

Child and Man

Education as an Art

January 1988 Vol 22 No 1 Science Teaching





Child and Man

ISSUE THEME:
Science Teaching
in Waldorf Schools

A human being can only come to an experience of freedom if his intellectuality awakens within him of itself. But it must not awaken in poverty of soul.

Rudolf Steiner, 17.4.24

Editorial Group: Brien Masters (Editor), Peter Ramm (Art Editor, Editorial Manager & Advertising), John Docherty (Circulation), Robert Kersey-Green (Treasurer), Tony Brown (Newsletter), Sarah Wakefield (Secretary).

Subscriptions and all correspondence to:
The Secretary, Child and Man, The Sprig, Ashdown Road, Forest Row, East Sussex RH18 5BN.

Editorial and Advertising: Tel (0342 82) 2115.

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Front Cover: *The twelve main stages of the evolution of the plant kingdom are described in the article on p.18.*
Inside Front Cover: *Significant life experiences precede each individual's journey into science. (See the quotation on p.14 from Rudolf Steiner, and the Editorial Introduction.)*
Inside Front Cover: *Simone Jones.*

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Child and Man is a focus for ideas, insights and achievements in Waldorf, Steiner and all truly human education throughout the world.

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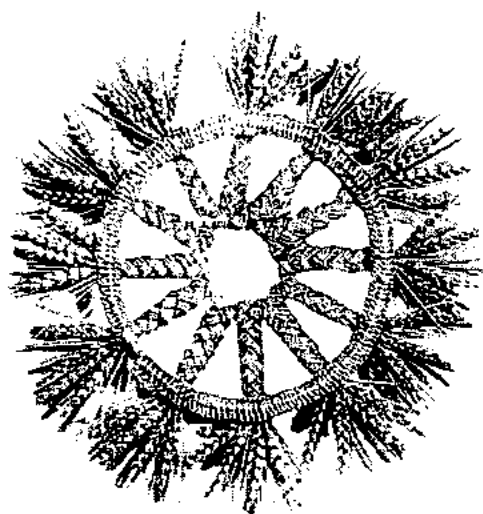
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Opinions expressed in this journal attach to the respective authors and are not necessarily those of the Editor.

Editorial Introduction

On the edge of the stubble field a few wisps of wheat are left growing among the last shrivelling poppy petals, the marjoram, meadow fescue and the hawkweed. The wheatstalks are heavily laden with full-corned ears, dry and surprisingly hard. Gathering them are children from the nearby village school. The friendly farmer invites them back to his farm. There, in the barn, they drink juice, sitting on hay-bales; they chatter excitedly about the forthcoming harvest meal which is to be adorned with the corn dillies, yet to be made from their gleanings.

In the farmhouse, the farmer's wife shows them an ancient and long respected sample of a Wedmore wheel which has pride of place over the kitchen mantle-piece. It was made by her great grandmother who farmed in Cheddar, Somerset. She remembers carrying



The Wedmore Wheel is actually an original corn dolly design attributed to the Somerset House Group, Cheddar.

it in harvest processions as a child, clad in white, with a crown of blue corn-flowers circling her flaxen head of hair. Now she is white; but her deep, heaven-blue eyes sparkle with flaxen light as she shares her vivid memories with the children.

On the way home, a boy pauses. He glances at the summer sky. He was thrilled by the agricultural machinery in the farmyard which the farmer had so proudly shown the class. But despite this, the abiding impression is of cornflower-blue eyes twinkling as the story of the past unfolded: the Wedmore wheel in the harvest procession, the wheels of the hay-wain rumbling along the track home carrying the last load of the year.

Such may well be the scene of a Class III in a Steiner (Waldorf) school if the environment is rural enough. (See inside front cover photo). The nine-year-old is becoming aware of world and Self as two distinct entities, both capable of infinite exploration. Behind him, as he pauses, the very sunlight seeming to ruffle his hair, lies the *experience* of the world. Before him lie the pathways leading towards an *understanding* of this experience. How does the great combine-harvester work? How does the seed become wheat, the wheat become bread and the bread become human nourishment? How does the light, as the sun sets over the stubble field, become so golden-hued; and how do the fleecy clouds turn pink — a pink that seems to be absent from anything that the human hand can hold?

Any given situation may furnish sufficient questions for a life time's scientific study, if one cares to take them far enough.

But science teaching in Steiner education is preceded by a sequence of closely related work in earlier classes. In Kindergarten, feelings of gratitude and wonder accompany and enrich being in and surrounded by Nature. In the younger classes in the Lower School, 'Nature Stories' are told, presenting the world imaginatively to the pupils' picture-filled consciousness. Nature study comes next: the forms and configurations of the animal world, the plant world and the mineral world, each with their particular relationship to the human being, are vividly characterised by the teacher, thereby awakening more conscious powers of observation. Such observation is nourished by the previous two stages of experience and leads the way to the next stage: natural science.

If scientific knowledge is like a mountain range that the mind has to cross via the pass of Chemistry, the pass of Biology, or Physics etc, one can visualise the experience of the younger children as routes coming from great distances of the lowlands of childhood consciousness and converging at the foot of each pass. Following this, an intense interest in the phenomena themselves characterises the adolescent's climb into the highlands of scientific discovery.

In this issue of *Child and Man*, we present the theme: Science Teaching in Waldorf Schools. Different branches of science for varying ages are described. A branch of physics — colour — for the 12/13 year-olds is represented; chemistry for 15 year-olds; human biology for 16 year-olds; and botany for 17 year-olds. Other examples, of course, could equally well have served the same purpose, either from the same group of sciences taught at some other age or from different sciences taught in Waldorf main-lessons such as meteorology, zoology or astronomy.

Nor, except in this editorial, have the earlier stages (of pre-science) been referred to. Interested readers will find these elaborated and amply represented in former issues. The intention here has been to present examples of the subject matter in science teaching *per se*.

In addition, the first of three articles

appears in which computing science is discussed in the context of Waldorf education. In these articles much that was clarified or merely surfaced as a result of the conference in High Mowing in March 1985 (see '*Child and Man*' Vol. 20 No. 1) is taken further and brought under still greater scrutiny. This is particularly important when technologically derived pressures are constantly being increased, by the computer industry and by politicians, with the aim of exposing younger and younger children to computers. In these circumstances it is helpful to have the *educational* viewpoint put forward by someone within the industry itself. This will give both teachers and parents a securer basis for the decisions they have to make in this connection.

More important, in some ways, than the subject matter itself are the implications as to *how* science is taught in Waldorf schools. And most important of all, perhaps, is the *relevance* of each topic for its respective age group. This is the starting point for Steiner's approach to all subjects within the curriculum and is itself based on an educational principle, the scientific integrity of which he never compromises: an understanding of the developmental stages of the child — collectively and individually.

We are also fortunate to be able to include in this issue a description of the 1986-87 Wynstones Course for science specialists. This was given an open-armed welcome amongst all Waldorf teachers and it is heartening to know that the strong team of tutors who directed the pilot course are offering further training beginning in September 1988. It is abundantly clear from the description, that the course could act as leaven in the future development of Waldorf science teaching. It is particularly fortuitous that, as more and more Waldorf schools open their doors and recently established ones add Upper Schools to their younger classes, the seeds of experience among the group of science teachers finding themselves in and around Wynstones can be further cultivated in this way. The harvest that such science teaching will yield for future generations is not to be underestimated.

B.M.

A Training Course for Upper School Science Teachers 1986/87

by FRANCES WOOLLS

The last issue of *Child and Man* dealt with the theme 'Waldorf Education in a Multicultural Society' and when I had finished reading the various articles it occurred to me that the common factor in modern education is what is taught under the heading of Science and Technology. Whether pupils attend a school in the English speaking countries of the world or are educated in Europe, India or Japan something of the disciplines resulting from four centuries of scientific research will be taught them. From the age of twelve onwards, when the powers of thinking grow rapidly, young people are eager to enter the realm of scientific knowledge with its experiments, histories and discoveries, but they can also be burdened by the frightening power mankind has gained, and spiritually crushed by the nihilism of an aggressive materialistic way of life. Anyone educated in a Waldorf School from Kindergarten onwards will have developed positive powers of soul to set against the eroding force of technology used for egotistical aggrandisement whether by individual firms, countries or races, but as science teachers we can ask ourselves: 'Is there a way of teaching science which will enable our pupils to understand the world and to work in the world with love towards one another, furthering mankind's progress? Have we a contribution to make for the 21st century?'

