenous zones, and from them the mesoderm arises. That, of course, is regarding things from the animal point of view, as modern embryologists and zoologists do. But consider, you can describe and indeed define all that is animal by saying that it consists of ectoderm, endoderm and mesoderm. That is not the case with man, and because it is not so with man, it is different also in the case of many of the higher animals; it is not as simple, not as the textbooks of embryology and zoology like to repeat ad nauseam, taking the primitive line laid down by Haeckel. Of course, the current view is that the lower animals came first, and that because of this the true circumstances are most easily demonstrated on fishes, amphibians and reptiles.

In order to understand what really happened in the world, the following step must be taken. (Sketching, explanation not audible on tape.) If you recall the lectures given by Rudolf Steiner in December 1923, when he spoke of the Mysteries at Ephesus and described the earth environment before the Fall, it was more or less like this: The world, i.e. the earthly world, was still quite atmospheric, enveloped in a dense substance that we might call milk, or protein. Then silica

rained into this substance. And at the moment when the silica entered, it began to grow verdant, then vanished, grew green once more, and again vanished. That was how the plant world first came into being. And if you wish to understand the true background of the amnion, then you will see that silicious-viridescent state of being that occurred there. And then calcareous substances formed as well, chalk pouring in like rain, condensing this atmosphere of milk and protein and forming the first lumps of what might be called animals.

Now if we take these things that we are looking at not as visual aids in the usual sense, but know indeed that once there was the world, and the world was man, and man was the world, then you will see how this state of being led on to the development of the primitive streak, of that which we have called the "germ." Now there is some thickening on the underside of the amnion, and also some thickening on the upper surface of the yolk sac. At the moment when that has happened, we have reached the end of the third week of embryonic development, and at last we may speak of endoderm in the human embryo—and that is the upper surface of the yolk sac—and of ectoderm—the underside of the amnion. This gives us the first notion of how ectoderm and endoderm develop in the human embryo. It is quite different from what happens when there is a gastrula. The gastrula is a pale reflection of it. Here the outer aspect is developed from the viridescent plant-like element, and the endoderm develops from the yolk sac, in an upward surge, substance coming together in condensation. And in there the mesoderm develops, this mesoderm being nothing else but all that is now taking shape in conjunction with the notochord. So here we have the ectoderm, here the endoderm, here the mesoderm, and we have the mesenchyme, which is everything that takes shape within the chorion. This now gives us four primary germ layers.

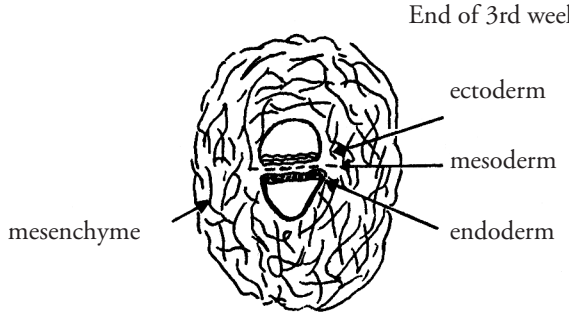


Figure 5

The substance that was available at the very beginning of embryonic development was the mesophyl. The mesophyl is the common, basic substance. From this common substance develop suggestions of forms, the membranes. And it is only when the forms have been found, when they have developed from the mesophyl as though in a moment of pause—everything is still flowing, still general—that blood develops, white blood, red, universal blood, blood vessels, circulation. It is budding life that is developing there. And much of this budding life remains within us. For instance the blood circulation, the blood which is forming within us, in the bone marrow, what we bear within ourselves as the hyaloplasm, all that is still developing mesenchyme. When wounds are sustained, the mesenchyme goes to them in the form of millions of representatives, for the very reason that it still has primary, original powers. It has those powers because it has remained general and has not yet specialized. Formed out as mesophyl in the beginning, the amnion, yolk sac, primitive pit and primitive streak develop. And the embryologists are somewhat premature when they apply the term germ layer, for this is still the general mesophyl, with all possibilities of development inherent in it until the moment when the I enters.

At that moment, ectoderm, endoderm and mesoderm arise at certain points —why, we shall still discover—and the mesophyl remains like a mother who has now given birth to three children. What develops from those primary organizers, from ectoderm, endoderm and mesoderm? From the ectoderm derives the skin, but also the larger part of the sense organs, and then through the sense organs also the whole nervous system. So we may say that the covering of the body, the sensory organization and the whole nervous organization derive from the primary organizer ectoderm. From the endoderm derives everything connected with digestion; I do not say, metabolism. Everything connected with digestion, from mouth to anus—the whole gut—is formed out of endoderm. Mouth, palate, teeth, esophagus, stomach, intestines and anus. And in addition many of the digestive glands, for instance the pancreas, the liver, and—but that is a very special case—the lung. You would be on the wrong track, therefore, if you thought the lower system of the threefold man, the metabolic system, derived from the endoderm. That would be a simplification, and that is not allowed. The mesoderm may be said to form everything that is left. From the mesoderm derives the whole of the skeleton, the whole muscular system, all the tendons, all joints, all blood vessels. The mesoderm also gives rise to the whole renal system, the whole sexual system. Just think of the enormous task given to the mesoderm. And

what is left is the mesophyl. This forms all that is new in us, all that flows: lymph and blood, formation of lymph and formation of blood. It is far from clear and established whether the lymph and lymph nodes derive from mesoderm or mesophyl, in fact I wonder if all that does not arise together with the mesophyl.

But just imagine it all: There we have one plus three germ layers. The ectoderm, the endoderm, the mesoderm—these may be called the three synoptic germ layers. And then a general aspect remains, and that is the mesophyl. This would correspond—not directly but more or less—to the Gospel according to St. John, for it alone points to the origin of the Word in the world. And now consider the fact man is destined to become a threefold being. That this was only established in our own time, by Rudolf Steiner, is one of the great mysteries in human evolution. Until then no attention had been paid to it. People did not look at it this way. Only a mythological concept of it existed previously. Now it has become accessible to science, the fact that man consists of a system of nerves and senses, a rhythmic system and a system of metabolism and limbs, It is one of the most tremendous scientific formulations not only of our century, but of all times.

The following may be said with regard to the points we have been considering: The system of nerves and senses undoubtedly derives from the ectoderm. The ectoderm may be regarded as the great organizer of skin, sense organs and nerves. The details of this will be discussed later. The system of metabolism and limbs, on the other hand, does not derive from the endoderm. This system does have an endodermal center of organization, but in addition there is a tremendous section of mesoderm. The system of the metabolism and limbs may therefore be said to derive from an endo-mesodermal source. And the rhythmic system has blood vessels, arteries and lungs, so that it derives from a meso-endodermal source. Now we must hold on to this. We must hold on to it because we must avoid any simplification, any notion that there we have it, that is the threefold structure and there are the three corresponding developments. No, that is not true, and it is not true because the three germ layers still remind us of what once were the thoughts of the gods when they first had the wish to create. At that time the notion was of a threefold, exactly differentiated image of man. For the thinking of the gods was creation because it was filled with the power of the will. And creation was thinking, because it was filled with the light of divine thoughts; all that changed. It changed because there was the Fall. Because of the Fall, meso-endoderm and endo-mesoderm must develop. This leads to a clear division between the organization

of senses, nerves and skin on the one hand, and bodily organization on the other.

My friends, if we do not look at these things, if we do not discover from such shifts what has been in the past, then we shall never get a clear image of the nature of man on earth. For we are not only threefold men, we are also twofold. We are twofold because we do indeed have a head, and this head is nothing but the complete metamorphosis of the whole bodily organization. Everything that we have in here, concentrated, compact, rounded off, we also have here, formed out and in a twofold form. Into this duality threefoldness inserts itself. And it is because threefoldness inserts itself into the duality, that this meso-endoderm becomes the bearer of the will, the endo-mesoderm the bearer of feeling, and the ectoderm the bearer of thinking. Thus man arises.

My friends, if we were to found a university where the teaching was from our point of view—and perhaps these weekend seminars are germinating points for something that is to come—then embryology will have to become one of the main subjects for the general study of man. Of course, it should not be taught by specialists in embryology, but demonstrated by the embryos themselves; they know what it is all about, that marvelous triality. And having listened, one might say, to all that—and indeed it is no more than just a first hearing—may we now ask the question: What in fact are the germ layers? It really is pitiful to see how the very specialists are suffering from the general stultifaction, believing that the ectoderm, for instance, develops through cell proliferation. Because of their proliferation, these cells must come together, forming the groove and then the neural tube. Meaning that at some point or other cells decided to proliferate, and from this proliferation formed a groove. And then the groove became a tube. And suddenly—how, one does not quite know—that structure began to think. Putting it crudely that is what science wants us to think nowadays. If one says anything else, one is a romantic. But just try and visualize how, in that embryo, in the third week, the primary organizers begin to take shape, and from them develop the system of senses and nerves, the skin, gut, glands, lungs, bones, muscles, nerves, all the blood.

