



The Future of Goethean Science

and the natural sciences today

Evolving Science 2014: Impressions from Conversations in the Ideas Workshop of the Natural Science Section at the Goetheanum.

The Future of Goethean science in Relation to Nature, Society and Anthroposophy.

RENATUS DERBIDGE

Nature

Initially overcoming the subject-object split in letting the essential aspect of the object light up in the soul ...

Everyone has his or her relationship to nature whether it is intuitive, conscious or unreflective. Nature experiences shape us. They may even be the prime motivation to become engaged, or even perhaps become a scientist. But in the discipline of study this motivation is frequently drilled out of us again in favour of data and facts. For the Goethean scientist, the original relationship is sacred. He heeds Goethe's maxim that the object of research should co-determine the method of enquiry. This leads to individual approaches. In the workshop conversations I was excited to hear how participants were able to show originality in their relationship to nature, and furthermore how Goethean science was connected with it. The richness was regarded not as a bothersome heterogeneity, that frequently in the past gave rise to arguments regarding the sovereignty of interpretations, but instead – and this is new and a silver lining – as a potential. Despite everything, the various Goethean approaches have something in common. For example, that we try to investigate by not treating nature as an external object, but by dealing with her in a kind of inner space formed by observer and object. Thus the subject-object split is initially overcome in letting the essential aspect of the object of research light up one's own soul. Today, many feel separated from nature and seek contact with her. This leads to enthusiasm and activism, but rarely to what some participants described as 'giving something back to nature', which can only happen through a non-violent method as exemplified by Goethe.

MATTHIAS RANG

Society

In future, will we succeed in working as a common <corpus> on Goethean research?

The question of the relationship of Goethean science to contemporary science and to society is a question about our own relationship to our wider surroundings. What significance does Goethean research have among the modern scientific fields? In the discussion, most participants attributed Goethean research with an important role, namely extending current scientific methods in a very particular way. But is this valued and taken up in science? It is rarely the case today. Why do so few conventional scientists pay attention to the results of Goethean science? On the one hand, it could be that too few Goethean scientists take an interest in and valuing the results of modern science. Anyway, don't we already distance ourselves by describing the practice of modern science as 'conventional' science? On the other hand, public perception may be worsened by the fact that Goethean scientists in the past have not arrived at a single common scientific <corpus>, in which to work together (as normally happens in the various specialist fields). If we succeed in future in working on Goethean research in such a 'body', its effect will certainly increase in science and society, including in education.

LAURA LISKA

Anthroposophy

Goethean science grounds Anthroposophy and Anthroposophy gives Goethean science spiritual wings – or are the two at all connected?

'How do you understand the relationship between Goethean science and Anthroposophy?', 'What is the significance of Goethean science for your spiritual path?' and 'What task does the Science Section have in the relationship between Goethean science and Anthroposophy?'—three questions posed during the conference World Café, eliciting a remarkably broad spectrum of answers. While some found no connection at all between Goethean science and Anthroposophy, others felt that Goethean science is Anthroposophy. Similarly, while some saw Goethean science as the core of their spiritual practice, another exclaimed 'this is a totally new question for me!' What became significantly clear, however, is that a strong connection—if not felt to exist—is definitely desired between Goethean science and Anthroposophy. As one person said: 'Goethean science grounds Anthroposophy in the world, while Anthroposophy gives Goethean science spiritual wings.' The task of the Science Section in this context is to mediate and foster communication around these questions. And when one participant asked 'Do we spend too much time debating methodologies instead of focusing on the burning issues of our time?' we were reminded of the ever-present necessity of finding a balance between inner work and outer activity. We find this task in Anthroposophy in general and it also holds true for Goethean science in particular. With this perspective, we can look differently on the three relationships: to nature, to society, and to Anthroposophy.

WHAT IS GREATER THAN WANTING TO UNDERSTAND THE WORLD?

At the Goetheanum no richer working relationship has existed longer than the collaboration between Johannes Kühl and Johannes Wirz. A discussion on the life and form of the natural scientific work at the Goetheanum.

What are your impressions of the conference on Goethean science?

Johannes Wirz I had not met before more than half the participants at this conference. I found this both pleasing and surprising. Otherwise conferences involve a meeting of people largely known to one another. This time it was different. Scientists and others interested came from all over Europe, even from as far away as New Zealand, to discuss Goethean science and, for example, a spiritual perspective on evolution.

Johannes Kühl In the past, leading Goethean scientists did not get on easily with one another. It pleases me that their pupils can now work fruitfully together, something that is not to be taken for granted.

Wirz When I look at our research in the Institute it seems to me as if we are moving between Scylla and Charybdis. The rock is the conventionalisation of Goethean science. Many assert that only one kind of science can carry weight in the academic context. The whirlpool is the non-sensorial research method, for example the methods of Dirk Kruse, Dorian Schmidt or Frank Burdich. In the Section we work between these extremes. It was interesting what answers the conference participants gave as we asked them about the status of Goethean science in anthroposophy. Many responded, 'Nothing – anthroposophy manages perfectly well without Goethean science', and others countered, 'Goethean science is anthroposophy'. The reality is probably neither of the above, and very likely not static either.

Kühl This means that the perspective on these extremes has changed. These days, condemning any research method, even a non-anthroposophical one, is insupportable. It is more important to learn to value the research results of colleagues. It is not the result alone that makes the difference but the way in which the result is viewed, the context into which we place it. Only thus does 'wholeness' arise. It can be sought in the object, or in the various perspectives from which we observe it. Wholeness arises anew through the human being.



Johannes Kühl and Johannes Wirz

Wirz I try to work in such a way that the path I travel and the results I describe in my work are accessible to non-anthroposophical colleagues. This of course means that I have to know the latest research in a particular field. In our current issue of *Elemente der Naturwissenschaft*, I go into bee research in this way, and am pleased to discover that many academic researchers arrive at a way of beekeeping that is appropriate for the bee. I

found what we should inwardly demand of ourselves in a letter from Rudolf Steiner to Eduard Schuré. There Steiner answered the question as to what was the task of the modern Rosicrucian, namely to study normal science in the fullest sense and bring it into relation to the science of the spirit – so, no remoteness there.