In our present established English speaking Waldorf Schools there has for some time been an acute need for more Upper School science teachers, and it was to help meet this need that a full time one year training course was held at Wynstones School, Gloucester in 1986/87. At the time of setting up the course, we had at Wynstones an unusual constellation of experienced Upper School science teachers, who expressed enthusiasm when the scheme was mooted and were ready to take the plunge. These were Alan Hall (physics), Ron Jarman (maths), Graham Kennish (chemistry and biology), Frances Woolls (biology). In addition we had two well equipped laboratories. We could also call upon our retired teachers Isobel Bruce Smith and Mariana Bruehl for painting and eurythmy. Weekly lessons in clay modelling and speech were also given and from time to time visiting specialists came along.

The course was built around the question, 'How do we meet today's adolescents with a meaningful science curriculum based on spiritual science?' This was a real challenge to the eight students who joined our course, and to ourselves, since it implies a re-thinking of what has so far been learnt in a particular scientific discipline and a considering of this in the light of spiritual science. It implies also a willingness to work at imagination, which is the key to presenting science in a new way

— to see the phenomena firstly through trained senses and then to try again and again to contemplate what has been observed so that something of the in-forming spiritual essence breaks through. To awake again a sense of wonder and make that an organ for perceiving the spiritual — to understand life as life and in so doing be able to develop those methods and experiments which will supplement and confirm an intuitive grasp of Nature upon the Earth, and the Earth's dependence on Sun, Moon and Stars. In the 20th century it has been possible to take a degree in botany without ever studying a *living* plant and to spend three years on electricity without considering the effect of its application on the lives of people.

One of the first exercises a student needs to undertake is to *characterise* a plant or an animal or a hail storm or any natural phenomenon, instead of *defining* it. The intellect is quick at defining and often judges this to be sufficient, whereas something like an artistic approach, without losing clarity of detail will bring a better and fuller understanding and one that allows of moral values being taken into account.

The field of science is so wide, on the one hand, and the areas of specialisation so narrow, on the other, that a holder of a science degree may actually find him/herself ill equipped at first to teach in an Upper School. But enthusiasm, a trained mind and expertise in scientific methods are good tools for exploring unfamiliar fields. Next comes the task of teaching what one has gathered, using descriptions, experiments, discussions, diagrams etc. and matching all this to the stage of development reached by any particular class, the fundamental approach being holistic and human-centred. It is a challenging task, but one that finds reward and fulfilment if one can direct young people to the study of science in a new way that encourages initiative and responsibility and looks for the subtle qualitative aspects of phenomena as well as for the quantitative.

No praise is high enough for the integrity and painstaking work of the thousands of

scientists who have laboured over the centuries, bringing benefits to millions of people, as instanced by the so-called 'Green Revolution of India', the eradication of smallpox and release from bondage of the back-breaking manual labour of former times. But the scientists have also given mankind nuclear power and genetic engineering, which potentially contain the means of massive destruction. It is our task then to find such a way of teaching science in our schools that man as a being of body, soul and *spirit*, emanating from the divine spiritual world is never lost sight of. A one year course can only point the way for such a development of our teaching — but the pointing of the way is very important and can be a true enlightenment. In the classroom we start with the phenomena, and not with the theory. We aim at fostering powers of observation and thinking, and allow time for the growth of practical imagination.

During the year 1986/87 there was a growing together of tutors and students — we learnt much from each other — how to handle both our 'material' and ourselves in relation to the classes being taught. The course included observation in science lessons and some teaching experience; opportunities for students to prepare topics for presentation to fellow students; the study of various aspects of Anthroposophy including those specifically scientific lectures given by Rudolf Steiner — the Heat, Light and Astronomy Courses. There were also 'main-lesson' periods of three weeks each given on Botany, Chemistry, Physics, Mathematics, Zoology, Geography, Astronomy and Scientific Methodology. Two afternoons a week were devoted to practical work in the laboratories in physics, chemistry and biology. The Course was run concurrently with the school year at Wynstones thus providing an opportunity for students to observe how a Waldorf School from Kindergarten to Class XII functions, with its manifold activities including festivals and assemblies.

All teaching should be practised as an art, and science is no exception. This art of

teaching requires, among other things, love of the subject, respect for the pupils and the continual work of the teacher on his/her own inner life. Rudolf Steiner pointed out that when we have gone through the process of developing spiritual forces within, 'immediate links are formed between the child's soul and ours, which are very important for the child's moral guidance and for the development of his will'. He also called upon teachers to have a comprehensive view of the universe as a background to all that is undertaken in school work. In the art of teaching the process is creative both for teacher and pupil.

The future of mankind is bound up with the use and misuse of science, so that it is of tremendous importance to foster the kind of science which will allow future generations to progress along a meaningful path. As M.C. Richard says in her book 'Towards Wholeness': 'The renewal of society will come when we can *imagine* it differently, and when we are ready, like artists, to take on the actual work of creating *new forms*.'

With a background of science teaching in Waldorf Schools, Frances Woolls is now well known principally in North America and England for her contribution to Teacher Training.

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Previous Editors

Until the winter issue of 1986/87, *Margaret Shillan* was involved in the visual aspect of *Child and Man*. She appeared on the scene before the journal changed to its present coloured format — in January 1977. She first designed a new front cover and then became responsible for layout. As Art Editor, her sense of colour and design, combined with her feeling for originality, contributed greatly to the attractiveness of the journal. She also brought with her considerable experience in publishing which helped to maintain the professional standard which had been achieved. It is a great pleasure to be able to acknowledge all this as we wish her farewell, now that she is concentrating her work on adult education at Emerson College, work in which she has always found much fulfilment.

Eileen Hutchins (28 June, 1902 - 9 October, 1987) was co-editor of this journal for very many years until increasing blindness in 1979 prevented her continuation on the Board. She was an outstanding personality. Former pupils of hers remember her forthrightness and enthusiasm when she taught at Leeds High School in the 20s; she retained both of these qualities throughout her life. Her early Anthroposophical experience was in the Sunfield Children's Home, from which she became founder teacher of Elmfield Steiner School, Stourbridge. Her teaching experience ranged through both Lower and Upper Schools; she also lectured widely in teacher training and elsewhere. On such occasions her life experience poured out, as if from a cornucopia, to illustrate the educational points she made — forcefully yet without dogma.

She was a storyteller of bardic dimensions, while always keeping an astute mind which was alert to the needs of the hour.

Subsequent editors of *Child and Man* always received a wholehearted welcome in latter years when arthritis incapacitated her still further. Bold, pertinent comments characterised her conversation. Although modern literature, the Cathars, the Troubadours, Parzival and Chartres were prominent among her specialities, it was as if every topic lit up and became more visible under her searching eye.

In the closing words of her book review of 'Education Towards Freedom' she remarked: "The Waldorf School Movement is here shown to be active in countries in many parts of the world. It is surely time that in England it should be taken more seriously". With depth of insight, fine tact, kindly humour and indomitable courage this was her striving not only for her native country but also for Waldorf Education as a progressive cultural force in the world today.

Brien Masters

Introducing Physics

by HANS GEBERT

Physics was first introduced to Waldorf children in Class 6. Usually all branches are started except mechanics. In each case the point of departure is some familiar phenomenon, familiar from everyday life or from previous work at school. Each branch is developed until some regularity or conceptual pattern appears which is part of accepted scientific knowledge. If it has practical application, so much the better. In the process, pupils should experience the joy and aesthetic satisfaction which accompany deepened insight and understanding.

I shall describe a possible introduction to light and colour. The example shows clearly all aspects of early physics teaching mentioned above. Naturally, many other introductions to this branch of physics are possible.