What have we there? Nothing, dear friends, but the four who have been the original organizers of the whole development of mankind. You know, the Egyptians knew that too, and they have depicted it. For that is the *Eagle,* that is the *Lion,* that is the *Bull,* as they shine down from above as the formative principles for the four archetypes of man, which are then taken together in the *Sphinx.* And the Sphinx

may be seen as the exalted image of the four germ layers, for the face seen in the Sphinx is the face of man. Streaming in from the heavens, radiating in, giving form and shape, are the forces of the Eagle. Out of these forces develop skin, feathers and scales, sense organs, eyes and ears, and also the nervous system, all that is the Eagle in us. From the opposite pole acts the force of the Bull, leading to all that is digestion. Digestion develops, gut, liver, and also the lung, for the lung mounts up in animal fashion and occupies the rhythmic system, because the earth has become much too rigid. Then the Lion comes in and permeates rhythmically, perceptively, giving form and shape: bones, muscle, the blood system. At the same time the Lion is the bearer of continuity of life, of the sexual system. The details of these developments will be discussed later.

Thinking	**S.N. System**	**—**	**Eagle**	**—**	**Ectoderm**
Feeling	**Rhythmic S.**	**—**	**Lion**	**—**	**Meso-endoderm**
Willing	**Metabolic S.**	**—**	**Bull**	**—**	**Endo-mesoderm**

Figure 6

DISCUSSION

The question of heredity is raised.

DR. KÖNIG: What does heredity represent in this whole process of development which I am trying to describe to you today and also on the last occasion? Until now we have not come across the term heredity at all. Yet it would be monstrous to simply deny the existence of heredity because it does not happen to suit one. We know perfectly well that heredity exists; but where does heredity come in, and does that molecular spiral, the discovery of which within the chromosomes has been a stroke of genius, in fact have anything to do with heredity? For it is a preconceived opinion, an opinion preconceived with some justification, to say that the secret of heredity lies hidden within the nucleus of the cell and that by having grasped this we have almost solved the mystery.

You see, I have the impression that heredity as a process will have to be taken separately from whatever it is that acts within the chromosomes. That will be the only way of getting a true picture of this activity. What I mean is this: During the last forty years experimental embryology (and very much right here in Freiburg) has uncovered

something which I consider of the greatest importance: Whenever two tissues or substances, contents of the embryo, get in contact with each other, they influence each other. For instance, the face is coming into being out of the ectoderm. When the optic cup touches the outer wall from within, the immediate effect is that the ectoderm invaginates, closes up and forms a nozzle, as if looking inwards towards the optic cup. You see, this is just one example of what must be happening all the time and all over the embryo, pathologically and normally. You can produce anything by implanting something at certain points, at certain centers of organization. You can get nerves to grow out into an arm by just bringing the arm up against a nerve, or even, in the case of the limb buds, let a leg develop from an arm bud, if you implant it at the right point. But when it is an arm already, when development has advanced far enough for it to be an arm, then this nerve that normally moves a leg, will move the arm as if it were an arm. So you can induce anything. It has been proved experimentally on mice.

Now let us consider this. For you see, in my opinion all this has nothing to do with heredity, but everything to do with the form-giving structure of the chromosomes. The chromosomes are sensitive oscillators; it is their function to transmit the form-giving impulsion into the actual forming out of the various parts of the embryo. This means that the mesenchyme cells may be said to contain all possibilities in a coded system. At the moment when, to give an example, these mesenchymal cells become mesodermal cells, the general code is narrowed down, becomes specialized for the mesoderm, just as it does for ectoderm, or for endoderm; but it still has all the possibilities of the organizer which, in the case of the ectoderm, can become senses, nerves, skin, et cetera. Now if something goes wrong with the coding, say a nerve is not linked with the limb for which it was intended, but with another, then the whole thing is re-coded, is generalized again, and then once more specialized. This is the only way in which I can see it at present. Heredity itself is not to be found within the chromosomes. Forgive me for sounding that dogmatic about it. Heredity is nothing but the substance made available to the developing embryo by the parents. I bear within me the substance of my father and of my mother. With that we already have something which links and influences my own, individual part in this stream, a stream that in itself is only substance, i.e. something tying me to the race, to the family, to my station, is coming in upon me, overshadowing my own individuality. And the chromosomes are regulators serving world evolution and therefore forming the human germ into a body. Here we have a first starting point for getting these things clarified.

Another contribution is made to the discussion:

After what you have been saying, it is strange indeed to consider how all the phenomena we are presented with in modern biology are in fact such that they should make us think dynamically and functionally. One thing influences the other, and vice versa. Oddly enough the majority of biologists are stuck in a purely mechanistic and rationalistic way of thinking. I would put it like this, that in mathematical terms their thinking is tied to a system limited by geometrical laws. In order to get the true picture of the facts facing them, they would have to break through into a higher, functional form of mathematics, a field where the phenomena can find their true interpretation.

Now I wanted to come back to the threefoldness of man. The way in which you have put it really presents us with the basis not only for the rational diagnosis of diseases—diseases which we see only as an end-result that is extremely complicated through the interplay of soul and body—but also for a rational therapy. It is necessary to go back far enough, really right back to embryology, in order to grasp why a kidney, why a liver will 30 or 40 years later behave in such and such a way. We have seen that, to begin with, man, too, is a twofold being, and how gradually the polarity of ectoderm and endoderm develops—two tremendous dynamic principles. The one in the quartz cosmos, forming out in the quartz process, as the ectodermal impulse, epitomized in the quartz principle, one might say. The other in endodermal, anabolic endodermal calcium processes. So the one would be more the Eagle principle, the other the Bull principle. There we have the basis for two groups of diseases which later will be polar opposites. The one, coming from the time before birth, and bearing the ectodermal nervous and sensory impulse into the time after birth—a strongly formative impulse. Or, to put it more exactly: In present-day man, as an egoic being, hardening, lead processes calling man into wakefulness, are opposed by anabolic silver processes which push man's consciousness towards sleep. If health is to be maintained, these ectodermal impulses must not reach across into the endo-mesodermal processes; they meet, so to speak, in a breathing middle region. On the one side we have a whole group of diseases leading to excessive wakefulness, arthritis, sclerosis, if these impulses grow too powerful. On the other side we have the group ranging from inflammations to tuberculosis. Now if either the upper, lead-quartz or ectodermal impulse or else the lower, silver-calcium or meso-endodermal impulse breaks through the pattern of substance appropriate for the time—and also the stage of consciousness—through this mesodermal, breathing middle region, then we get carcinoma or mania, as Steiner takes it. These two diseases

are outside normal development as we have seen it in our study of embryology. This applies to their substantial, structural aspect as well as to the state of consciousness. With the one, people are too wide awake, too "hard" in their substance; with the other, too much asleep, and too "soft" in their substance; the spiritual aspect enclosed in the substance is squeezed out. The person gets illusions, even hallucinations of a manic type. The psychologists will have to understand these connections if they really wish to help towards curing the souls of men. And such understanding will lead to a rational therapy.

Between the two poles described above, breathing, or the rhythmic system has its being. The lung is nowadays consistently regarded as the respiratory organ par excellence. But the scheme given just now demonstrates quite clearly that it cannot be so, or at least not only so. It does breathe air, but it must also be seen as belonging to the sphere of nutrition. This is obvious from many clinical observations, and also from its physiology, right down into the anatomical structure, the branching vessels. The liver, kidney and head also breathe, though not in a way perceptible to our senses, they do so in sensory perceptions. In this respect they belong to the sphere of the Lion. Through the differences in their spiritual and substantial structure—modified by the actual individual element—they provide the basis for our various emotional qualities. This is the sphere where the two poles that have been mentioned meet. From the very beginning of twofoldness, in "Adam" and "Eve," as you have shown us so beautifully, we have the two polar tendencies towards disease. And one can see this already in embryology. And when one then considers the middle section, later to become the vertebral column, et cetera, one can just begin to get a first understanding of how all these elements overlap and at the same time bear the mark of the individual when we are face to face with the patient. And one should also be ready to receive therapeutic impulses from such an approach.

DR. KÖNIG: Yes indeed, I consider it most important that these things should be pointed out. It certainly should not be suspended in a vacuum, but provide a basis for medical and human insight. That is what matters. It would be excellent if we could have other contributions on this. That is the only way to substantiate what so far has been only a schematic description.