How can the biographical traces of the work be described?

Wirz In the opening lecture of our autumn conference, Johannes Kühl presented the stages in anthroposophical natural science at the Goetheanum from Wachsmuth to the present day. It is an impressive history.

For me personally, when I reflect on my barely 30-year working life, it looks like that at any university. The first ten years are study, then ten years freeing oneself from one's masters – for me these were Jochen Bockemühl and Georg Maier – and then ten years being productive in the sense of the master. I still feel connected with the Goethean science of these two, but I attempt to extend it with one or another quantitative method. Then I will know not how just one plant grows, but instead I study twenty of them and put the ruler on the leaves.

In the 80s the mainstream in genetics thought that there were only two 'forces' in evolution: chance and merciless selection. Then came the birth of 'evodevo'. No longer was selection the focus, but instead the way in which genetic programmes are interpreted. In the 90s, epigenetics arose and with it the idea of the inheritance of acquired characteristics experienced a renaissance. That is a sign to me that we are nearing the essence of life: processes are not totally determined, but neither are

Out of all the beings of nature, it is only the human being that 'knows'. Each time a principle, fundamental law appears in our consciousness, it has a powerful significance for the world. It is a creation.

they chance. They are guided by the organism. We now know of genes that in one insect are involved in the formation of a hind wing and in another suppress the growth of wings. This tells us that it is a matter of how the gene is interpreted. I think to myself: 'it's great that someone has discovered that'. I then involve myself with the power, the entelechy, that bestows on this genetic 'text' one meaning or another.

Anthroposophy gains legitimacy in the mind of the public through its applications – its science has a hard time of it.

Kühl That is true apart from in education. Teachers are interested in research, in fact not only in Goethean research but also in a spiritual understanding of conventional results. To that is added the fact that the increase in technology in our surroundings leads to a wealth of questions for which we anthroposophists are expected to give some guidance. This includes the genetic modification of our foods, the electrosmog of our communications, modern lighting such as LEDs in our building interiors – and, not least, our use of energy.

Wirz In fact the public is interested in the fields of life taken up by anthroposophy, such as agriculture, banking, medicine and education but hardly at all in understanding the background of it, the 'theory'. But for us the task comprises precisely this development of understanding. I often feel this as a tragedy, and at the same time wonder what could be greater than understanding the world?

Kühl It's a matter of this understanding relationship to the world. Then the question of, for example, the spiritual significance of the rainbow arises, not at the beginning but at the end, after an appreciation of its physical beauty and profundity.

Wirz There are like-minded thinkers who say that 'life' manifests itself into appearance – is perfecting. That takes us to the wider context, its significance for us and for the world. I always have the impression that in this way we create a possibility for spirits that have no eyes or ears to have experiences.

Goethe said that nature rejoices when the human being manages to understand her. Have you already heard this rejoicing?

Kühl In our conference, Walter Bos addressed this question starting from Goethe's article *Considerable assistance from one ingeniously chosen word*. Goethe described there what it meant to him to have been 'understood' by someone. Bos sketched how he experienced that nature 'shows' herself to him. Frits Julius goes a step further when he tells of having felt 'invited' by elemental beings. These beings had led him, though not in fact to a supersensible experience, but to a special sensorial experience of nature: a particular moss, a striking mineral. In

human interaction it is easier for us to agree about this 'becoming seen'. But nature is more discreet about it. Perhaps I have not heard the rejoicing, but certainly a gentle murmuring.

Wirz If we follow Rudolf Steiner's statement that only in our process of knowing does the world complete itself, then we should not ask where and how we should do something for the further development of the world. So, among all the beings of nature, it's only the human being that 'knows'. Each time, a fundamental law, an archetype appears in consciousness, it has a powerful significance for the world. It is a creation. In my scientific work, wonder and amazement frequently arises only after I have 'known' something, not before.

How are things regarding the results of the research?

Kühl Even if for example the research of Georg Maier in the 80s was difficult for many people to understand and today such research would be hard to finance, it is a fact that with Wilfrid Sommer, Florian Theilmann and Johannes Grebe-Ellis at least three of his 'pupils' with 'Goethean science' dissertations now work as university lecturers. Jochen Bockemühl's at least as extensive research is well received amongst horticulturists and farmers.

What were your happiest and unhappiest moments in your work?

Wirz Sometimes when I'm standing on the Glashaus terrace and look up at the Goetheanum it comes to mind that it could not have turned out better for me than that my biography led me here, that here I can appreciate the human perspective in biological research as well as that of humanity. The saddest time was in the 90s when at the Institute mistrust and disappointment hampered our work. And we were not in a position to deal with the problems openly. We have come a long way since then.

Kühl It is rewarding when one can work in such freedom, it's part of the 'job' to go into issues of cognition, to develop relationships with people who are deeply concerned about the world and anthroposophy, and, for example, to study the Class Lessons. Of course, work at the Goetheanum has its hard times too, as for example the drastic budget cuts in 2010, and also that we found it so difficult openly to deal with wrong decisions.

Wirz There is an interesting spiritual pattern: at university, by comparison with my colleagues, I was spiritually on a different planet. But relations at the human level were very cordial: we celebrated and had fun together. At the moment it is the reverse here. At the spiritual level we try to make genuine connections with one another, but at the human level it is more like fallow ground. When we succeed in cultivating some life, sharing with one another, unexpected sources of inspiration can be found by all. In this respect the potential is not yet exhausted.

Biological past – spiritual future

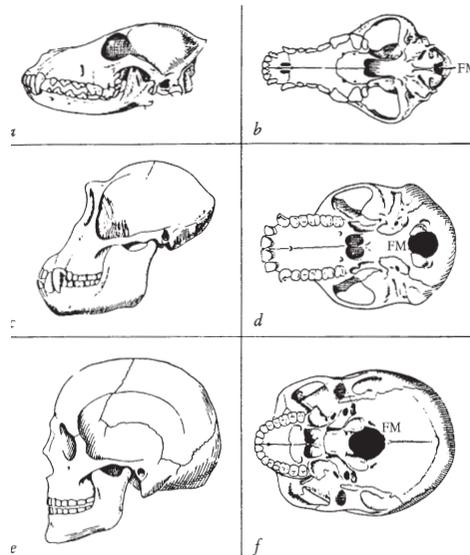
If in the 'normal' sciences reflection is the most valuable tool, in Steiner's spiritual science it is meditation.