Waldorf School pupils learn painting from the time they start attending the school. They are, therefore, familiar with the way in which mixing paints produces new colours: yellow and blue produce green; red and yellow produce orange; red, blue and yellow make some kind of brown. The children have experienced also that some colours are good neighbours and others are not. Red comes naturally between violet and orange, while it has no neighbourly relationship to green. If children have not already painted a colour circle, in which good neighbours are next to each other, they can now do so. Starting with red and going around the circle we get orange, yellow, green, turquoise, blue, purple and we end up with violet on the other side of red. In each section there is a graduation. The green section, for instance, starts very yellowish and ends nearly turquoise.

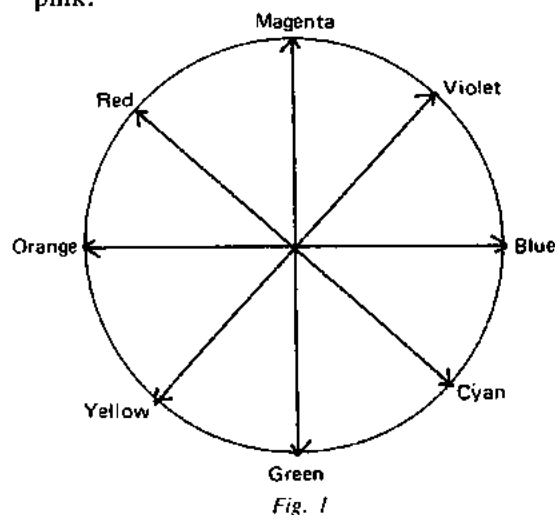
So far the colour circle simply shows *neighbourly* relations. The space occupied by each colour section is arbitrary. The following experiments show that the circle can be arranged so that *opposite* colours are also significantly related.

Paint a strong patch of colour near one edge of a white sheet of paper. Gaze at it until a luminous halo appears around it. Then shift your gaze to another part of the paper. A luminous patch of colour, the so-called after-image, appears. It is lighter than the paper to the same degree to which the original colour patch is darker than the paper. If the original colour patch is, let us say, red, the after-image is bluish green. Now try to paint the hue of the after-image. It is, of course, impossible to capture its luminosity and brightness because all pigments darken the paper. If you have succeeded reasonably well, the after-image of the second patch of colour will have a hue very similar to that of the original one. This experiment should be repeated with several colours. The colour pairs thus obtained are physiological complementary colours. (The term 'physiological' is necessary because slightly different colour pairs derived from the spectrum are called 'spectral' complementaries.)

Perhaps some pupils have experienced a similar pairing of colours when observing shadows. The phenomenon is particularly pronounced in snowy landscapes just before sunset. When the setting sun tinges the snow yellow to pink the shadows appear violet to green respectively.

The phenomenon of coloured shadows can be produced artificially if two similar light

sources are available, one coloured, the other white. It helps to fit dimmer switches so that the brightness can be changed. With the coloured light source cast the shadow of a simple object onto a screen. If the light source is red, the screen appears red also and the shadow is black or slightly tinged green. Arrange the other light source so that it does not throw a shadow on the screen but just illuminates it with ordinary, white light. Gradually increasing the brightness will lighten the red colour of the screen as the shadow, illuminated with the white light, becomes unmistakably green or turquoise. If possible, continue the experiment by shifting the non-coloured light source until it also casts a shadow of the simple object onto the screen. This new shadow is illuminated by the red light only and therefore appears red. The two shadows are coloured in physiologically complementary hues while the background is pink.



It is now possible to arrange the colour circle so that good neighbours are next to each other and complementary colours opposite to each other. The arrangement is shown in *fig. 1* in which arrows indicate pairs of complementaries. Cyan is the technical name for a light, icy blue, while magenta is a bluish pink; the latter is the colour which Goethe sometimes called peach blossom.

The colour circle or a similar scheme is used in very many applications of colour

technology in television, photography and interior design. It is an aspect of all colour-specification methods. In the continuation of the lessons it is exciting to show how it applies to colour mixing. In this way the work can be lead back artistically to its starting point.

We continue by showing how colours mix when they are produced on a screen by coloured lights rather than by paints. Produce two partially overlapping light patches on a screen which can be coloured independently of each other. This is most easily done with two projectors, each fitted with one opaque slide with a central hole. The light patches produced on the screen by the projectors can be coloured by a filter.

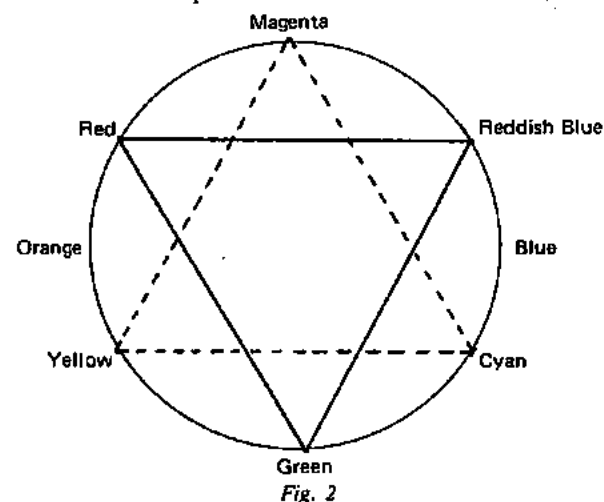
Make one projector light yellow and the other blue and show each patch of colour alone. When both are then shown partially overlapping there is no trace of the green which most people would expect. The area of overlap is a light grey. However, when the patches are green and red the overlap is yellow. Most pupils will gasp with surprise when they first see this.

Different colour pairs can now be tried out, to show that saturated green, red and blue hues are best for producing new colours in this way. If three projectors are available, green, red and blue patches can be produced, arranged so that there are areas on the screen illuminated by one colour only; other areas on which pairs of colours overlap; and a third area illuminated by all three colours together. A surprisingly large gamut of colours is seen as the brightness of the three so called primary colours is varied. Examining a colour television screen, it is often possible to see the separate green, red and blue dots which make up the picture. This is particularly easy if the set has separate controls for the brightness of each colour. (Readjusting the set after such an experiment may be difficult!)

It is clear that colour mixing by lightening, which has just been described, follows quite different laws from those governing the mixing of pigments. Adding paints to any coloured patch always darkens the colour. The colour mixing described at the beginning of this article is, therefore, an example of

colour mixing by darkening. Mixing by lightening is scientifically called *additive mixing* because light is subtracted; this is to say, every new pigment absorbs its share of light.

Subtractive mixing can also be demonstrated with a projector. Use the projector for producing a red spot on the screen. Now use an additional green filter in front of the same projector. The green filter darkens the light patch produced by the red one. Far from being yellow the resulting colour is nearly black. However, if yellow and blue filters are used in a similar way the result is green. Further experimenting with the one projector shows that the best filters for producing new colours by darkening are magenta, cyan and yellow i.e. the complementaries of green, red and blue. Magenta, cyan and yellow are called the *subtractive primaries*. Printers use these



colours together with black for producing relatively cheap colour prints. For really good prints more colours are used. Older physics books and encyclopaedias sometimes show what prints look like when only two of the primaries are used. If a school parent is connected with a printshop she or he may be able to provide similar examples which are intermediate products in producing the final colour print. The subtractive primaries are also used in colour photography.

We can sum up the whole main lesson block by superimposing on the colour circle the triangles corresponding to the primaries for mixing by lightening and by darkening, as shown in *fig. 2*.

The question arises: which of the many reds, blues and greens are the correct primaries? Actually there is a reasonably wide choice. Colours from the spectrum are often chosen. No three colours, however carefully chosen, give all other colours. To produce all colours, arrangements too complicated to be described here, have to be used.