A SPEAKER: I would like to point out that the medical textbooks do mention individual organs as early as the third week.

dr. könig: That is quite wrong, they must be old books. In the early stages of development, as I have shown you, the heart develops on the outside, but it is not yet a heart. After the 13th day, tremendous growth takes place, and that which has been side by side quite naturally then is one inside the other. Here we have the beginning of the second act with an incredible diversity. Starck's textbook of embryology gives an exact description, that is the one you should read. It is the best book on embryology we have at present. Very mechanistic, but also very exact.

a speaker: To go back to the development of animals—at the moment when there is endoderm, we get the polarity of within and without. The inference from this ought to be that animals developing this aspect further must also have an inner life; somehow, dimly or in some form or other an inner life should be there. Now I would like to know how this development proceeds in relation to the organs. Which organs develop in which animals at the moment when an endoderm arises. What I am getting at, is this: Beings that have a kidney must be sentient beings, for the kidney is the organ through which something sentient may emerge from the current of what is merely life as such. It is most interesting how, face to face with persons with kidney disease, for instance, one finds that they show a marked hypersensitivity at the moment when the upper process of the kidney, the strongly form-giving element, preponderates. Nervousness, one calls it, i.e. such people are too wide awake, they take up everything and the result later on is high blood pressure. On the other hand there are those who remain too much in the purely living element with their kidneys, they do not transform it into the sentient sphere, just because they are ill. Everything that goes in the direction of actual inflammation of the kidney, as far as the, will therefore always present the difficulty of how to get out of this fluid sphere into something of a true, sentient feeling. These people remain in it, sleeping. What I would like to know is when does this kidney come out of animal development, out of what is just mere life, into something that is sentient?

dr. könig: The kidney, let me state this right away, is perhaps a particularly complicated organ as we know it from the study of animals. I would just point this out. This is an important question, and so I must ask you not to equate kidney with kidney. As you know, man has a pronephros which changes into the mesonephros and finally becomes that which we call our kidney, the metanephros. Actually,

it all is kidney—pronephros, mesonephros, metanephros. That is, it all begins to develop in the head of the human being. At the level of the ear, the neck, develop very tiny tubules which are interconnected. (I can't give you the exact details; the physicians among you will no longer remember it, and the others don't know it yet.) The tubules are connected up with the coelom and take up waste substances from the coelom. But this is found only in the embryo, nowhere else, and later the mesonephros descends and finally becomes the kidney which we know as such.

So we have a process going from above downwards. The whole structure of the mesonephros then becomes part of the reproductive system, but again I just mention this in passing; it would be too complicated to give it in detail. But all that is the kidney, and in the beginning—and in the lower animals to the end—the kidney is a small, continuously repeated system of tiny tubules with some form of terminal organ that absorbs and eliminates. Do you know the zoophytes, the polyps and medusae? They have no kidney at all. They consist only of ectoderm and endoderm. Let me sketch that for you, because it is of tremendous interest, and might even induce you to do a zoology course as well.

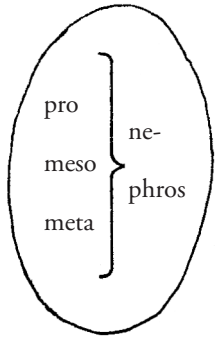


Figure 7

You see, those are the polyps; they are still sessile and have tentacles, like that (Fig. 8), and inside is the gut or endoderm. Sometimes, but not always, sexual buds develop and drop off. A flower or a fruit, whichever you like, drops down. That will never develop into a polyp. A polyp develops only here, by sprouting, detaching itself from the parent, and then settling here. But once a fruit develops, all that dies out. And there, a very first feeling of the sensory system develops, and a digestive system. There (b) we have much more endoderm, and there (a) much more ectoderm, and so the one has a head formation and the other has not. It is one of the most beautiful images one can use. Now there is as yet no kidney there, but at the moment when something new comes into action, here in the sting, that begins to move of its own accord for the first time. The polyps do not do so, they are sessile, and the medusae are moved from without (c), as dust is moved from without. But here it begins to move. And how does it move? It moves with the aid of the "system of water vessels." And the system of water vessels is an image of the inner life in man. To put it plainly that means: There, where I move, I have an inner life. And movement and kidney and

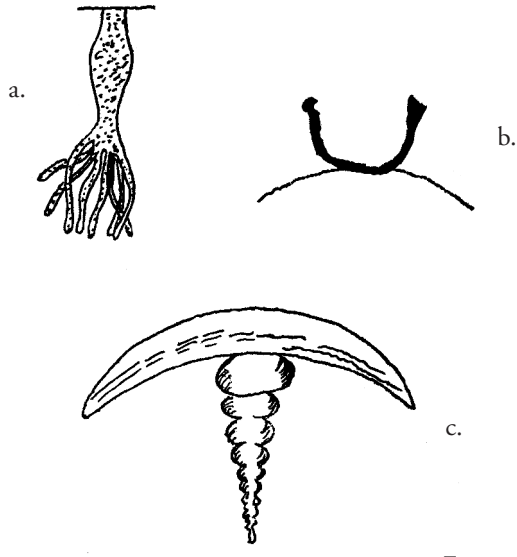


Figure 8

inner life, all that belongs together. There is no kidney if there is no movement. And there is no movement if there is no kidney, and that, of course, is exteriorization. If I have an inner life, I exteriorize it, I express it, and I do so in any form of motor activity. And that which takes expression—for that is katabolism—that is functioning. That is how it is. This is the point one must look to, so that one can in the first place get down into the root, one might say, that is so important. From then on all animals have kidneys, systems of water vessels, et cetera. But they are far from having kidneys like ours. Those only appear gradually in the higher mammals.

A SPEAKER: If as a layman I may just ask: could you give us an outline of how the germ develops in plants, so as to round out the picture?

DR. KÖNIG: I fear that would lead to confusion, because it has so many aspects, that one would not be enough. It would take a whole hour to explain. One would have to make it clear how there is no seed and ovum, but something quite different.

A SPEAKER: I would like to ask the following: this picture of how the kidney develops, that gives one a basis from which to start a number of things. The image of the kidney, this organ that in man descends from above to below. And in the field of massage and in various symptoms of illness we do, of course, have those zones up here in the neck where we "find" the kidneys again.

Now it should be very interesting to get a pictorial image of the lung, for instance, ascending from below to above. How does that look?

DR. KÖNIG: I can just give that very briefly, because we shall discuss it tomorrow morning anyway. I should like to give you the outline of it, because then I shall have more time for other things tomorrow.

You see, I don't even have to draw this. The lung only gets up into the middle zone because in man, and in connection with this also in the higher animals, especially the higher ones, I mean higher mammals, though not in all mammals, a diaphragm develops, a diaphragm separating the abdomen from the chest. In the majority of vertebrates the trunk, that is the chest and abdomen, forms a single whole. The lungs extend all the way down, the kidneys all the way up, it may be one way or the other, the heart is up there, and only at the moment, at the cosmic moment, when the diaphragm develops, the heart descends, is surrounded by the lungs, and the kidney stays down there. Do not think that the lung ascends. No, the lung cannot go back because the kidney descends, that is the reason. And if you recall the embryonic development of the kidney, how the ureter rises up from the bladder and takes hold of the metanephros. This will suddenly make you see what it means that pro- and mesonephros develop into the metanephros; the metanephros is held fast and the mesonephros drops down and becomes part of the male sexual system. All that is dramatic: Again you have something that must fall, and the lung is the counterthrust to that which has fallen down. Because the kidney falls, the lung must rise and there are remarkable lectures by Dr. Steiner in which he describes how Jahveh made the counterthrust to the fall of Lucifer; that is it. One must know this if one is to understand these processes, and it is all written down in this drama. What I have told you just now is part of the third act. For it happens later, during the late Atlantean epoch. And now I feel that with this picture we should come to an end.

Lecture 5, Seminar II

My friends, this morning we were trying to arrive at some conception of the germ layers. We have come to see that the formation of the germ layers may be called the second act in the drama of embryonic development. We then made an attempt to describe the formation of the germ layers—at least in the early beginnings—and from this description we arrived at an image. This image arose when we said that in the ectoderm, mesoderm, endoderm and mesenchyme we perceive the same formative forces which also have a hand in the formation of man everywhere else in the world. In occultism these forces are called Eagle, Lion, Bull and Man, and in ancient Egypt they were given visual representation in the form of the Sphinx. We linked ectoderm and Eagle, mesoderm and Lion, and endoderm and Bull, and so the mesophyl had to be called the general aspect, that which is for ever coming into being and sprouting anew, and also that which is entirely human. Well, that might be called the first step in what there is to be said about the germ layers, at least from one point of view. This afternoon we are going to go a bit further in describing the germ layers.

You see, it is essential to try and get an image of things. The statements made by modern science just do not give a picture at all. Simple cells are described, cell layers are put together, structures are presented; but one cannot say that all this creates a picture, or an image. It is left to us to perceive the gestalt in the more or less confused mass of cells we are presented with. This is the crux of the matter. This is why I am going so slowly—because our thinking today is such that the perception of gestalt, of an image, has become so very difficult, because thought is no longer creative and alive. And if one does come up with such images, then it is said that they are more or less only "imagination."

You see, if one takes the concept of ectoderm and Eagle, that in itself is already an abstraction—unless one adds that from which this ectoderm originated. And even more so—now I may take all that as given—if you take everything together and really try to get an image, say seeing the Eagle of ectoderm, from which senses, nerves and skin develop, together with the mesodermal Lion and the endodermal Bull, then you get a configuration which now takes effect in embryonic development. I already tried to indicate last time that the embryo never grows into a whole from all the various parts from which it develops. Basically the embryo consists of a hundred different parts. And that at every hour and on every day these parts form a whole; that is one of

those great miracles which occur within embryonic development. This process is almost as if from all corners of the universe, from all spheres of existence, power and substance, form and shape are rushing in, forming configurations that are independent of each other, producing forms and substances that at first have nothing to do with each other. And yet this multiplicity is always again a new integral whole. One of the formative spheres involved is that of the Eagle and ectoderm; another is the mesoderm, the Lion, and that will only be a whole if it is seen together with the allantois. We spoke of the allantois before; in the human embryo it is at first a very insignificant structure. But we know that in birds and reptiles it is developed and formed out to a special degree. Then we have the endoderm (Bull), and this endoderm (Bull) will be a whole only if we include the yolk sac, the organ from which the endoderm may be said to take form, and from which it gradually stands out more and more. Finally there is this general, sprouting, vital mesenchyme, with potentialities in all possible directions, surrounded by the chorion. Thus we have four formative principles presented in the embryo: the Eagle with the amnion, the Bull with the yolk sac, the Lion with the allantois, and Man with the mesenchyme and the chorion.