Both practices takes us to boundaries, and – if we are fortunate – to the capacity to go beyond them.

All sciences, including Rudolf Steiner's spiritual science, have to meet certain criteria. In the process of knowledge they achieve an internalisation through the cognitive assimilation of experiences – whether the perceptions are sensory, conceptual or ideal, i.e. outer experiences or mental perceptions. They dispense with received ideas in the knowledge not only that new experiences challenge old theories, but also in that familiar experiences can repeatedly be seen in a new light. They flourish and develop only in a 'thought community' or 'thought collective', meaning that methods and results must be communicated. Goethe's methodological approach understands thinking and idea as part of reality. It is true that the whole always manifests itself in individual experiences – in the plant sprouting, growing, flowering or ripening – but it is only fully grasped and conceived in the idea. As Kurt Goldstein remarked, idea or picture are not the keystone of the scientific cathedral but rather its foundation.

Anthroposophy starts with the idea

In contrast to the natural sciences the task in anthroposophy does not start with experience but with the idea; the result of spiritual science is textbook knowledge. They form the starting point for gradually moving forward in the realm of spiritual contemplation, which only becomes possible through developing the corresponding spiritual organs. If in the 'normal' sciences, reflection is the most valuable and important tool for progression, in spiritual science it is meditation. Both practices take us to boundaries, and – if we're fortunate – to the capacity to go beyond them. This opens the door to experiencing the spirit. Steiner described this distinction in the briefest way in an annotation to the new 1924 edition of



Skulls from dog to man via monkey: the premaxilla, the will in the head, increasingly retreating, becoming spiritualised as language and thinking.

'Theory of Knowledge Implicit in Goethe's World Conception'. Through thinking, the scientist lifts sensorial experience from below to the threshold of the spiritual world – that is his job. Using thinking, the spiritual scientist brings the experience of the spirit down from above into the reality of the world of the senses.

The gift of evolution

Both perspectives on the evolution of the human being can be traced in Steiner's scientific biography. In his early writings he showed himself convinced about the correctness of the Darwinian and Haeckelian view. In later publications such as the 'Michael Letters' his thoughts were formulated with a different emphasis. The sentence 'From the conjoined labours of the whole choir of these beings (the Archai) results a world-aim and object: the birth of the human form' points to a teleological interpretation of evolution. The emergence of the

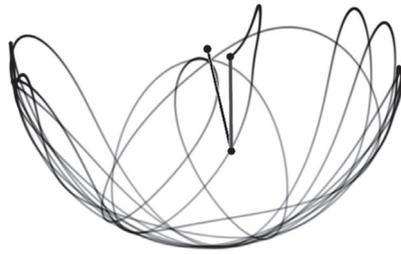
spiritual human being as the first being in the creation of the universe breaks with the conception of man being the last to appear.

In the human skull we can recapitulate the steps of biological evolution. The cranial orifice, placed centrally underneath, is closely connected with the upright posture. The retraction of the facial skull, together with the descent of the larynx, creates the precondition for speech. The large domed rear cranium, together with the undifferentiated hand, enables the creative activities of cognition, handwork and art. The biological preconditions for walking, speaking and thinking are gifts of evolution. The faculties themselves still have to be acquired! The biological past facilitates our spiritual future to the extent that the acquired characteristics mark the moment of birth for the transformation of the bodily members into spiritual ones.

The structural relatedness of natural and spiritual science, which was addressed at the beginning of this article, can be seen in exemplary form in the third mantram of the Foundation Stone verses. In the resting head the thoughts of worlds are opened to us – that is the task of the sciences. With the capacity to contemplate the spirit, we experience the 'world-being's light' that bestows on us free willing. And finally, through the help of the angels of the third hierarchy, the soul can awaken in the 'spirit's universal thoughts'. The consciousness for the universal thoughts – the goal of any scientific endeavour – becomes to live and to be in the spirit; the soul progresses from being acted upon to taking action. As the scientist understands the structure and practice of knowing better than most, who other than the scientist is best fitted to become a spiritual scientist?

In the flow of the sciences

Anthroposophy finds the spirit through the experience of the senses



Double pendulum

Anthroposophy positions itself between anthropology and theosophy. Anthropology involves understanding the human being scientifically. Theosophy gains its knowledge through super-sensory research. Anthroposophy pursues the project of connecting all knowledge 'this side of the threshold' with the awareness of the ubiquitousness of the spirit.¹ Its aim is to prevent the irreversible separation of the two directions of research, not least because of the prolific development of modern science and technology.¹

Neither presupposed nor rejected

Anthroposophical research begins with the twelve senses and their capacity to point to the spirit. The spirit need neither be presupposed nor rejected. Instead it suffices to be open to its appearing. This attitude is also present in Goethean science, both methodologically and in view of its spiritual mission. For this, in my view there are two conditions to be fulfilled. Firstly it requires a community of researchers who strive for a truthful knowledge of the objects and processes in the world of the senses. Secondly it is a matter of learning to read science and technology as an adventure in the evolution of consciousness, and at the same time, starting from the research methods of this science, of eliminating its claim to sovereignty.