Let us review what has been accomplished. The starting points of the work were two well known experiences, in our case the results of mixing paints and the neighbourly relations between colours. Next we discovered conceptual, almost mathematical, relations; in our case the polar relations shown by pairs of complementaries. Next we saw how colour responds differently to polarically opposite processes, such as darkening and lightening, in polarically opposite ways: we showed that the primaries for the two processes are complementary to each other. Finally we arrived at a geometrical pattern illustrating the laws used in all colour mixing. *The fact that the conceptual scheme, beautiful as it is, fits reality only approximately shows an important feature of all physical law.* In branches like mechanics and electro-magnetism the fit is very good, when it comes to colour and sound, reality is too complicated to fit exactly into the simple mathematical laws.

Similar familiar starting points can be found for other branches of physics. Acoustics, for instance, can be started by studying the well known family of stringed instruments or of recorders of various sizes. It can then be shown how pitch, loudness ('dynamics') and quality of notes (timbre) relate to properties of the instruments and the way in which they are played.

Similarly the study of heat could start with the well known air movements (draughts and winds) produced by temperature differences and could continue by showing their effects on motion, size, density and pressure of different substances.

A little thought and imagination yield a number of different points of departure for each branch of physics.

Hans Gebert, since retiring from his Assistant Professorship at Mercy College, has lectured on Waldorf Education in the United States and U.K.

Teaching Biology in a Human Context

by GRAHAM KENNISH

'Your body is a space capsule, your head the command module' so begins the introduction to a 3-D moving pop-up picture book on the human body now available in the U.K. 'When you reach puberty your hormones switch you on' announces a heading in the London Science Museum permanent exhibition called 'A Study of Ourselves'. An advertisement for beer displayed on vast billboards in the U.K. recently, showed a series of ape-like figures progressively reaching a vertical posture, the penultimate figure with a bowler hat (symbol of the English business gentleman) and the final form carrying a can of the appropriate beer. A question mark pointed to the potential evolutionary leap which awaited discerning drinkers.

These three examples are particularly gross reflections of deeply held beliefs in the West, beliefs firmly underpinned by faith in scientific objectivity. One of these is that the human body is nothing more than a highly complex machine which human beings will eventually be able to take apart and reconstruct. A second, that our bodies and our minds are subject to the outcome of a complex chemistry. The third, that human beings have evolved from a primitive animal/condition and that any further evolution is in the random and arbitrary hands of environmental influences.

In teaching any science to adolescents one is aware of the forceful nature of these beliefs which are carried subliminally or openly throughout our culture.

One of the hallmarks of a good scientific theory is that it should be capable of being

disproved. This would seem to guarantee the absence of dogma in science as any theory worth its salt will eventually be superseded, by definition. Human nature, however, is stronger than scientific principle, so from black holes in space to human evolution, theories rapidly harden into tablets of stone brought down from a mountain of research. If we experience surprise, displeasure or vague discomfort in reading such statements as those below, then we can be sure that we are taking current theories for granted or carry memories of school science unchallenged within us:

- * atoms do not exist,
- * human beings did not evolve from ape-like ancestors,
- * life did not arise from a primeval organic 'soup', nor the universe in a gigantic explosion,
- * the sun is not a ball of atomic fire,
- * the heart is not a kind of pump,
- * the brain is not a kind of computer.

Any twinges? How free are we to consider alternative views or even challenge current ones in our thinking. Cemented and consolidated by years of experimental measurement, poured out in textbooks, magazines, films, games and models, opposition can invite ridicule, disbelief or the accusation of a lack of objectivity or ignorance of highly specialist research techniques. Yet the history of science is filled with the birth of ideas that ran directly counter to customary modes of thinking and the very birth of scientific enquiry was the birth of an independent and free spirit of enquiry, unconstrained by tradition and

religious or social pressures and prejudices. Galileo and Darwin illustrate the struggles. But it can take the kind of extremism in evolutionary fundamentalism or creationist ideas to dent contemporary evolutionary science.

What is objectivity? Is it confined to what can be measured in mass, distance and time or can it include the faculty of observation; thinking and an open mind? There may be few technological or military applications in an open-minded contemplation of the universe but this must surely always remain the bedrock of free-thinking enquiry and scientific progress. We stifle or undermine it at our peril.

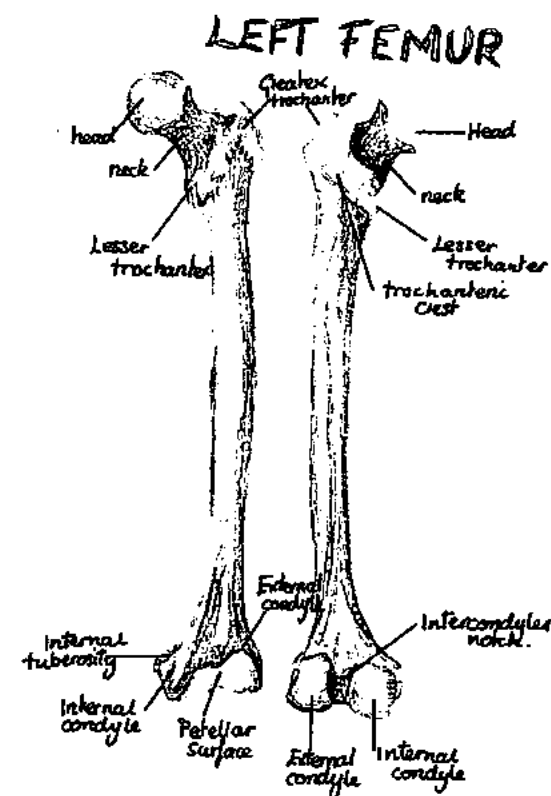
These considerations are crucial to the teaching of science to adolescents in a Steiner (Waldorf) School and the main lesson periods in Human Science for Classes (Grades) 9 and 10 (14-16 year olds) illustrate this. The periods are widely known as Human Science to allow the widest possible context to the biology arising from this. How can the wealth of knowledge currently available about the human body for example, be presented without a fragmentary succession of organs and systems, implying that all these and more constitute the whole? What meaning does the liver have, torn from its context of blood and digestion? What meaning does the digestive system have, torn from the context of daily life? What meaning do any of these organs have in relation to my inner experience as a human being? A teacher could be tempted to overcome these problems and make the subject relevant to life merely by linking the study of items of popular interest; alcoholism, liver disease, digestion and a healthy diet. Such connections stimulate interest but they alone fail to meet the adolescent's deeply held conviction that there is meaning and mystery in the world. Unless there is a context for biology which carries 'food' for these, an adolescent's thinking will be confined by the practical or the popular, so deeper less conscious questions will remain unaddressed.

One aspect of biology that has, until recently, received little consideration is that of form — why living things have the shape they do. In human science a considerable part of the work should be an experience of form by drawing and modelling, so that observation

and thinking retain all the mobility which other lessons like those in music, art and movement have developed.

To illustrate how observation and thinking can create a meaningful context within which fine details and invisible processes can be studied, take the form of the human skeleton.

The form of the human head is spherical. At the extremities of the body are opposite forms, linear, angular, jointed. Between head

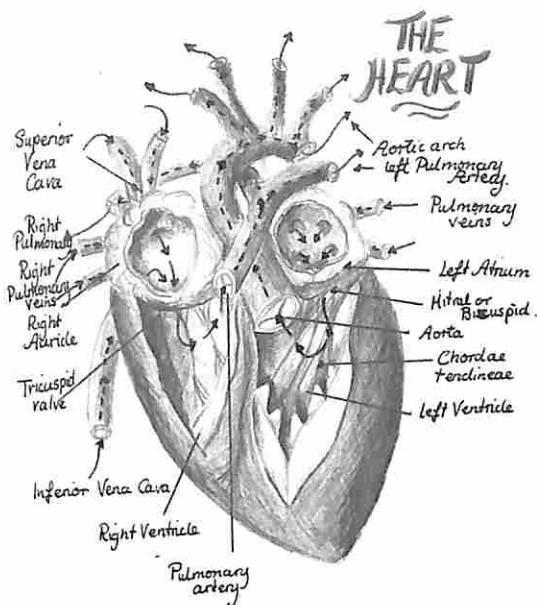


These drawing are taken from the classwork of a 16-year-old.

and legs, the ribs (which are both linear and curved) create a materially incomplete enclosed surface (the rib-cage), protecting the soft tissues of heart and lung as the skull does brain and the bone, marrow. The head is still, the skull plates fused, with only the jaw bone moving, like a limb. The upper ribs move in breathing but are fused together by the sternum. The lower ribs are freer hanging, limb-like, opening up the chest cavity into the abdomen. Following these forms and their movement, the opposite qualities of skull and

limb with the balancing features of the ribs are clear to see. Care in observation and a thinking faculty which can rove over the contrasts as well as remember details and named parts build a meaningful whole, not quantifiable yet not arbitrary or fanciful. Such a picture can be followed into the forms of individual bones (the 'head' of the femur, for example) before it fades into the detail of bony tissue and the process of ossification. This type of approach can be extended to other parts of the body as well as the systems of organs commonly considered in a quite different context in any standard textbook or encyclopaedia. The fundamental difference is that relationships between organs and systems of organs can be considered and grasped without recourse to theories about neural/electrical transmission, nerve/muscle reflexes or sensory/motor nerves. Such considerations should *follow* as elaborations of thought, not be considered the foundation for understanding the whole organism.