In the course of embryonic development these four formative principles develop and take shape in quite different and divergent ways. There is one thing I want to mention right away, and that is this: You see, it is perfectly obvious that a few weeks after fertilization, in the sixth, seventh or eighth week, two of these membranes disappear completely. They melt away,; one might say they are overcome and absorbed by the burgeoning embryo. Look at the picture again: On the one side the allantois, that small rudiment, really no more than a guide for the developing umbilical cord, is disappearing, leaving a mesoderm without allantois. But as that which has been the allantois is entering into the mesoderm on that side, the structure of the umbilical cord and placenta develops quite mightily from the mesoderm on the other side. So this is our picture: The allantois vanishes, but the amnion develops mightily—how, we'll discuss later—and together with the mesoderm the umbilical cord comes into being. As we look at this, look at it in such a way that you learn to feel bones, blood vessels, muscle, cartilage, heart, connective tissue, joints, kidneys—into all those the allantois has gone, and indeed it is the allantois that has its resurrection in the renal and sexual systems, for instance.

A similar process occurs with the yolk sac. The digestive tube, the gut, widens, growing larger and larger, and into this gut formation

the yolk sac gradually disappears. I have already told you that a more or less closed circulation, the vitelline circulation, did already exist in the early stages of development. That, too, vanishes completely, and one might indeed get the impression that the elements which previously existed in the yolk sac have their metamorphosis in the digestive powers which later unfold their activity in the gut and in the glands developing around the gut.

Then there is a third entity, one that is completely different, the amnion. My friends, what happens with the amnion is the direct opposite of what happens in the case of the allantois and yolk sac. For nothing else within the embryo—I am now speaking of the entire structure—grows so strongly, so continuously, getting bigger and bigger, than the amnion. By the end of the second month this amnion has swallowed everything, one might say. Let us visualize the embryo like this (Fig. 9), quite primitive to start with, and surrounded by the amnion. This amnion grows and continues to grow, getting bigger and bigger. Only one thing escapes its grasp, and that is the umbilical cord. Then we must sketch it like this, that we say: All around is the chorion. But the chorion is completely filled with amnion, i.e. with amniotic fluid; and that is linked with the ectoderm. No doubt you understand that we must follow the development of such forms in order to ask ourselves: What lies behind it, what lies behind it all? I repeat, the allantois disappears, the yolk sac disappears, the chorion remains as an enveloping membrane, and the amnion may be said to show the greatest and most comprehensive development. And we must ask ourselves, my friends, what is the intention behind these formative processes? Why is it that a fairly balanced tetrad is now giving way to excessive amniotic development? That is the question I put to you.

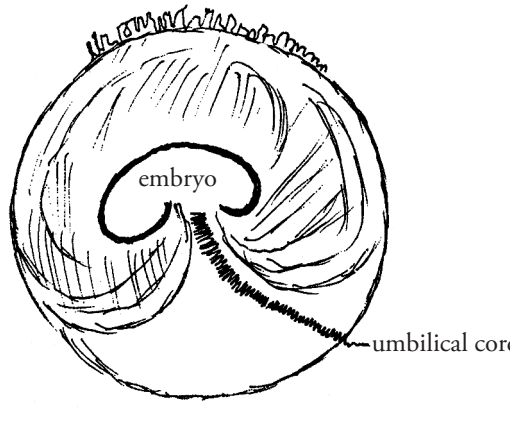


Figure 9

What does that indicate, when more and more water is surrounding the embryo, when it floats in the dark, not breathing, having no real air and light, but surrounded by water that is coming and going? My friends, nowadays we know that this amnion is no motionless water, but that this amnion is constantly circulating, that it not only pulsates rhythmically, but is also quite definitely renewed and disappears again within the limit of a few days, we do not know exactly how many. The road taken by this renewal and dissolution is not yet exactly known. What we have to visualize is this: There is the embryo, coming into being and taking shape; it has lost the allantois, but the mesoderm continues to develop. Instead the umbilical cord has grown much bigger and more important, linking heaven and earth, the heaven of the chorion and the earth of the embryo. The embryo has also lost its yolk sac, and it is enveloped by the chorion. That may be said to change very little, just as the mesenchyme remains eternally young. But now this tremendous amnion develops. Well, what do you think?

A SPEAKER: One might imagine, and both agriculture and medicine make use of this, that whenever water is in motion, a cosmic element is able to come in. And so one might imagine that the embryo enveloped in water would perhaps need the cosmos to come in from outside, so that it may have the power to develop its form fully.

DR. KÖNIG: It certainly needs that. But you know, that is still a thoroughly teleological way of thinking. The good God wants us to have stoppers for our wine bottles, so he lets cork-trees grow. Basically that is the same thing. But there is more behind it. You are quite right in one respect, for anything that is in water can still remain cosmic today. True enough, but that would not need so much water; that is not necessary and in fact excessive.

A SPEAKER: Surely the whole of the Moon evolution is behind this?

DR. KÖNIG: The whole of the Moon evolution is behind this, and something else—and that is Atlantis. There rise the waters of Atlantis, that is Atlantis. This is what happens within the pregnant woman; she becomes Atlantean within her existence, and because she becomes Atlantean, because she might be said to go back a whole epoch of Earth evolution, cosmic forces are able to come in and act as they did during Atlantis. That is how we may put it. But it happens not in order that it may *be* so, but because it *is* so. And the moment we begin to consider this, we may take a further step—and now you will get something of a surprise, I am sorry, but I cannot help it, but we get the following:

There is the amnion, and this amnion as it grows and develops we have found to be an image, a symbol. Everything we come across here is image or symbol. It is the image of Atlantis, and linked with it we have the ectoderm, and this ectoderm in turn is connected with the old Moon. Now we can glimpse something more of these forces which are behind the formation of the whole nervous system. (How that is done, I'll tell you later.) Then we have the allantois. Now you see this allantois is related to Lemuria. You can work that out very accurately from zoology and the developmental history of animals. The mesoderm has to do with the old Sun. But Lemuria has perished. And because Lemuria has perished, we have the allantois vanishing here once the image has been recorded. Just as Lemuria disappeared, so the allantois must disappear. And finally there is the yolk sac. The yolk sac also vanishes, for it represents Hyperborea. My friends, I shall never forget the first time I had occasion to open the yolk sac of an embryo, of a very early embryo, for the yolk sac exists only at this early stage, and found—this is now more than forty years ago—a fluid in there that was so glorious and beautiful, so bright and overwhelming to my eyes like radiant gold. You see, there one gets quite a different picture of the yolk sac than if one sees it in frogs or toads, for instance. In their case one sees only something that has come down. But here we have "Hyperborea" and this Hyperborea—you see, surprise follows surprise—is connected with the endoderm, that is, with Saturn. And now you will ask: But where is the mesenchyme? Well, that has gone, for from it everything else has developed. Saturn could not have come into being had there not been mesenchyme and chorion before. Now we have taken a big step forwards.

Amnion	—	Atlantis		
		ectoderm	—	Moon
Allantois	—	Lemuria		
		mesoderm	—	Sun
Yolk sac	—	Hyperborea		
		endoderm	—	Saturn
		mesenchyme	—	chorion

Figure 10

If we really want to grasp it, if we really want to get the picture (Fig. 10 is drawn on the blackboard)—the amnion, that is Atlantis. And during Atlantis comes the unfolding—read it up, what unfolds

there, memory, the first thoughts are formed in man, everything immediately connected with a nervous system that is already functioning. And this nervous system goes back to the time of the old Moon. Please don't say, yes, but Atlantis is the fourth Earth epoch and Lemuria has to do with the old Moon. I am sure that is so, just as you are. But it is the nervous system that now begins to unfold within Atlantis as that which has come into being on the old Moon. And so the Sun breaks through Lemuria, the old Saturn breaks through Hyperborea, so the mesenehyme lives within the chorion which is remaining Saturn. There you have a description of the inner forces at work within the germ.