Elimination of space and time

If, in the history of science since the 15th century, we consider the significance of the sequence of discoveries without generalising their mechanisms in an improper way, it is clear that the advent of anthroposophy in the 20th century is no accident.²

For this overview, I restrict myself to physics. In the Middle Ages it could still be regarded as Aristotelian. Despite the great coherence of this way of thinking and its apparent irrefutable cosmology, Galileo initiated the dismantling of Aristotle's laws

of physics. We can take it for granted that the observations, for example the cases of light and heavy bodies, had not significantly changed. What had changed was the perspective and the range of meanings of the concepts used. In only three centuries from Newton to Laplace, confidence had arisen that, based on the laws of mechanics, it would be possible to determine the distant past and the distant future from the present state of things! This conviction has increased today and is widespread as a vision for society. With Laplace, Newton's mechanics was founded on the existence of an absolute space and an absolute time as a framework for the evolution of all phenomena, a framework in which determinism appeared to be necessarily linked to predictability.³

But this link was broken when Henri Poincaré founded dynamic non-linear systems in a radically new approach to the investigation of potentially more comprehensive solutions for the equations of motion.⁴ From 1963 deterministic systems with few degrees of freedom and exhibiting unpredictable behaviours, were described as 'chaotic' by the meteorologist Edward Lorenz. Against the background of the work of Minkowski, Lorentz and Poincaré, Einstein developed his special and general theories of relativity, and thus eliminated the concept of absolute space and time.

Deconstruction of matter

What relationships are there between the question of matter – its interaction with light and its chemical properties – and the mechanistic view of the world? Non-relativistic quantum mechanics was the answer to this question. In Niels Bohr's atomic model, which looks like a small solar system, gravitation was replaced with an electric field between a positively charged nucleus and negatively charged electrons.

Further components were necessary for the coherence of this model: Heisenberg's uncertainty principle and the exclusion principle formulated by Wolfgang Pauli. In the framework of quantum mechanics, only these two principles have explained why matter can take up a 'space' at all.⁵ Thus was the intuitive idea of matter dismantled. Evidently physicists are trying to unite the two theories, and whether absolute time exists is again being discussed.

A question of ethics

Current philosophy of science is able with a hitherto unattained precision and power to formulate the consequences and the contradictions of materialistic reductionism, as, for example, achieved by Olivier Rey in relation to physical reduction in neurobiology.⁶ Or, as Michel Bitbol put it: 'The construction of an objectivity, which ... requires that the subject stands back from his own presentation, can without doubt be identified as the cause of why we live side by side with an ethical desert',⁷ – a problem that confronts our society.

Without denying the basis of current scientific culture, we can direct our attention with full justification at the experience of the senses, in order to discover there the manifestations of the spirit. Only this experience can give us back the basis of the lost sources of ethics.

1 Steiner, GA 45 2 Basfeld, «Erkenntnis des Geistes an der Materie», Verlag Freies Geistesleben, 1992. 3 Laplace, «Essai philosophique sur les probabilités», 1825. 4 Letellier, «Le Chaos dans la Nature», Vuibert, 2006. 5 Leconte und Lusseyran, «Leichte und Schwere», in «Elemente der Naturwissenschaft» 47, 1987, Heft 2 6 Rey, «Itinéraire de l'égarément», Seuil, 1990 7 Bitbol, «L'Elision» in: Schrödinger, «L'esprit et la matière», Seuil, 1990

Easter mood of observation

What does Goethean research mean for nature herself?



Chicory

Goethean observation and research is practical empathy. In observing we try to recreate nature inwardly. Perhaps we pass a chicory flower and say to ourselves, 'How beautiful this blue of the petals'. This can be the start of a genuine encounter with the plant – if we can overcome the hurry with which we usually go around. The petals show a characteristic blue, friendly, deeper than that of a forget-me-not; more a blue that just 'exists' rather than 'shining out' at one. Some violet is mixed in with the colour and adds a note of melancholy in this tousled flower-head, already fading early in the day. Such an observation need not take up much time. Everyday life resumes with a happy feeling, but the blue has gone into us. In my giving attention to it in meeting it, I am the one who benefits most.

Being invited

Is there any indication that more has taken place than a subjective act of perceiving and experiencing that is enriching only for the person involved? Yes, because the walker was certainly not on his way in order to look at plants, and felt so to speak 'invited' to this observation. And the invitation was specifically by the chicory, not by all the other possible plants that were there. It was as if it was flowering just for him. And the observation was without personal intentions or desires. After the blue of the chicory, nothing was 'taken'. Nevertheless the blue entered into the observer. By empathic observation one enters into something like a field that stretches between the person and the phenomenon observed. In this field, the process of observation unfolds without coercion in such a way that it is informed by both sides. We participate actively, but we are also helped, and we receive subtle indications which guide our attention.

Frits Julius

From such observational experiences we gain increasing certainty that nature wants to be observed by us and is happy to enter into human beings. The Dutch biologist Frits Julius goes a step further: he describes in his autobiography how he reached a point in his observations of nature where he let go of all his own efforts and instead let himself be guided by the nature beings: 'During a period of about three hours I took no step without being led. I was constantly being brought face to face with overgrown rocks, with plants or, to express it better, with miniature landscapes, where I could learn something characteristic. Through the fact that I was placed somewhere, I simply knew that there was something there to understand. That was the beginning of my curious schooling of sense perception'.

For example, two kestrels fly past in a far reaching curve, displaying overhead their flying skills: speed, flying along in a straight line, circling, gaining height until they are carried by an updraught, and the transition from rapid flight to hovering on fluttering wings at one spot. As the light of the sun shines through their wing and tail feathers, the birds are surrounded by an aura of light. Filled with admiration, delighted indeed, one gets the feeling that we can perceive the bird as it actually is. It appears as a being of light that emerges from a world of light. We sense ourselves not as onlookers but as collaborators in what is happening, a process of appearing.

Elevating

Firstly we emphasise that people are enriched by going through an encounter with nature, because an essential feature of nature is that it gives of itself. Seemingly in it lives the wish to be seen, an orientation towards joining together with the human being. Nature is enabled to do that if, for our part, we bring our receptivity into the process of appearance. Giving of itself, nature passes into us. We notice this concretely the next time we walk past a chicory flower, or see a kestrel once again. The chicory flower has inserted itself into our intelligence, into our capacity for orientation in the world, and now influences the form of the next observational process. It has become human within us and through our mediation. Is that what we bring about with our attention to nature?