The nervous system is centred in the head with nerves leading to and from all parts of the body. The brain rests, partly floating free of gravitational pressure in the cerebrospinal fluid. There is no movement, impulses are silent, invisible — we feel most awake here, alert, our senses concentrated here. Below a sheet of muscle which divides the trunk, the digestive system begins metabolic processes whose outcome supplies the energy needs of muscles which meet the demands of gravity in the limbs. Movement, warmth and activity prevail here and as a complement to the senses which receive impressions from the environment, limbs reach out and impress themselves upon it. Between the two extremes of shape and activity of head and limbs (nervous system and metabolic system) are the rhythmic movements of heart and lung. Rhythm is movement and stillness in harmony. Breathing leads substance outwards into the world and receives from it. The circulation of blood gives and receives inwardly. Our experience of feeling is centred here, brought to consciousness by the head or expressed in movement through the limbs. Our inner experiences as human beings have their reflections in the form and activity of the bodily organs.



This brief and sketchy attempt to show the context within which the details of the human body may be taught to adolescents, seeks to illustrate how a sense of wholeness and meaning can be the foundation of such a study.

These pictures are neither fanciful nor arbitrary and are available to any keen observer with the controlled imagination which lies at the heart of objective knowledge about the world. They lead the adolescent to respect and have confidence in his own unaided faculties, so that further study of details and reading about experiments which explore the most minute aspects of physiology can be related to a meaningful whole. Another message received is that knowledge about the human body does not rest solely on the biochemical or genetic analyses of experts, but is a mystery open to any keen observer with clear and mobile thinking. Adolescents also have a context within which to appreciate and admire the results of medical technology alongside the deeper issues raised that challenge human attitudes to birth and death. The adolescent's burgeoning inner life is also confirmed as a reality which the body supports and responds: I have a brain, but I am not my brain. I have feelings but I am not my feelings, I have a body but I am not my body.

I am, therefore I think? [sic]

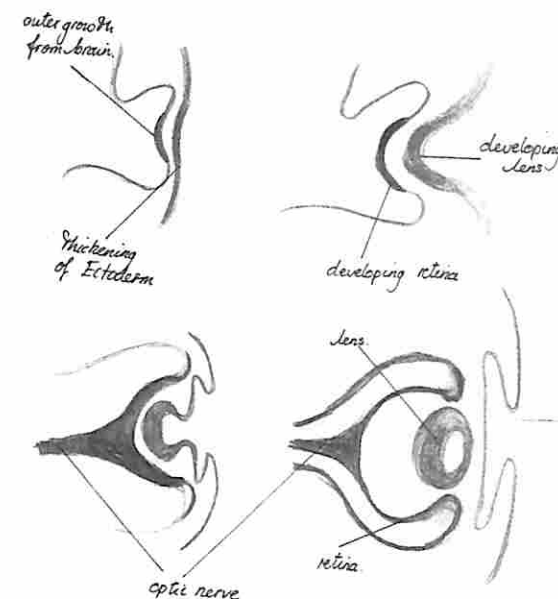
Another outcome which follows a consideration of form in the human body is a consideration of the balance and harmony in its architecture — observation of the animal world can show very clearly that by a one-sided emphasis of the peripheral parts of the human skeleton, for example, specialised animal limbs arise — an extreme development of the digits of the hand gives rise to a bat's wing, bone for bone. One-sided development of the forefinger alone creates the horse's hoof, while any distortions of the balanced forms of human teeth quickly create herbivore (cow), carnivore (cat), or rodent (rat). Distortions of the human form always give rise to animal-like caricatures as the political cartoonist knows well. Such considerations leave open the question of how the human form evolved. Studies of the animal world return again and again to the human being without whom, after all, observations and questions would not exist.

In contrast to this emphasis on form comes what is usually considered the 'real' content of biology: details of gaseous exchange in the lungs, respiration in the tissues, haemoglobin in the blood, excretion in the kidneys, enzyme activity in the alimentary tract. These substances and processes are not directly visible and most of what is known about them is the outcome of detailed experimental investigations. They demand clear thinking and a vital exercise for the growing teenage intellect quite apart from the factual knowledge of their content. In differing degrees, with examples to stretch the ablest pupils, a *whole class* should experience the real satisfaction in understanding such biological processes and how each is co-ordinated with another, to create a harmonious balance against a changing environment. The context outlined previously makes it harder to fall into the satisfaction of the clever intellect which would anticipate that if only enough details were known and added together, like a gigantic biochemical construction kit, the whole organism would be explained.

As with all Waldorf teaching, the choice of what to study is so vast, that the question immediately facing a teacher is where to start.

And so — also a Waldorf principle — the choice is best determined through consideration of the developmental age of the class. In Class 9, thinking powers are usually not so fully developed as they will be in Class 10 and adolescents live very sharply in their senses, so a beginning can be made successfully with a study of the skin and the very visible and obvious sense organs, for example the eye. Its intricacy and sensitivity awakens and challenges any tendency to superficial comparisons with a camera. Analogies usually have very limited value and, when held to as teaching aids, seriously distort accurate observation, memory and thinking, leading quickly to the false sense that the eye has been explained. Details challenge such easy paths to understanding as these considerations may illustrate.

The light-sensitive cells in the retina actually point *away* from the light. The act of seeing involves the whole organism, not just the eye, and the image which reaches the retina bears little resemblance to our perceptions of the world around us. We cannot see light but only the outcome of its penetration of matter. At night, outer space is filled with light from the sun but appears black until reflected by the



Development of the eye.

moon. So what is it that we 'see'? Is it a coincidence that we say 'I see' when we understand something? Dim stars cannot be seen looked at directly but appear when the focus of our gaze is turned slightly to one side. Is this not often true when we search our memories and thoughts? Suddenly a thought 'dawns' on us and we see it 'in a flash'. The genius of language leads us to the widest considerations.

So, the opportunity arises to consider such fundamental questions as the nature of light, or the biographies of individuals who have been deprived of sight or hearing. The widest possible considerations should be able to arise within a human science period.

In Class 10, the main lesson includes Embryology and, as far as time allows, such themes as child development, racial or cultural differences, temperaments and personality. At this age a pupil's thinking ability and maturity is usually much more capable of doing justice to such topics, particularly to the development of the organs and the human questions that arise over abortion and embryo technology. The major organs of the body having already been considered, their development from layers of folding and enfolding tissue within a matrix of sustaining membranes is a rich and rewarding study. I have felt very privileged to experience how boys and girls of this age can be together and feel free to share some of their deepest concerns and feelings on life, death and relationships arising from an objective study of this miraculous process of development.

At an age when sexual physiology and the 'facts of life' as they are so inappropriately called, are outwardly known and serious relationships have often already begun, this study of embryology can come as a healing force to adolescents in their struggles to cope with the freedoms and the responsibilities our society has placed on them.