Now we go one step further, and the point is this: Let us perceive or try to perceive the activity of the Moon in the ectoderm within the Atlantean flood, the activity of the Sun in the mesoderm within a Lemuria that has perished, the activity of Saturn in the endoderm in what is Hyperborea. We may achieve this by studying the developmental tendencies of ectodermal, mesodermal and endodermal structures. For instance, I spoke of the embryonic shield and how the chorda dorsalis or notochord develops under this shield. If we take a cross-section, we have the embryonic shield here (Fig. 11), and underneath the embryonic shield we have the chorda dorsalis here, a tube in cross section. Now development proceeds like this, the ectoderm—for all that is ectoderm, it is the nether layer of the amnion—begins to thicken on both sides of the notochord. These thickened structures are the neural folds, and as they thicken it happens that between them the surface drops down. So we must imagine that right across the

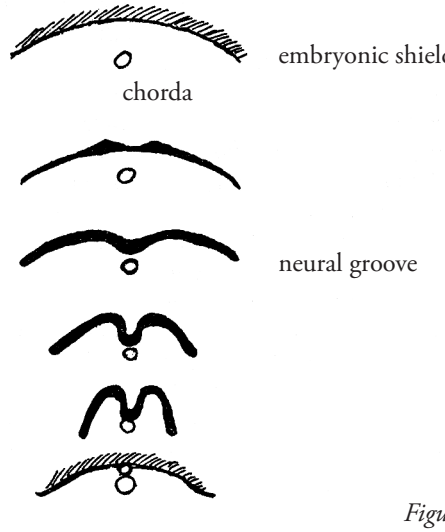


Figure 11

whole embryonic shield a depression is formed, the neural groove. And on it goes. This neural groove deepens. Proliferation continues, goes downwards, deeper and deeper. The process continues and in the end this proliferation closes up in the center. The groove closes up, becomes a tube, and over it the ectoderm again forms a cover. And so two things have developed from the primitive ectoderm. Now at last an integument is formed, and underneath the integument the neural tube.

My friends, this introduces a very special process. To make myself clear and avoid confusing you, I must always sketch the notochord in as well, and we have two now, the notochord and the neural tube. But you see, it goes on, and suddenly we realize that what has been without has become within. The outer has become the inner.

My friends, we may also say the following: The amniotic fluid becomes liquor. The liquor flowing through and around our brain and spinal cord is basically nothing else but still amniotic fluid. There you have the developmental tendency of the whole ectoderm. Let me give you another example: Here we have the outside of what is going to be the face. Inside the brain has already begun to develop. From this brain the primordium of the eye is pushed out, an evagination develops, going farther and farther until it forms a kind of cup. And the moment this cup reaches the skin, a piece of skin thickens and is separated in exactly the same way as I have described for the nervous system (Fig. 12). A lens vesicle is formed, and then you have the cornea in front, the lens there, and that is the ectodermal part of the eye. As development continues the lens comes to lie within the optic cup.

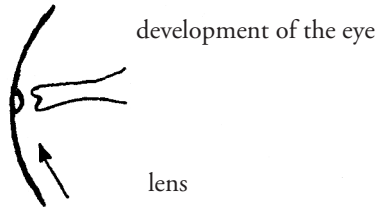
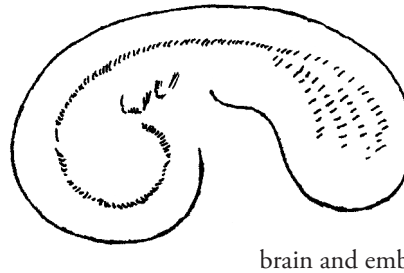


Figure 12

What is the meaning of this? It is that the Moon—the force that is active in the ectoderm—always has a tendency to separate. That is why it is out there, because it has withdrawn from the Earth, like the lens, like a nervous system. Only the nervous system has entered into the body and the lens into the eye. You have to recognize that these segregating tendencies represent the formative tendency of the ectoderm, and then you will understand what is developing. My friends, that is no mere separation, for at the same time the outer becomes an inner.

Let us look at it meditatively and imaginatively. Here is something that is outside. This outer part becomes an inner part. It has been out here, a receptor for activities coming in from without, and now it is inside. If one wanted to work out a nervous system that would provide a basis for thinking and for memory, one would have to proceed like this. First we have the outer aspect, and if I want that which shines upon it (for all that is light) to arise and develop within me, this can only be by letting it be reflected within. This is how all the sense organs develop, and how the whole of the nervous system develops. And the skin remains the outer aspect. In every sense organ you get a combination of without and within, be it the lens in the eye, or the sensory epithelium in any other sense organ. Nothing else will do. The two must act together. In the nerves, however, everything has withdrawn. And the brain and spinal chord are resting within us just as the embryo is resting in the uterus. I'll sketch that for you (Fig. 13). When you see the brain like this, more or less like this, what do you see? Nothing else but the embryo as it lies in the womb. Exactly like that, there are the arms, there is the belly and there are the legs. Because of that the embryo lies like this, and the brain lies like this and is surrounded with fluid. It just has to be drawn properly. In midwifery you always see such forms. And for us it means once more that we must learn to see in images. That, my friends, is the important thing, nothing else. One must learn to see, and then you will realize how everything is the human form. There is nothing that is not in the form of man. Everything is metamorphosis of man.



brain and embryo

Figure 13

Now for the next item. We have considered the ectoderm. How does the mesoderm develop and take shape? My friends, that is different. I return to the notochord. This notochord cannot really be called mesoderm, for basically this notochord is still part of the ectoderm, the endo-mesoderm, the meso-endoderm, of the mesophyl, but it has taken definite form. On the twentieth, twenty-first and subsequent days, the first primitive vertebrae begin to develop along

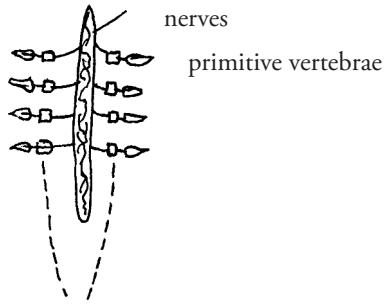


Figure 14

this notochord. Don't worry, I'll tell you what they are in a minute, but I just want to give you the picture. Let's say four on each side, eight altogether (Fig. 14). Here you see an embryo at that stage [showing an illustration from Starck's textbook of embryology]. I must show you this, so that you really get the picture. [Here the tape did not record. Dr. König spoke of the archetypal cosmic forces of Eagle, Lion, Bull and Man, and from these developed above and below, in front and behind, right and left, and in conjunction with these speech and thinking (Fig. 15). A speaker asked about speech and thinking.] Why does speech develop from the vertical, the Lion, and thinking from the left-right aspect, or the Eagle?

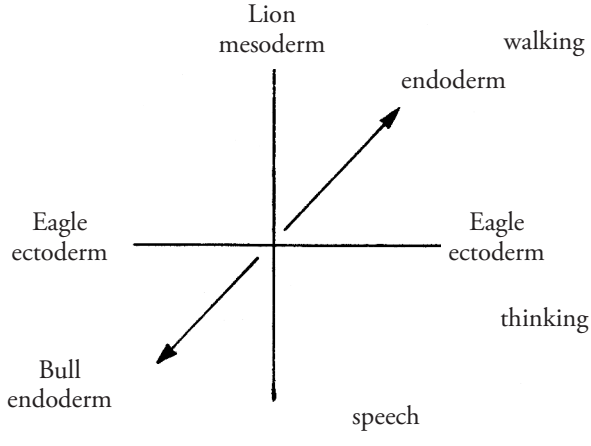


Figure 15

DR. KÖNIG: Who will try and answer that? I think it is a good question, this because it touches on basic things. There is no point in my saying: Rudolf Steiner has said so. We must try and gain an understanding ourselves. Do try, for it is not a good thing for me to stand and teach. What do you think?

A SPEAKER: Perhaps one could again start from the embryonic development of mesoderm. What develops from the mesoderm? Basically the heart, blood, bones, blood vessels, muscles. One ought to try and visualize the direction in this. What actually is the skeletal system? It is between heaven and earth, that is the direction. The blood, if we consider the circulation, comes from the heart, fundamentally speaking, and goes upwards and downwards from there.

DR. KÖNIG: Not quite like that, but one could put it like that. I find this excellent. Do carry on.

SPEAKER: I am getting stuck already. I cannot quite fit in speech.

ANOTHER SPEAKER: But speech is somehow a kind of walking, too. One could also see it like that.

DR. KÖNIG: Certainly, you may call it a kind of walking. But think, for instance, just of the fact that speech comes only on the outgoing breath; it is the only possible way. I have known people who spoke also when taking a breath, but it certainly sounded like it.

SPEAKER: Thinking consists chiefly in arranging, and one does not arrange things from above to below, of from in front to behind, but always between right and left.

DR KÖNIG: That is most interesting. Could you substantiate it a bit further?

SPEAKER: I only think on one level of thinking, really. And one might look at young children, when they think they at once use their hands. They sort things out side by side, and that is what we do with our thoughts. We cannot really say we think up or down, or into the depths, or forward; it is an arranging side by side, and as I speak it occurs to me that in comparison we must think of the word that there was in the beginning, and that is always there, forming a link between above and below. This is no physical above and below, but rather a meditative, psychic above and below, and that creates the link.

DR. KÖNIG: That is a possible approach, but not quite enough; though it is possible, it is a way that is indicated there. The wise minds of the physicians among us should come up with many things—and so they do.

A SPEAKER: How is it with small children, when do they start to speak?

DR. KÖNIG: Don't you remember?

SPEAKER: No longer quite.

DR. KÖNIG: The child usually begins to say its first words by the end of the first year, when he enters into the upright position. At that moment the child begins to speak, and I recall something Rudolf Steiner said in one of his lectures to workmen, I don't remember in which, but he said the fact that the parrot is able to talk at all is connected with his having a vertical backbone.