There are phenomena that immediately and always radiate a certain sublimity: the starry sky, a rainbow, a sunrise, a waterfall. Other phenomena require more application until we experience them resplendent, shrouded in something great. This resplendence arises when the phenomenon is sensed as a picture. For example, lady's smock or cuckoo-flower with its little groups of flowers floating aloft can be an example of yearning for a higher world, a desire that is not stated aloud, but is nevertheless constantly there. A carpet of wood anemones in the bare spring woodland can be a picture of friendly, pure devotion. Thus, as a picture, the phenomenon loses its flatness. It is elevated in that we concern ourselves with it. Its dignity becomes experienceable. An Easter motif lives in such processes of appearance. This spring-Easter mood is very noticeable when reflecting on a successful observational event. Something is brought into movement, freed from the rigidity of habitual interpretation. What practical Goethean science can mean for nature probably lies in this direction.

METAMORPHOSIS AND EVOLUTION: A HUNDRED YEARS OF THE GLASHAUS



The building and its mission

The Glashaus is without doubt one of the most beautiful and most loved buildings on the Goetheanum grounds – above all because it reminds us immediately of the first Goetheanum building. Its lavishly beautiful yet simple design is very human.

Its existence we owe to a fortunate event: in the autumn of 1913, i.e. shortly after the laying of the Goetheanum foundation stone, the building office wanted first of all to put up a simple workshop for grinding the glass windows. As someone had the idea of showing the plans to Rudolf Steiner, he outlined the building that we know today! (Source: personal communication from Kurt Remund)

Later, in a lecture (4 January 1915, GA275), Rudolf Steiner described how all the buildings near the Goetheanum should be a metamorphosis of the same thing according to their functions – with explicit relation to Goethe's theory of metamorphosis. The central motif is the double cupola:

«In this interpenetration of the motif of both the cupolas lies infinite variation, lies an infinitude. Only by our having brought about this interpenetration of the motif of the double cupola will we achieve, for the far-reaching artistic phase of our construction, what expresses itself in our building as a reflection of our spiritual scientific thoughts. Thus this interpenetration is present even in the main building. And even if we once again remove the interpenetration, pull the cupola motif apart, we are then nearing an Ahrimanic principle. Were we to bring them still closer together, or push them into one another completely, we would be building as if we were putting one inside the other.

In this way we would arrive at the Luciferic principle.'

And a little before that:

'The basic idea of the double cupola has to be adhered to in all that is in intimate, organic connection with our building...'

This idea is developed with the example of the boiler house. Here the Ahrimanic principle is removed from the building, probably because it was its 'technical centre'. Therefore, it is as if the two interpenetrating cupolas of the Goetheanum were pulled apart, the north side becoming asymmetrically large in comparison with the somewhat stunted south side, and out of this, so to speak, grows the chimney.

Unfortunately we know of no similar description of the metamorphosis that led to the shape of the Glashaus. But we could look for it ourselves. As in the case of the boiler house, here also the two cupolas are pulled apart and separate, thus approaching the Ahrimanic principle, but the building largely retains its symmetry. Is that an indication of the almost violent, though equally artistic activity with which the images were wrested from the hard glass? Or an anticipation of later scientific activity, which always involves an engagement with Ahrimanic tendencies?

According to the information in the plans archive of the Goetheanum, the plans for the construction of the building were drawn up in January 1914. Christoph Lindenberg's record gives 1 April 1914 as the day that construction work started. The official opening of the building was on 17 June 1914, as little as two and a half months later! When we consider that work at that time was carried out almost without machines – as with the building of the Goetheanum, the construction wood was delivered by horse and cart – this is an



The Goetheanum with the Glashaus and boiler house. Early shot: The Glashaus does not yet have its chimney and the cupolas are not yet slated.

amazingly short time. On early photos we can see that initially the roof was not slated, and the chimney was not yet built.

At the opening of the Glashaus, at that time primarily designated as a studio or artists' workshop, Rudolf Steiner gave a lecture, probably in the so-called middle room of the Glashaus (printed in GA 286). There he described an important effect of the Goetheanum building: through the relief form the walls are 'speaking'. Through them, so to speak, the speech of the gods can be heard. (Steiner made an interesting aside on this: one would find nothing in nature with this quality – with one exception, namely the relief of the ground, the shaping of the landscape!) The reliefs and sculptures become like the larynx for this speech and their effect makes the human being capable of peace:

'My dear friends, however much people wonder how outer institutions can eliminate from the world offending and criminality, true healing of evil into goodness for the human soul will be through true art sending that spiritual atmosphere into the human soul and the human heart such that these human souls and hearts, if they are sympathetically surrounded by what has come about in architectonic sculpture and other forms, when they are inclined to deceitfulness, will stop lying, and when they tend to disturb the peace, will stop disturbing the peace of their fellows.'

Today, in a time when 50 million people in the world are fleeing cruelty and violence, such words go to the heart! Moreover, there is a surprising preliminary remark:

'Perhaps not quite everything will be achieved with our building – because we really want to set up only the most elementary beginnings.'

If we consider that subsequently not one of the people immediately connected with the Goetheanum could experience this capability of peace, then we can sense how far into the future this ideal is projecting!

Then Steiner moves on to the intended effect of the windows:

'All this relief form is an organ for the speech of the gods... What can we wish for when we try to penetrate our walls?... We can do nothing other there than to show that the human being..., in breaking through the wall is seeking a way to the spirit. And we will look at these windows; in their chiaroscuro, in their coloured chiaroscuro

they should show us: 'Thus, O Man, you find the way to the spirit.'

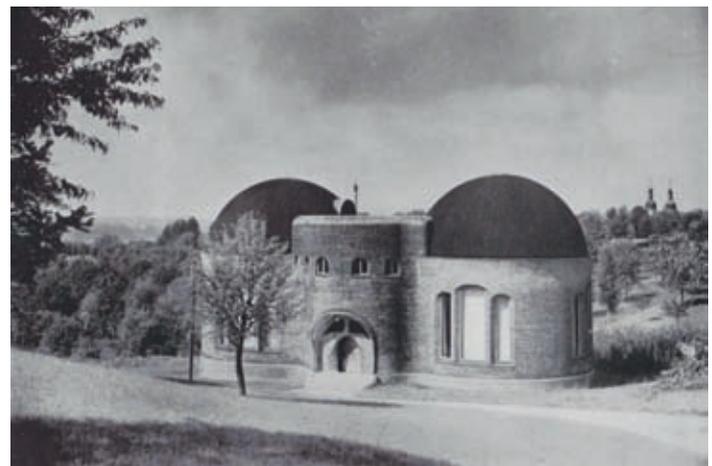
And somewhat later:

'But in the moment when we find ourselves in the transition from 'being able to be calm', from 'sitting calmly' to our own movement, to what we want to do in order to find the way to the gods, in that moment we must have movement, yet inner movement; we must break through the wall. These windows must be there to invite our souls to start moving on the path to those places whence we are spoken to through the forms of the walls.'