It can be a fitting end to such a period also to include the question of old age. While we talk easily of growing up, it can be quite a revelation to adolescents that to become an adult is to embark on a lifelong experience of learning and development. The 'seven ages of

man' need not be limited to a decline from youthful vigour to dull senility but may include the pathway to self knowledge and wisdom.

There rests an opportunity here for adolescents to perceive that the excitement and the challenge, as well as the doubts and anxieties they are struggling with within, are shared on other stages by parents and grandparents, too.

Graham Kennish teaches Upper School Science at Wynstones School, Gloucestershire. He has also shared the fruit of his teaching experiences as a tutor of the London Waldorf Teacher Training Seminar.

Educating the intellect

This is the context from which the quotation on the title page is taken.

'We must strive to educate in such a way that the intellect, which awakens at puberty, can then find its nourishment in the child's own nature. If during his early school years he has stored up an inner treasury of riches through imitation, through his feeling for authority, and from the pictorial character of what he has been taught, then at puberty these inner riches can be transmuted into intellectual content. He will now be faced with the task of thinking what up to now he has willed and felt, and we must take the very greatest care that this intellectual thinking does not appear too early. For a human being can only come to an experience of freedom if his intellectuality awakens within him of itself. But it must not awaken in poverty of soul.'

Rudolf Steiner 17.4.24

Organic Chemistry and the Ninth Grader

by DAVID MITCHELL

The 15-year-old Ninth Graders stand before us. When we observe them, what is it that we notice? Quite fast we may see that they are filled with emotional energy. They don't seem to think, but rather they 'do' things and then watch the results. They are passionate, irascible, and apt to be carried away by their own impulses; and, yet they have high aspirations. At this point in their life they have met few humiliations and can be brazen and all-knowing. They can carry everything too far whether it be their love or hatred or anything else. They are compassionate and suppose all people to be virtuous, or at least better than they really are.

Riding the waves of advancing adolescence they can at any given moment be lonely, moody, argumentative, depressed, ecstatic, and challenging to all authority. Adolescence is a time of tremendous physical and chemical change. The body is in revolution and the soul is in conflict. Rudolf Steiner refers to the onset of adolescence as 'a gentle sprinkling of pain that never goes away!'

What is it that is going on inside of our Ninth Graders? Physically their heart is doubling in weight. Their blood pressure is increasing. Their lymphoid system is shrinking which may open up infections to the throat area. Boy's voices are changing (they drop a full octave while the girls drop only one tone). The limbs, starting with the feet and legs are beginning to elongate (this can cause pain and restlessness). The lungs are increasing in size

and the breathing is changing — costal in the girls and a deeper diaphragm breathing for the boys. Two dozen different hormones are being released leading to the emergence of individual sexuality — fat becomes distributed over the body, lips thicken, thighs firm up, and the hips take on adult curves. There is a rapid acceleration and deceleration of the skeletal growth and there is a need for lots and lots of sleep — usually saved up for Saturday and Sunday mornings!

The alpha waves of the adult become added to the low frequency waves of the young child as the brain experiences change. The child feels alone, restless, sometimes angry and begins to formulate questions for their teachers such as 'What really matters? What is the *point* of it all? Who *am* I?' It is a difficult passageway in life and calls for a lot of compassion from adults.

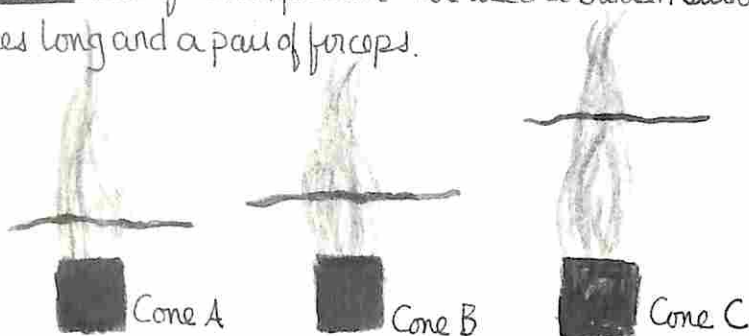
The end of the 14th year is that point in time when the intellect is being born and the individual begins to find enjoyment in logic. Teachers and other adults become the whetstones upon which the teenagers can sharpen this new found ability to reason. They must be met in their school experience with subjects and teachers who challenge them.

The curriculum of the Waldorf School attempts to meet and exercise these forces. For the Ninth Grader 'what' has become the significant question, and proper directed activities such as a phenomenological approach to science is one of the answers.

Copper Wire

Experiment #2

Apparatus used for the experiment - We used a Bunsen burner, a copper wire ~4 inches long and a pair of forceps.



Procedure - Using the forceps we placed the copper wire at three different places in the flame; Cone A, Cone B and Cone C, and left it at each spot for ~2 minutes.

A sample from the file of a Grade Niner. Further observations, conclusions and questions follow.

Rudolf Steiner organized the Waldorf curriculum so that the chemistry in the Ninth should be carried forward from what was done by the class teacher in the Eighth Grade. This recapitulation involves experience and prepares for an intellectual grasping of the subject which is not abstract. It becomes then a living knowledge.

This age group benefits from a comparison of contrasts: black with white, inhaling and exhaling, heat with cold, anabolic with catabolic and acidic with basic. A key to working with this age is to have them summarize as much as possible. This helps to centre and pull the pupil in.

Organic Chemistry is one of the Ninth Grade main lesson blocks. Chemistry is the study of the inner nature of substances. The organic is the world of the living. Everything we refer to as organic has carbon in it and has had to be living substance at one time. As said before, the Ninth Graders are confronted by the task of maturing not only with regard to sex but also to earth-life. Organic Chemistry is placed at this point in their blossoming self-knowledge for very specific reasons. The teacher must invigorate their awakening in

their surroundings in order to help them retain their health. This will help to regulate their impulsive jumping into activity.

Their thinking is however a 'willed thinking'. They learn by doing. Science is filled with activities which when structured properly lead the students into discrimination in their thinking.

The material covered should include the symbolic relationship of man and the plant world, a deep understanding of photosynthesis, the assimilation of carbon dioxide, the carbohydrates and their two pole direction toward solidification on the one hand (cellulose) and toward rarefaction (alcohol) on the other.

The contents of this block should be discussed in relation to the physiological process going on in the student's bodies. They should experience the respiration of the plant in photosynthesis and contemplate nature's manufacturing factory for making carbohydrates. The technological process of making paper as well as artificial silk (rayon) can be demonstrated. Finally vegetable and animal fats can be examined as well as mineral oils, rubber and petroleum. Joseph Priestly's



achievements and studies of phlogiston are studied as well as the nature of Oxygen and Carbon Dioxide. Van Helmond's observation of the plant and Ingenhousz's discovery of the oxygen-carbon dioxide respiration cycle in plants can be read to the class.

In the teaching of chemistry there are four general rules which Frits Julius suggests we follow:

- (1) Everything we present must be in correspondence with what is happening within the child.
- (2) We must develop an all-embracing world outlook.
- (3) The students must understand and remember the material we present.
- (4) We must allow breathing space. Present a phenomenon, give it a chance to breathe and then bring it back. This is the fundamental rule within our block schedule. We present a block of chemistry, or physics or astronomy etc., we let it rest and then we bring it back later.

Waldorf chemistry teachers have wonderful resources in the work and indications of Rudolf Steiner, Stockmeyer, Eugen Kolisko, Frits Julius, Gerhard Ott and Manfred von

Mackensen.* Their writings can be referred to for specific experiments and direction in Waldorf science teaching.

In my class I like to keep the students actively involved in the experimental process. Besides demonstrations I involved them in 19 different experiments over a three week main lesson block. These experiments involve chromatography, the making of synthetic rubber, the fermentation and distillation of alcohol, the making of rayon, the creation of esters, saponification, the chemical identification of sugars (both monosaccharides and disaccharides), starches, cellulose, and photosynthesis to name a few. The starches corn, wheat and rice as representatives of the West, Europe and the East were discussed. We did solubility tests, density tests, flame tests, fractional distillations etc. We did microscopic tests distinguishing between vegetable, animal, mineral and synthetic fibres. Every student concocted a synthetic rubber ball of their own after our study of rubber. The students were asked to write reports in their main lesson books on these experiments to include:

- * a list of apparatus,
- * a sketch of the setup,
- * the procedure,
- * their observations, and
- * whatever questions (at least two) that this particular experiment arose in them in the evening as they reviewed their main lesson work.