SPEAKER: I thought that had to do with the larynx.

DR. KÖNIG: Not in the least. The parrot never speaks with the larynx. No bird speaks or sings with the larynx. There is no such thing. They have a completely different organ. I must sketch this for you, for it adds to the above and below aspect. It is part of the zoological studies that have been promised. If we have the trachea here, then the larynx is up there in man, and also in the animals, only much smaller. And then the trachea divides and in songbirds and also in other birds an organ develops that looks something like the instrument called the bagpipes. Do you know the bagpipes? Well, they look like that. That is the syrinx. With it, the bird sings. Birds are bagpipers. And the parrot speaks with the beak and the tongue. But there again you have an above and below. The air passes through, there is no other way. But that is as yet no answer, one of many answers. You wanted to say something?

A SPEAKER: Has left and right anything to do with perception, with observation?

DR. KÖNIG: Left and right has chiefly to do with this: that we are able to let our lines of vision cross, and it is in this direction that we then make perceptions into ideas. At the moment when that has happened, the process of thinking starts. If you study the brain, the organ of thinking, you will see how it is not only constructed in exact symmetry between left and right, but how everything in the brain depends on the establishment of connection between left and right. There is a special organ in the brain, the corpus callosum or great transverse commissure, that has only one task: to establish connection between the two hemispheres. The two nerve strands from the right

go to the left, and those from the left go to the right. If you consider, for instance, how the optic nerves cross over and then run backwards, that is all connected with the interplay of left and right, i.e. with the upgrowth of thought. With regard to speech it is like this: The word is formed here [makes a sketch], and feeling flows into the word from below, thinking descends into it from above, and so you see again how above and below play in this direction. And that the strides we take forwards and backwards are the actual walking, that is obvious.

That we digest in the direction from in front to behind is also connected with the fact that our mouth is up here and the anus behind and below. And the marvelous thing is that the position of the heart is such that its axis brings all three directions in space into perfect harmony; for the axis of the heart goes from above, behind and to the right to below, in front and to the left. That is why in our speech Lion, Eagle and Bull are combined in harmony.

A SPEAKER: I am not quite clear on another question. You have linked ectoderm with left and right, and mesoderm with above and below. But the organs of the mesoderm do show marked parallelism.

DR. KÖNIG: You mean symmetry?

SPEAKER: And an actual left-right relation as well.

DR. KÖNIG: Yes, but I said that this symmetry arises in that it also adapts itself to ectodermal development, of course. You must look at the development of the forms and not the final result. You see, the kidney tubules, for instance, develop in sequence, one after the other, and on the left and right of course, because there is no other way. But I think it is not the left and right that is significant here, but the metamerism. Because of that I told you how the ureter, for instance, grows upwards from below and eventually takes hold of the renal tissue; and again you have the same direction. In the descent from pronephros to mesonephros, from mesonephros to metanephros, you again have this direction. In the descent of the testes you again have this direction. They are also symmetrical, but that is not important. May we have some more contributions, please.

A SPEAKER: Might it not be said that each sphere is affected by the other spheres, and through this the directions change?

DR. KÖNIG: I think that with regard to the whole of the mesoderm it all has to do with the fact that Sun-mesoderm develops, but is taken

hold of and permeated by the ectodermal, nervous, Moon-like element. At that moment the bilateral symmetry of left and right arises. That is the whole point. It is striking, isn't it, that the kidneys, the sexual organs, the muscles and bones show a bilateral symmetry. That is so because the element that is active in the nervous system has pervaded them. In my opinion that is one of the reasons why people go on thinking that the nerves move the muscles.

A SPEAKER: Those three principles for the ectoderm, endoderm and mesoderm, determining the direction, structure and extent of growth, they apply in the same way in the animal kingdom.

DR. KÖNIG: Exactly. Only the directions are different.

A SPEAKER: But if that is so, then man would only differ in that there is no mesenchyme in the animal kingdom.

DR. KÖNIG: No, that is there.

SPEAKER: Then what is the difference?

DR. KÖNIG: You know, the animal has practically everything that man has got. Man is not different in having more or less, man does not differ with regard to *what*, but with regard to *whither*. No animal could live without the mesenchyme, because that is the primal substance, and in every animal, too, we see a trace of man. But he does not enter into the animal so far that thinking, speech and walking develop. And what we must ask ourselves here is: What are thinking, speech and walking in the animal? That would be a real starting point. But if we say, they cannot have a mesenchyme, then we imagine we are something better than they.

A SPEAKER: Another question. May one actually go so far as to speak of an above and below in the embryo?

DR. KÖNIG: Well, you know, where the head is, that is the above, there is no other way. It is always like that.

A SPEAKER: Originally man has the tendency to hold the head down. He only brings it into the upright position in the course of evolution. When does this happen in embryonic development?

DR. KÖNIG: The embryo, and perhaps it is just as well if we discuss this now, the embryo has this form until about the

second month. It increases a bit in size, but remains the same in principle. It has no above or below, nor in front and behind.

Lecture 6, Seminar II

Today we are first of all going to try and review briefly the themes touched on yesterday morning and afternoon. Then we shall go on and bring to a conclusion the particular period of embryonic development that has been the object of our meeting. First of all let us once again visualize, as accurately and as much in the form of a picture as we can make it, how the development of the germ layers is indeed radiating forth, emerging, taking form out of the four archetypal principles described by Rudolf Steiner: *Lion, Bull, Eagle* and *Man.* As we say this, we immediately see the zodiac and recognize that it is from the zodiac that these universal principles pour down, in four opposite directions, to the earth: forming, molding, shaping human beings. You can see how that is revealed once more in this phase of development. But as development advances, as the embryo grows, developing from an embryo into a foetus, and from a foetus into an infant, only little will remain of these happenings which at first have been so much to the fore that we have been able to describe them.

Now we might ask ourselves where in the fully grown human being lies that fourfold aspect that we have been able to discuss in some detail. And there is only one answer: This fourfold aspect still persists in every one of us, in what we call the blood groups. In each of the blood groups—I don't want to go into detail—a remnant of what once was Eagle, Lion, Bull or Man is still at work. It has been obscured but is made manifest in those forms and figures that were described yesterday, when we were able to trace them right into the formation of the actual organs. Just think what it means that now we are able to perceive the actual Eagle-ectoderm forces in the way lateral symmetry is developing, see the Lion-mesoderm forces at work as metamerism unfolds, and the endoderm-Bull forces in the polarity between in front and behind. That, my friends, is how the human being is fashioned through the four germ layers and their archetypal animals. One might say that at that time we are our own Sphinx. That is saying a great deal. Everything we discussed on that previous occasion when we described world evolution as given in Genesis and the development of the enveloping membranes, then coming to the moment when the Fall coincided with the development of the primitive pit, with the ego, the I, like a finger taking shape as the central rod of the whole development of man—all that is once more presented to man in the third post-Atlantean period

of his cultural development in the image of the Sphinx, that men might see, at least symbolically, what this is all about.

Perhaps I may just touch on something else in parenthesis. In our present day the Sphinx has once more been set before the eyes of those prepared to see, in a new architectural form. It is near Basel, where the Goetheanum stands; below the Goetheanum stands this strange form of the boiler house. I don't know how many of you can recall it, but if you look at this boiler house with the larynx opening out and the two breasts curving forward and upwards, then you see nothing but a modern metamorphosis of what in ancient Egyptian times has been the Sphinx. This only becomes apparent—and we shall touch on this again later—when one has really given one's mind to and entered into the way in which forms are coming out, are taking shape, in the growing and developing embryo.

But now we come to one of the major themes for today, and so let us consider the following: My friends, everything that happens up to the seventeenth day does so solely and entirely through the interplay between the *physical germ* provided by the parents and that entity which following the description given by Rudolf Steiner I called the *spiritual germ.* That spiritual germ is really nothing but the archetype of the human form. This archetype of the human form, if you recall, comes into being in the midnight hour between death and rebirth, when it is woven around the central point of the individuality preparing for incarnation. The hierarchies, the human soul linked to that individuality, angels and archangels—these start to weave, reaching right across the whole universe, weaving the destiny of the individual, as into a mighty tapestry, a carpet of life and of karma, weaving the spiritual germ. Coming from the all-embracing vastness of the universe, getting smaller and smaller as it passes through the spheres of the planets, gathering itself through Saturn, Sun, Mercury and Venus, arrayed in astral body and spiritual germ, the Ego, or I, enters into the sphere of the Moon. And there, at the moment of physical fertilization, the spiritual germ drops away from astral body and ego. This creates a vacuum and causes another group of beings, the original Teachers of mankind who dwell on the Moon, to weave an ether-body for this human being, putting it together from light and warmth, sound and life.