It is striking how in this lecture, which was essentially addressed to the 'building workers' of the 'Goetheanum site hut', Steiner speaks to the feelings of the people who worked with him there. Thus I will quote another sentence from the end of the lecture:

'My dear friends, better than through words, we dedicate this place of work – for a workplace it is to be – if in going away again from the door, we concentrate with all the powers of our heart on the love of the world of people and of the spirit that is found through what happens in these rooms, the way to the spirit; to the spirit from which, if human beings find it lovingly, will peace and harmony spread among men on earth.'

This in a certain sense describes the mission of the Glashaus and the work described there.



View from South-East, yet without the chimneys and the slated roof

Building office and publishing house

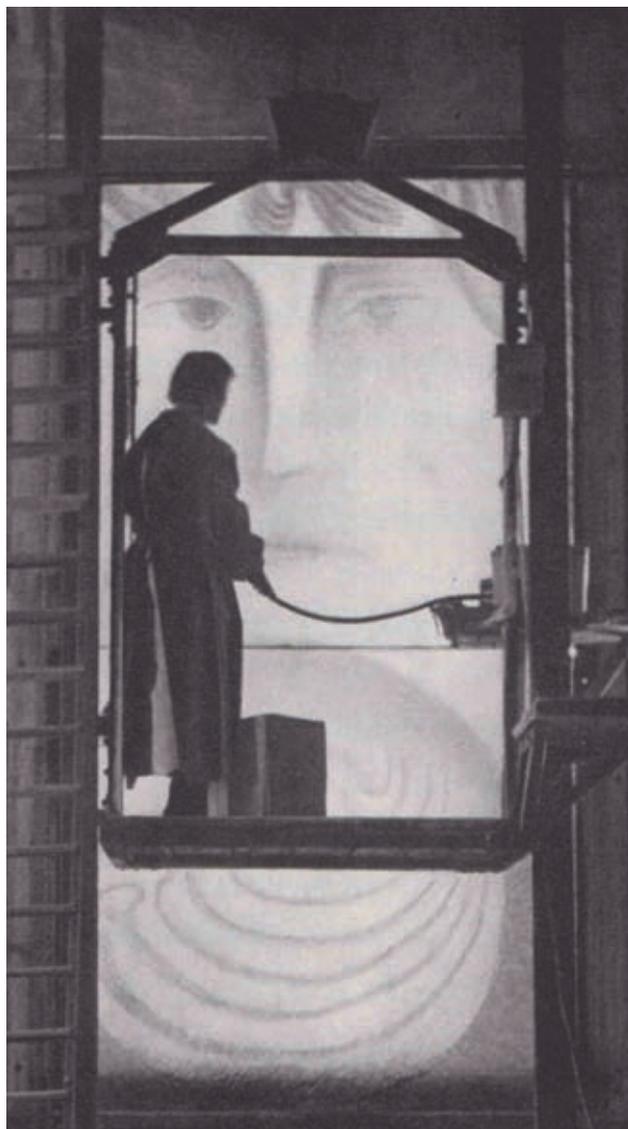
Of course, the Glashaus was initially used mainly for grinding the glass windows. The ready-made glass sheets came from a company in France. They were then installed in the Glashaus before going in the corresponding windows in the Goetheanum building, and were worked on from the inside. At that time, the two 'cupola towers' had no floors. As photos show, the artists were able to stand on a kind of elevator platform that could be raised or lowered, and grind away the glass with corundum discs which were driven by flexible shafts from electric motors, and probably constantly cooled with water. The windows of the first Goetheanum were made under the direction of Thaddäus Rychter, and those of the second directed by Assia Tugenjew, who, together with Rudolf Steiner, developed the hatching technique (he describes it himself in GA K12). Only after the Second World War were they installed in the building. The building office was repeatedly also accommodated in the Glashaus. Here plans were drawn up, organisation discussed etc. Initially Thaddäus Rychter lived in the flat over the middle room. Later it was occupied by Assia Tugenjew. The building administration was still working here in the 80s, together with at least part of the Goetheanum finance office. Even members of the Vorstand had to collect their salaries in cash from Herr Estermann and Fräulein Ruschmann. Later the rooms were used by the Goetheanum publishers. Floors had long since been installed in the cupola towers, and for decades the two cupolas were used as store rooms!

Science, agriculture and therapy

Science discussions, some with Rudolf Steiner, started in the Glashaus quite early on, 1920 at the latest. Ehrenfried Pfeiffer and Guenther Wachsmuth are two people who met there and together wanted to establish natural scientific work in Dornach. Thus 1921 saw the founding of the 'Goetheanum Research Laboratory'. Wachsmuth describes how such an event is one of destiny:

'Such impulses and the institutions that result from them came about not through outer causes. They were born out of the concrete life-encounter of particular people, whose destiny, and at the same time their free inner resolve to serve spiritual science, brought them together in a particular sphere of life and work. Thus was born this research laboratory in Dornach out of my life-encounter and friendship with Ehrenfried Pfeiffer... (So) it happened quite naturally that, after a short period of sharing thoughts and intentions, a space was sought where experiments could be carried out. At our request, Rudolf Steiner allowed us to occupy a cellar room in the Glashaus, above which the coloured glass windows were being ground, and we started the founding of the laboratory with the most basic act of creation.' (from Alla Selawry: Ehrenfried Pfeiffer, Dornach 1987)

Pfeiffer, who was also in charge of the stage lighting at the Goetheanum and, in consultation with Steiner, studying the sciences in Basel, was more of a practitioner, for he had the urge to experiment, for instance to find experimental evidence for the etheric. Wachsmuth was more the 'theoretician' who worked on his 'system', so to speak, of etheric formative forces. He later set



this out in his book 'The etheric formative forces in cosmos, earth and man'. During the 1923 Christmas Conference, as Wachsmuth was employed in the Vorstand and as Leader of the Science Section, Steiner favourably mentioned this book at the conference and directly referred to it as justification for employing young men who were largely unknown amongst anthroposophists. (Wachsmuth was 30 at that time, and not a trained scientist.)