The next day in class we review the experiment and try to evolve any conclusions which are then written down in their block books. The conclusions, concepts and questions are drawn from the experiments. The airy side of the carbohydrates (alcohol and esters) can now, after a night of contemplation, be contrasted with the earthy side (cellulose and starch).

One assignment I like to do with my students is to have them research a biography of a modern scientist for both an oral and a written report. In the oral report I ask them to include where the scientist lived, what his or her upbringing was like, what their physical appearance was like, how they became interested in science, give an explanation of their most significant discovery and what it meant to the development of science, describe what difficulties they encountered in life and how they overcame them. I also ask them to include one humorous anecdote from the life of the individual they research. Scientists included have been Nobel, Boyle, Newton, Cavendish, Priestly, Dalton, Pasteur, Curie, Einstein, and others. I first contemplate each child and then assign a specific biography that I imagine will enkindle their interest. Then I hand them a photocopy of a brief biography and a picture from Isaac Asimov's book *Asimov on Chemistry* to get them started. They are required to write notes from each others reports.

It is beneficial for the teacher to plan one or two field trips during the block so that they can have a first hand experience of an industrial process created by human thinking and borrowed from man's observations of the activities of the plant world. I like to visit a local distillery and schedule a brewmaster to give a talk on fermentation some days after we have studied it in class.

The Ninth Grader needs to experience the

world as their own, and should feel that the world is an important and fine place to be. The task of the teacher is to bring the students of this age down into their physical bodies . . . to plant them firmly on the earth. We must invigorate their awakening in their surrounding in order to help them find their own personal health and balance which they will need in their adult life.

As described above the building up and the breaking down of the natural world is experienced through Ninth Grade organic chemistry. By describing the physiological process one can come to questions like alcoholism from an objective point of view at a time when the students are still open to such observations. They can see how sugar develops warmth in us while alcohol overheats us. Instead of stimulating our forces the alcohol creates a bluff and develops exaggeration and illusion. When they meet these realities through their own observations and experiments within the chemistry lab then they have learned objective lessons for life.

The 15-year-olds entering the Ninth Grade should be taught in such a way that they are led to the feeling that everything in the world is important. They must learn to trust human thinking and they should experience that thinking is capable of dealing with inner as well as outer problems. In their science courses, in particular, they should realise that it is human consciousness which awakens technology and that a proper, moral technology can provide us with a better world to live in.

After years of Waldorf class-teaching, David Mitchell taught Life-Science, Chemistry and Geometry in the High Mowing High School. He is currently at the Pine Hill Waldorf School and adjunct Professor of Education at Antioch College which offers an M.A. in Waldorf Education.

*FOOTNOTE

Eugen Kolisko, *Elementary Chemistry*.
Frits Julius, *The World of Matter*.
Gerhard Oit, *Grundriss einer Chemie*, Vols. I & II.
Manfred von Mackensen, *Vom Kohlenstoff zum Äther und Salze — Säuren — Langen Laborunterricht in Chemie*.

A Thing of Beauty is a Joy Forever — the Plant

by JANET & DAVID SHARMAN

From time immemorial the plant world, so intimate a part of our planet Earth, has succoured man not only by nourishment, shelter and warmth but by the raising of his spirits, by speaking to his heart of the wonder and beauty of creation. The glory of the colours, the restfulness of the green leaves, the rhythm of the coming and going of the plant world through the year, all spoke their secrets to man of old as if in a dream. In more recent centuries man's growing wakefulness and searching and the development of modern natural science has led to a dichotomy whereby he has become ensnared with the materialistic side of nature and the need for analysis with a growing dependence on theoretical ideas and concepts.

Nature, and theories about nature are often two quite different worlds — a widening gap exists.

It was most disturbing to read in a recent account of teenage vandalism that 64% of the young people questioned saw no wrong in the destruction or mutilation of plant life. Yet, no doubt many of these teenagers will have had some 'science' lessons at school. Obviously the gradual atrophy of the feelings and emotions of young people has been effected by the nature of their education and in particular their relationship to the natural world around them. It was one of Rudolf Steiner's most urgent wishes that young people should not grow up or leave school without a full appreciation and love for the plant world, not only its aesthetic influence, but also the wonder of its nature in that

through the plant world man has a direct link to the cosmos and the influence of the cosmos can reach to man.

It is the challenger of the Botany main lesson in the 11th Class of a Waldorf School to try and close the aforesaid gap — to bring to young people a knowledge of the plant world essential for a modern scientific education but at the same time learn to understand living nature, to look at rhythms and forces inherent in the plant world. The stature of a plant is the resultant physical manifestation of many things and we must look and listen to what the plants tell us — for it is by virtue of its form that the plant speaks most eloquently to us, whether the form is there before our eyes, luxurious and colourful, or hidden in the exquisite detail of a tiny seed. This unfolding, ever changing, pliable form — contracting and expanding, bathed by the forces that form it, showing the rhythms of the cosmos in its manifest substance — this is the plant nature which we must come to understand today. By seeing the universe reflected in the plant kingdom, the greatness of nature can be experienced. Or in Rudolf Steiner's words: 'the comprehension of nature's rhythms will become true natural science'.

The higher plant and the elements (fig. 1 p.20)

The four elements as the Greeks described them — earth, water, air and warmth — can be considered as qualities of life within which a plant grows and develops — the interplay of these qualities will affect the moulding of