We may now visualize the following: Down there on earth, in the mother's womb, the spiritual and the physical germs are interacting. The constellation of the spiritual germ is such that it bears within itself the image not of the individual, but of the human form generally. This image is implanted in the physical germ as a spiritually physical form,

i.e. not materially, but physically woven from spiritual substance. That occurs within the maternal organization, and the earthly substances together with the heavenly substance of Man now recapitulate the genesis of man's coming into being on earth. At the same time when this is happening in the uterus, the Moon organ of woman, another process goes on in the Moon sphere of the universe: With the help of the colony of Teachers on the Moon, the ether-body, I and astral body are brought together during those holy seventeen days—for that we may call them—of our existence, those days that are like a grand overture at the beginning of every life that comes into being on earth. And at the moment when the sixth day of creation has been reached in that recapitulation and the call is heard: "Let us make man," at that moment the human being itself, fashioned from the I, the astral body and etheric body, comes down to earth.

Now consider this: A home, a first dwelling is prepared for a being that in the normal course of events has lived for hundreds of years, if we count in earthly fashion, in a world that knew not space nor time. There one finds no above and below, no right and left, no front and back the way we know it. There all is constant change, brief moment equals eternity, and there etheric, soul and spiritual elements have their being. But now something that is earthly substance is coming into being below, and these two aspects, the heavenly and the earthly—and this is quite tremendous—must be brought together. My friends, that we are able to speak nowadays, that we are able to walk, that we are able to think, that we act and do all that the earth demands or does not demand—none of this would be possible were it not for the events which happen between about the seventeenth and the fortieth days of embryonic development, in the second act of our drama. You see, there is no need to draw the I. It fits into this outer periphery of the home provided by the mother. That is the chorion. And from the chorion develops step by step the structure which we call the placenta. If we were to go into it, we could make it clear how this placenta is in fact an image of the Sun. Within it, the egoic being of the incarnating individuality is at work and has its being. Just consider, my friends, what it would mean if more and more people were able to take in again such images: the I, or ego, of my growing child, of all children as they come into being in the sun of the placenta during pregnancy, lives as in a sphere of fire. If you have seen the windows of the first Goetheanum, you will remember this figure. There it is all presented and delineated.

The astral body dwells where the rhythms of the amnion—and I am not saying the fluid itself—I am saying where the rhythms of the

amniotic fluid coming into being and going away again, weave the I in the sun of the placenta, the astral body not being material substance, nor the I being material substance. The I in the place occupied by the placenta, not involved in its physical activity, but in the warmth, the fire that radiates from it as from a sun; the astral body in the rhythms of the amniotic fluid, constantly hovering around the form of the embryo. And now the etheric body moves into the embryonic form that is developing. The etheric body actually involves itself in everything concerned with the formation of the germinal layers.

My friends, here the first opportunity is given to convert cosmic existence step by step into earthly transactions. You see, yesterday I put great stress on the above and below, left and right, front and back; that was because now space can be experienced, to begin with by the etheric body. This etheric body begins to fit itself into the above and below of the mesoderm, though there is as yet no actual above or below. But divining what is to be, it begins to fit itself into the front and back orientation that the endoderm will give one day, and it begins to take up the still somewhat vague symmetry of the ectoderm. One must try and sense, experience this, how these forces of development, formed out of light and sound and life, fit themselves into the substance; how light now comes to experience darkness and symmetry arises; how sound experiences movement, its shadow; how life begins to encounter the death of substance; and how all this comes together in front and back, above and below, left and right. You see, that is how the etheric body is coming in, step by step. Into everything that derives from the coming into being of substance, from the powers of remembrance of the evolution of the earth and of mankind, into everything that is added by the hierarchies, and by Lion, Eagle, Bull and Man, into all this an etheric body that has grown individualistic must submissively fit itself. It must creep in, it must become a spatial form on earth. That is compulsory.

And the astral body, a body of the stars, spread out to begin with over the whole cosmos, then inhaled as it descended, growing smaller, is now beginning to experience, in the rhythms, how it is to have a sense of time; not today and tomorrow, nor year and day, but the basic function that goes through all we know as time: rhythm. As the amniotic fluid comes into being and goes again, as the waters flow all around the embryo, as within, in the brain and spinal cord, the fluid ebbs and flows—it is not the water, but its rhythm through which the astral body enters into the process of time. And then, my friends, reflecting the experience of space from the ether-body and the experience of time from the astral body, the ego, the I, gradually awakens to the lessons in the school of earth that the universe has devised for it.

Figure 16

Yesterday I showed you a sketch of the somites. Do you have any idea hat that means, when with growing perception we begin to look at such cubes, such blocks as they lie one behind the other, in our own physical body? There you already have the earthly form, and let me tell you, it is a tremendous effort for the mesoderm to take on such cubic forms. Those are the very blocks that later on the children play with. Here the I experiences that for the first time. Or else the I experiences how from the first beginnings of the lung the outer circumference is gradually developing, and begins to get the experience of center and periphery. And when the brain develops, it also experiences symmetry as its forms come into being. We are not looking through the microscope now, but through the eye of the I as it rests in the placenta. And we find: Here experiences are arising for the I, and it is due to these experiences—dawning and dreamlike—that the world of the spirit becomes closed to the I. The light we have known within the world of the spirit, the encounters we have had there, the powerful impressions that surrounded us, all these must drop away, drift away, die away, so that the human being may become part of the earth.

It is only through the study of embryology, my friends, that we can come to get the feel of such experiences. They take us down into the earth. Now that I have tried to describe this to you, you will be able to understand what I am going to say next. Basically, and here I am coming back to what I said when this course started in October, we ought to be musicians, we ought to be architects, we ought to be eurythmists, geometricians, mathematicians, if we are really to grasp all that happens during those few days, those twenty-three days when the germinal layers develop and the organs come into being. And yet when this is over, on the fortieth day, we still have not got a human being. What we have got is the ancestor of man; he has developed. But this ancestor of man is formed out of the music of the universe, out of the architecture of the universe, out of the eurythmy, the logos, the mathematics, the geometry of the universe; and look, the craft of pottery is at work on the embryonic form, for it is a potter's work that is done in the shaping of the larynx, for instance, or produces a gall-bladder on

the potter's wheel of the liver, and carves out the cups and calices of the renal pelvis. Yet pottery is not the only craft; there is weaving, too. Cartilaginous tissue is produced. Bony substance is woven. Connective tissue is spread like a carpet. All the crafts are represented. This we must come to realize more and more; only "then will we perceive how in these twenty-three days the foundations for all future activities are laid in the body of the human being.

My friends, we could not shape even the simplest jug, nor weave the smallest carpet, carve wood, shape any material, if all that had not been put into us. You will find a reflection of this in the Book of Genesis, where among descendants of Cain are described the three sons and the daughter of Lamech: one an instructor of every artificer in brass and iron, another the father of all such as handle the harp and organ, and the third, the father of such as dwell in tents and of such as have cattle. And it is not that those early ancestors have led men to carry out such activities; all that is laid down in the embryo. Thus the form of the ancestor of man arises. Let me draw it for you. If we look at the embryo at the end of the second act of this drama, it is something like this: there we have a gigantic head, a mighty forehead. The whole thing is still head, really, to begin with. There runs a spinal cord, ending in a little tail. There you have the somites, already growing out towards the center and taking shape—bony tissue, muscular tissue forming fifty or sixty of these symmetrical, metameric structures. There is as yet no face. And then here, underneath, we find a great big bulge. If we look at it from the outside, if we were to open it, then we would see a very strange, convoluted formation, something like this—I am merely sketching it in, because it is really very complicated, and you would see blood flowing through this structure. For that is the heart. Next comes another tremendous shape: the liver. The umbilical cord goes in there. (Please remember, this is just a sketch; an embryologist could show you several serious mistakes I have made; for instance, the umbilical cord probably should go here.) Now then, within we have budding, sprouting life. In there the blood vessels are beginning to develop, everywhere, in the brain, around the heart, all through the liver, along the spinal cord. But, you see, we can also say that here we have the three animals: the endoderm—the bull; the mesoderm—the lion, in the heart; and the ectoderm, the eagle, here in this form.

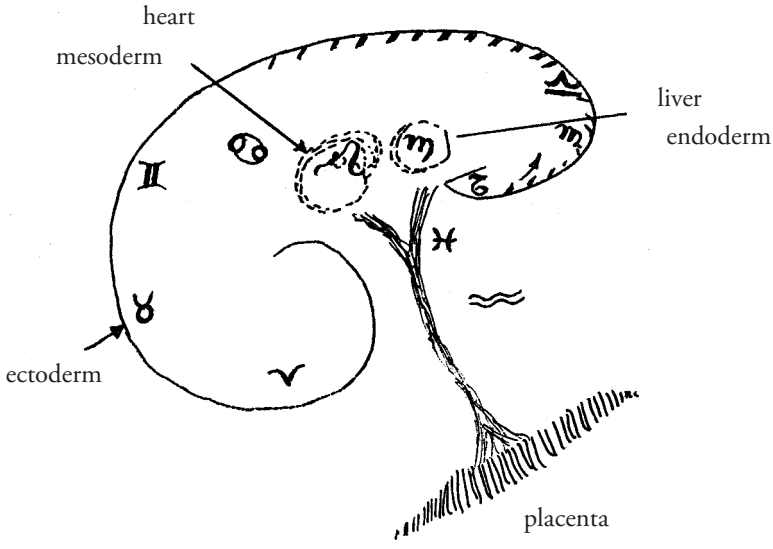


Figure 17

My friends, here you see the same principle, the same formative tendency, that we found in the amnion, where the amnion gets bigger and bigger and more or less swallows up the yolk sac and the allantois. Here you see how the ectoderm, which belongs to the amnion, develops mightily, producing something that barely leaves room for heart and liver. What does that mean? It means that the following is happening. Here, just sketched roughly, is the placenta. Here the ego, the I, has its seat. No animal, not a single one, has such a placenta, not even the apes. The apes have two placentas, for instance, one on each side. Beasts of prey have what is called a ring-placenta, naturally, because they are the middle animals. It would require a whole special study to describe the different forms the placenta takes in the mammals. But here, in the sun-like placenta, sits the I, and the astral body and ether-body convey to it the first dawning experiences of earth.