Pfeiffer, who later worked particularly in the fields of agriculture and nutrition, was the first to take up Steiner's indication to investigate the etheric with the help of crystals. The method of sensitive crystallisation was developed in the Glashaus cellar. It is now used in several places round the world, on the one hand for quality investigations, and on the other hand as a help during diagnosis of cancer. Soon a small team of very enthusiastic colleagues supported the work by helping to carry out the experiments. When Pfeiffer was offered a position in the USA and moved there, these people continued to work on the crystallisation pictures under various leaders. In the 90s, crystallisation lost its importance as a diagnostic tool.



Thus, at the beginning of work in the Glashaus, the scientific impulse was already combined with practical agricultural and therapeutic applications.

After the dissolution of 'Kommenden Tag' and the Stuttgart science institute in 1925 – Lili Kolisko's biological institute continued to exist – the engineer Paul Eugen Schiller came to Dornach and directed the 'Physics Department' of the Institute. He probably worked in the Glashaus and occupied himself particularly with the sensitive flame method. With this he showed how a gas flame that was 'spoken to' with various sounds shows forms that rapidly change and therefore have to be visualised with a stroboscope. The 'superstroboscope' that he developed for this was even sold out several times. It is noteworthy that Steiner's indication and Schiller's work both inspired, later in the 60s, the work on flow acoustics, and, together with this, the work on ring vortices as a primal phenomenon of flow at the Max Plank Institute for Flow Research in Göttingen. There, over a period of many years, an extremely fruitful collaboration of young physicists interested in anthroposophy arose round Prof. Ernst-August Müller. The connection with the Science Section was always maintained.

Attempts to demonstrate the effect of the etheric

After the Second World War, Frieda Bessenich and later Ate Koopmans took over the leadership of the crystallisation laboratory. Schiller too continued experimental work. For example he investigated whether different warmth qualities could be demonstrated by letting wheat seeds germinate on a table heated by water that was warmed by different sources of heat (fire, electricity). However, no differences were found. In another experimental design, he investigated differences in the warmth qualities of day and night with suspended thin metal spirals kept as isolated as possible from other influences. The hoped for results were not forthcoming here either. A young physicist by name of Georg Maier was involved in these experiments, but after their negative outcome he was dismissed.

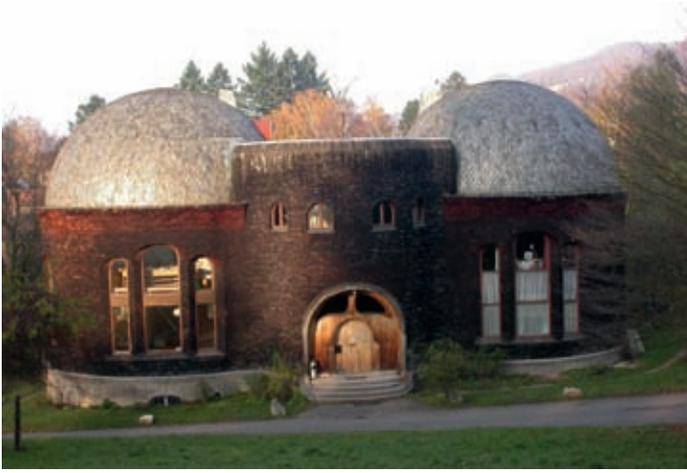
This work, together with much of the argumentation in Wachsmuth's books, shows a particular attitude: people were looking for experiments and effects that the science of that time could not explain, in order to 'prove' the influence of the etheric. This could not succeed. Where 'inexplicable' effects were discovered, science of course soon discovered the explanatory circumstances. Nevertheless, it is no doubt important that such experiments were carefully conducted for the reason that a negative result is also a result for science, and future scientists can learn from it. As Jochen Bockemühl once put it:

'Given the conditions at that time, in the first and second generation of anthroposophical work it was not as reasonable to think that, in understanding things, it is not a matter of explaining phenomena by adding thoughts, but of contemplating the connections that are in the thing (phenomenon) itself. These connections are the spiritual element that goes to make up the reality of the object of contemplation. This, through the appropriate training, allows organs to be formed that penetrate into deeper dimensions.' (Biographie Guenther Wachsmuths in: Anthroposophie in 20. Jahrhundert: Ein Kulturimpuls in biographischen Porträts. Hg. Bodo von Plato, Dornach 2003)

The etheric in the activity of thinking

Jochen Bockemühl started working in Dornach in 1953. Half his time was devoted to evaluating crystallisation pictures and the other half to his own projects. The germ of his later work on living things was established with botanical and zoological themes.

In 1963, after Wachsmuth's death, Hermann Poppelbaum took over the Science Section leadership. As a young biologist in 1924, he had included in a book Rudolf Steiner's thoughts on evolution. Many other publications followed. Even though many things in these publications have in the meantime of course become outdated, his clear and careful train of thought is nevertheless always a pleasure to read! As he became both a member of the Vorstand and its chairman in 1963, for continuing the work of the Section he was largely dependent on his colleagues in the Glashaus. A first significant step was taken in 1964 when Bockemühl and the physicist Mario Howald-Holler founded the journal *Elemente der Naturwissenschaft*. This organ of the Section for the publication and discussion of the work of anthroposophically orientated scientists is still published to this day (Editors-in-chief: to 1973



The Glashaus in 2004 before the renovation



The Glashaus after the renovation in 2007

Jochen Bockemühl and Mario Howald-Holler, to 1992 Georg Maier, since then Johannes Wirz). In about 1968 the two, together with Anselm Basold and other scientists not based in Dornach, particularly Robert Bünsow, Norbert Pfennig and Ernst-August Müller, all three lecturers at the Göttingen University, founded a Section collegium, the first of its kind in Dornach! In 1971, on his 80th birthday, Poppelbaum handed over the Section leadership to Jochen Bockemühl.

A multitude of activities started in the Glashaus in the 70s: in many conversations Bockemühl together with Herbert Koepf, who in 1972 took over the leadership of the Agriculture Department of the Science Section, and other friends in biodynamic agriculture, managed to guide the very varied efforts in this movement into working together. The resulting agriculture conferences grew from year to year.

In the meantime Georg Maier had returned to the Glashaus. The collaboration between him and Bockemühl resulted in a big step in their cognitive approach. They no longer sought the etheric as a force 'out there', comparable with a magnetic field, but observed how it was experiential in contemplating, in the activity of thinking applied to observing. A first step is marked by Maier's essay *Elemente als Stufen der Naturbetrachtung* (EdN 13, 1970). In 1976, as a result of collaboration in the Sektion collegium, appeared the book 'Toward a Phenomenology of the Etheric World' containing Bockemühl's article *Elements and Ethers: Modes of Observing the World*. Ideas themselves become interpretative organs with which we encounter the spirit in nature. With this publication a research program was outlined that was to leave its mark on the coming years.

In 1976 the 'Anthroposophical Natural Science Study Year' was founded, which existed to the end of the 90s. Up to twenty students from around the world studied in the Glashaus. The training was initially for two years and later for one. The students followed specific courses and did their own projects, particularly on botanical themes, but also on physics, even to the extent of designing the landscape of the Goetheanum grounds! This intensive teaching activity radiated throughout Europe and beyond to many countries and continents.

A further discovery by Bockemühl should be mentioned here:

the contraflow of metamorphoses of the leaves on the stem of a plant from below upwards and during leaf development. The same (four) formative principles are at work but in reverse order! This gives a picture of the two temporal courses that Steiner occasionally mentioned.

Most probably, Maier's greatest contribution to physics was in the field of optics. His book, 'An Optics of Visual Experience' (Adonis Press, 2011) has become a standard work in 'phenomena-orientated optics'. Among other things he managed to make the world of diffraction phenomena – originally the domain of the wave theory of light – accessible to a Goethean approach. The 'Workshop for Physicists and Physics Teachers', held from the 70s until today, has become an annual meeting with colleagues, amongst them Heinz-Christian Ohlendorf and Manfred von Mackensen, and students, enriched almost every year by new experiments and series of experiments. Some of these former students have in the meantime been appointed to university chairs and, in their dissertations, built on Maier's work.

The work on crystallisation pictures also progressed, under the leadership of Haijo Knijpena from 1972 onwards. In those days up to 5,000 blood crystallisations were done annually, and the income from this was able to finance the research!

The section, the Goetheanum and current events

During these years the Glashaus was a place of intensive, lively scientific and anthroposophical work, though at times apparently detached from the rest of the Goetheanum. At times people spoke of 'those up there'. At the end of the 80s a new development started: Section Leaders such as Michaela Glöckler and Georg Glöckler, Manfred Klett as the successor of Koepf as Leader of the Agriculture Department, and later also Christian Hitsch, worked on overcoming the inner separation of the Sections from the Goetheanum. They felt themselves responsible not just for their Sections but also for the whole. Regular meetings of the resulting collegium of the School of Spiritual Science were set up comprising Section Leaders and members of the Vorstand. During this time, in 1996, the leadership of the Science Section was taken over by the physicist and former Waldorf teacher Johannes Kühl. Jochen Bockemühl and Georg Maier continued to work in the Glashaus with him, and a friendly collaboration



Colleagues and students in former times on the Glashaus-steps



Colleagues and students in front of the Glashaus: a meeting of the supraregional training for Goethean science in 2013

developed with occasional changes in the team.

An era came to an end in the 90s. As in all other anthroposophical trainings the student numbers declined so that the regular study year had to be abandoned. Requests for blood crystallisation were reduced to 500 a year. Funding it became a problem and after the turn of the century this work had to be completely stopped. At the same time larger research projects connected with issues of the day increased in importance, e.g. genetics, (Ifgene conference 1996) and, later, beekeeping. These two topics are matters of concern to the biologist Johannes Wirz who shares responsibility for running the Institute. The work on medicinal plants is continued by Torsten Arncken and Ruth Richter. Soon after the retirement of the physicist Florian Theilmann in 2005, Matthias Rang started his PhD thesis on a theme developed from Goethe's Theory of Colour. Another dissertation by Renatus Derbidge on form variations in mistletoe berries is in progress. Apart from current themes (radioactivity, technology, quantum physics), Johannes Kühn worked on the relationship of Goethe's Theory of Colour to the atmospheric colours.

Attending to the challenges of our time and maintaining contact with friends within and outside the anthroposophical movement were also matters of concern to Nikolai Fuchs, who took over the Agriculture Department in 2001.

From November 2005 to January 2007 the Glashaus was thoroughly renovated. The cupolas were converted into seminar rooms. To this day the colleagues are grateful for the sensitive execution of the construction work by Susanne Böttige and Martin Zweifel. The greatest compliment was probably from a former student who when entering after the renovation 'murmured': 'Ah - it is still the Glashaus!' With the renewal of the building, the 'Agriculture Department' became a Section. After Nicolai Fuchs left in 2010 he was relieved by a Section Leader team: Ueli Hurter and Jean-Michael Florin work partly in the Glashaus, accompanied by Thomas Lüthi in Sweden. Some of the time they continue to work as farmers in Switzerland or in the agricultural association in France, so that a particularly strong relationship to their field of work is maintained. Since then both Sections, one representing a caring-understanding view of the earth, the other a caring-cultural application to the earth, have been working in the same building, sometimes on joint projects.

'My dear friends, better than through words, we dedicate this place of work - for a workplace it is to be - if in going away again from the door, we concentrate with all the powers of our heart on the love of the world of people and of the spirit that is found through what happens in these rooms, the way to the spirit; to the spirit from which, if human beings find it lovingly, will peace and harmony spread among men on earth.' (Rudolf Steiner, 17.6.1914)





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