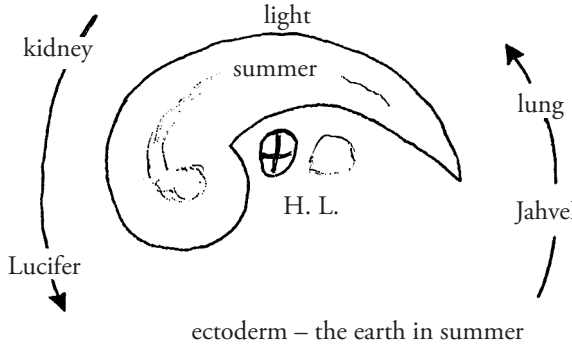
There the ectoderm arches out. My friends, there you see how the form that comes into being here points to the process of reincarnation. Rudolf Steiner has demonstrated this quite clearly: The trunk and the limbs—not the head—of one incarnation are transformed, metamorphosed, change into the new head that comes into being. This tremendous head develops from all the heredity that I bring with me, that I myself have pressed into my ether-body when in the sphere of the Moon the heredity-package was put into it. And to begin with I am nothing but head. But of course the earth will have its due. And so it adds the heart, forms the liver, and here, in these two places, the

first rudiments of limbs, like flippers, are developing. That is the trend which development from the germ layers now tries to follow. What the ether-body has brought down from the Moon, that is at work here. For now you can see, in various places in the human form, the Ram, the Bull, the Twins, the Crab, the Lion, the Virgin, the Balance, the Scorpion, the Archer, the He-Goat, the Waterman and the Fishes. The I has to experience more and other things.

We have tried, my friends, to share the experience of the incarnating Being. as it has to come up against those forms, as it has to come to terms with the formative tendencies that are borne towards it during the second act of embryonic development. It means that our Being—and when I say Being I mean ego, astral body and ether-body—must come to terms with everything that after birth will become experiences of space and of time on earth. Here and now, in this process of incarnation, the Being only experiences everything without light, with no light coming in from outside, through eyes and skin. But the light of the spirit is there already in that cell of the womb. It experiences it though no breath is as yet flowing, taken up and released by it itself; nor does it know gravity as yet. Gravity, the force to rouse the *will,* is not yet present; the embryo floats in the uterus like an astronaut in his capsule. There is no great difference. It does not breathe, and therefore *feeling* is not aroused. It is not illuminated and given light from without, and so *thinking* still remains dormant in there. What goes on is a weaving, shaping, looking back in memory on the cosmic experiences of the past. But those structures that I have told you about now wipe out the memory of the past, of existence in the world of the spirit. And it is not only that time must be discovered in rhythm, and the experience of space in the dimensions; the earth as a star, as a planet, must already be experienced in advance. How is that done? What indeed is the earth? We experience the earth in that we let gravity be experienced by our limbs, the ebb and flow of the breath by the chest, and light by the head. This cannot happen *in utero*.

But something else does happen, and I would like to give you an idea of this, because it is very much part of this whole range of experiences to be gained between the seventeenth and the fortieth day. For we must not just look at the forms as they unfold quite mechanically, but also reckon with the actual Being that is coming to terms with these formative processes. And so I'll once more sketch that ectoderm-Eagle, and interweaving the whole mesoderm. (I am just sketching it here—just so that you get the idea—the heart does not yet look like this, it has not yet got four chambers.) And there is the liver and there the gut, and there the lung begins to develop. There is a triad. And, my

friends, here is *earth.* For the whole nervous system, brain and spinal cord is predominantly permeated with an inner light-forming activity. If one follows Rudolf Steiner's descriptions on the basis of one's own inner experience, then there is fair justification for a statement like this: Although the nervous system, once it is fully developed, forms a seed of death within us, now the light of summer dwells here. There it is all spread out, shimmering, flickering, all grown ripe; there summer glows all over the earth. And we may say: In the ectoderm we experience not only right and left, not only symmetry, but also the earth in summer. In the north and south of the globe this is the other way round, but that does not matter. Now let's take the mesoderm; a certain dichotomy has always been discernible in it. On the one hand it links up with the system of the limbs, but it also carries along the endoderm. It forms out the heart. It fashions the blood vessels; yet it also contains everything connected with the sexual system. It really is the organization that retains the strongest and most lasting memory of the Fall. This mesoderm experiences with the heart, or brings into the experiences made with the limbs and all the rest, spring and autumn. And now it is not difficult to link the remaining part, the endoderm, with winter.



ectoderm – the earth in summer
mesoderm – spring – autumn
endoderm – winter

Figure 18

This will give rise to a great many questions, but I am going to deal with just one aspect now. It is impossible to discuss everything fully in one course, but I just want to give you an idea, so that seeds may grow and lead to further study. You see, one might say that summer, bearing this whole zodiacal configuration, surrounds the spring and autumn coming to life in the mesoderm; and right inside we have the winter of the endoderm. What do I mean with the winter of the endoderm? The whole of the endoderm is an apparatus for the transformation of substance. The whole of the endoderm has devoted itself, one might say, to whatever is transforming substance, be it in the liver, intestine or any part whatsoever of the digestive system. And that is what happens

in winter, when color and substance change, when the seeds of plants fructify the earth. The earth is the mother and in her everything that drops into the earth is transformed in winter. Such a winter-like experience is found in the endodermal structure that lies within us from mouth to anus. This is the point of that whole aspect of development. My friends, the gut that first develops on the surface of the yolk sac, for instance, has no mouth to start with, nor does it have an anus. You see how this development is very much the opposite of the gastrula I showed you yesterday, where the opening, being mouth and anus at the same time, is the very first thing. Here a system for the transformation of substance is taking shape. That it does. And then it is a secondary process, in preparation for what will happen when the child is brought into this world, one might say, that a mouth opens outwards, i.e. into the amnion, and an anus opens outwards, also into the amnion. But that is a secondary process, because according to the divine conception of his coming into being, man was not at all designed to take in and give out food substance, because at the beginning of Lemuria all intake of food was at the same time a process of breathing that went on without those holes in the body. Do you see what I mean? It would be a malapropism and misconception to think that man is an eater. He has only become one because he turned himself into one. He is not meant to be. Man should not even speak. Man should listen, have gestures, breathe, i.e. he should live within the light and sound sphere of existence, giving and weaving tones and colors. Things went differently because the serpent that we still bear within us intervened. Because of the intervention of the serpent, the gut opened in the mouth and anus. But the gut, the liver, the lung, all the digestive organs, are processes that transform substance, working in the fashion of winter. And this is what we experience as we enter into this embryonic form. And we also experience autumn and spring in the mesoderm between above and below, in the metamerism that is developing, with the muscles sprouting as in spring. But in between the muscle of the heart, its transformation leading to the form of the cross, so that we also bear death within us. And in the same way we experience the descent from above to below in the development of the kidneys. There autumn comes.

My friends, Dr. Hillringhaus spoke of the inner experiences connected with the kidney. Perhaps I may add something to that: in our time, forty years ago, few poems were written on spring, almost always poems on autumn. Autumn became a tremendous experience. All that arises from the kidneys. It happens because they offer the possibility of an inner awakening. Light arises in man whilst darkness

gathers outside. But then also the dichotomy, for loneliness develops. Yet at the same time arises the possibility of being filled with spirit. And we turn to the spirit of autumn, one might say, to Michael, because in the final instance we recognize the world as wisdom, living in all that is ectoderm. If we wanted to add to this, we might take Rudolf Steiner's description and on the basis of this say: The earth is the cycle, from summer to winter, from spring to autumn, created by archangelic beings around the earth. We can experience it here as the Uriel-Eagle, the Raphael-Man, the Michael-Lion and the Gabriel-Bull. Those are our experiences at this time. For by becoming aware of the seasons in our germinal layers, we begin to experience the four archangels who are influencing our lives. At the same time we experience the following, which also happens now, and which I mentioned to you yesterday: We experience how the kidney descends, and the lung on the other hand ascends, and that the kidney we bear within us is the result of Lucifer's activity, and what the lung accomplishes with Jahveh's counterthrust, that rises upwards, reaches upwards. And instead of having the lung below and the kidney above, we bear within us, through the diaphragm—as the consequence of the Fall—that inversion which had to lead to it that later—and never before (in my last sketch it should actually have been more of a tube, with blood flowing through it)—the heart had to develop the four chambers. The cross of the earth arises, poised as I described it to you yesterday, from above, on the right and behind to below on the left and in front, harmoniously integrating space and determining our destiny within us.