Fig. 1



Fig. 2

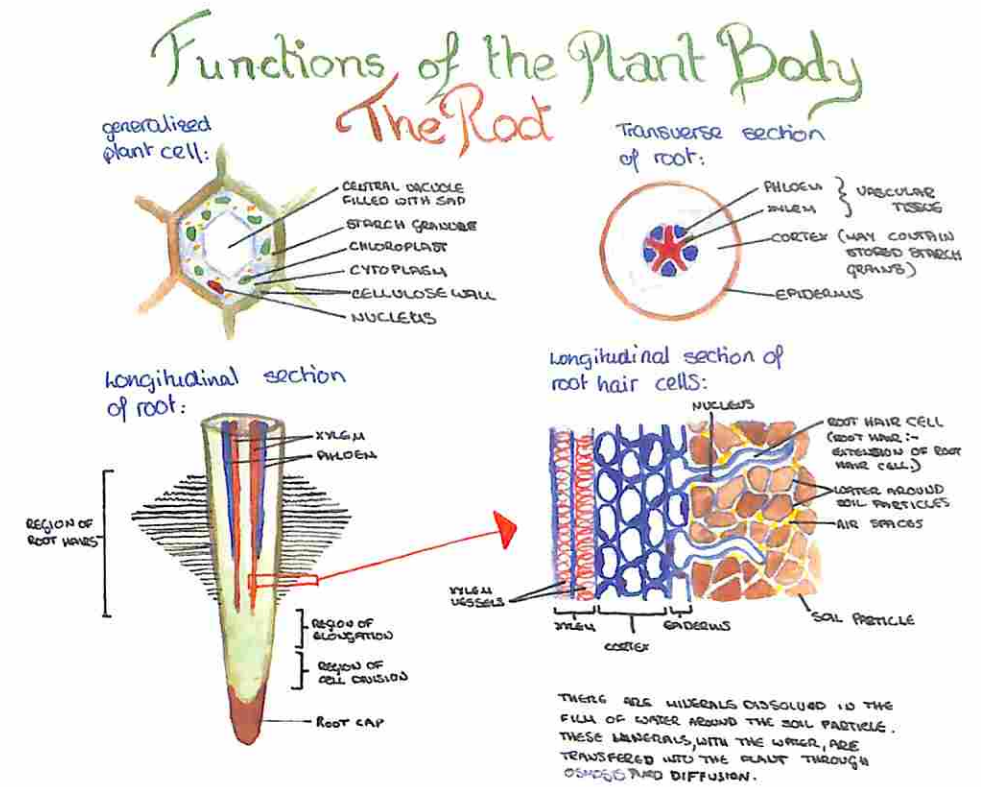


Fig. 3

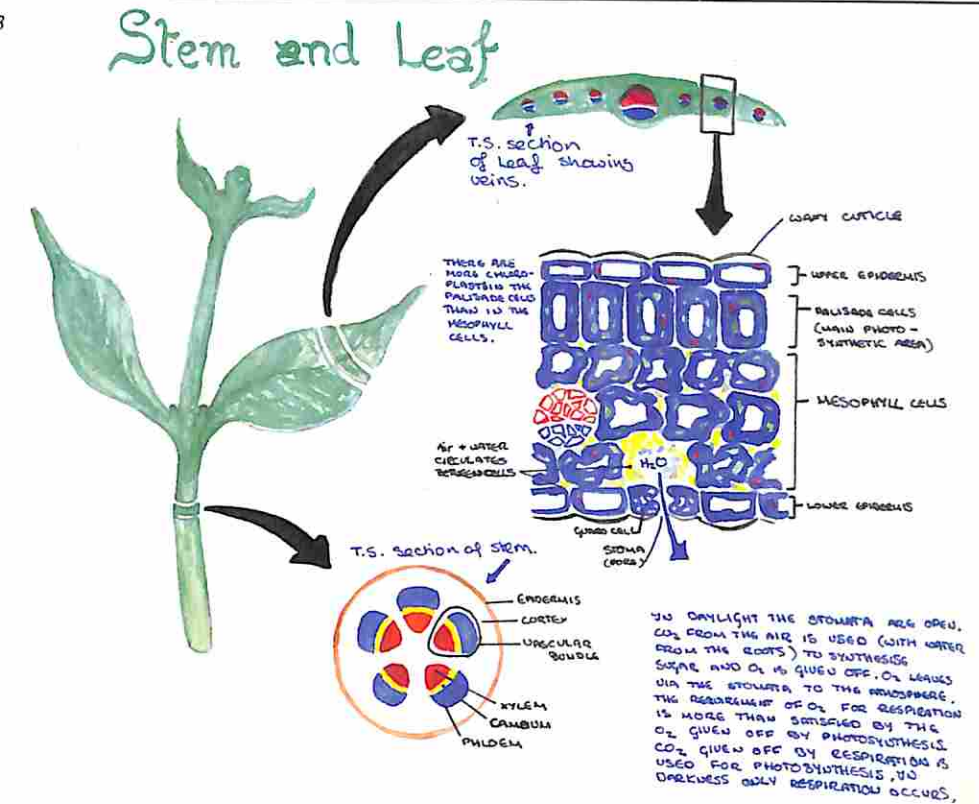
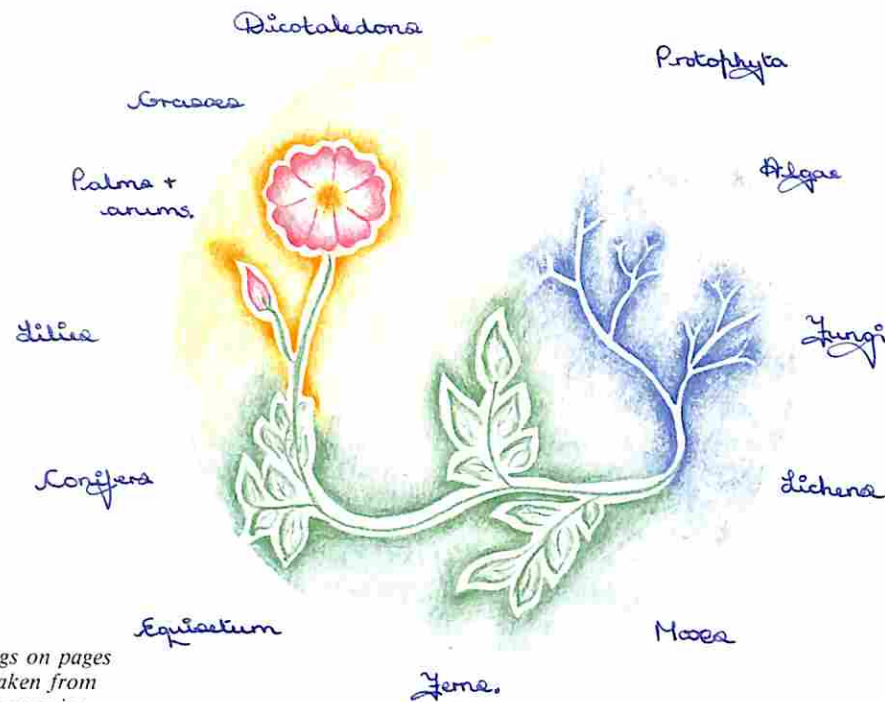


Fig. 5



The drawings on pages 20/26 are taken from main lesson exercise books of Class XI pupils aged 17 years.

physical substances and call forth the infinite variety of plant form. Predominance of water or air can effect leaf form, resulting in metamorphic change. The higher plant grows rhythmically between the darkness of the earth where it is rooted, wherein the seed rests in winter and the light warm radiance of the sun's rays wherein the shoot expands; leaf after leaf in mathematical exactness spreading into the atmosphere where moisture and air circulate to form new grains of substance in the organic functions of the leaf. At the height of warmth and expansion the blossom appears with colour, scent and flavour to bestow its gifts to man. Such an imagination can be spoken about with the young people and drawn, while at the same time allowing them to observe the intimate detail of a particular plant body — Shepherd's Purse (*Capsella bursa-pastoris*) plant and buttercup flower for example. Here again expansion and contraction in leaf and bud can be pointed out at each node, all expansion arising from the sun's influence while contraction is ruled by lunar forces. The final overcoming of the heavier watery and earthly forces by warmth produces the flowering shoot — with very rarely a reversal to the vegetable phase. Many discussions can take place here with regard to influence of seasons on crops etc. as the interests of the young people are stimulated.

At this time pea or bean seeds can be looked at and planted in glass jars to observe the details of germination and the unfolding of the plant in time. This daily observation of the growing delicate plant for several weeks can bring considerable delight and wonder to a teenager, calling up feelings of tenderness and care.

Microcosm and macrocosm

During this school year Astronomy too will have been studied and a knowledge of the stars and planets gained — perhaps even the wonder of seeing a planet such as Saturn with its rings and moons through a telescope has been possible — and a feeling aroused for the great movements of the heavens. Now, in contrast, one can turn to the cell, the universal unit of life and with the aid of the microscope once more discover the orderly working of a creative nature in such a minute and detailed process as cell division and the elaboration of the different types of cells that arise when one

describes the diurnal rhythms and working of the stomata in the leaves — where so many questions of ecology and climate can be involved too. What is the secret that raises a column of water to the top of a 300 foot tree? — many theories cannot entirely satisfy one's curiosity.

Together with this understanding, essential scientific processes such as diffusion, osmosis, active absorption of minerals, root pressure, and transpiration must be undertaken, and this is willingly done by the young people who thoroughly enjoy setting up apparatus and making their observations (*figs. 2 and 3 p.21*).

The enchanted rainbow

Goethe, the 18th century German poet and scientist, pointed to the polar opposites of light (yellow) and darkness (blue) working in harmonious activity together, out of which arises the colour green. This same polarity is there in the living plant where the roots are trapped in the earth's darkness while blossoms reach for light and warmth. In the green leaves a harmonious activity exists where the miraculous creation of virgin substance takes place.

Air-permeated water with the sun's rays striking through them makes the rainbow. The same elements of light, air and water bring about carbon assimilation in plants. May we then think of the plant as an enchanted rainbow through which the creative process works to produce material substance in the world of nature?

With such an imagination before them — of the plants as a bridge between heaven and earth — the pupils can go on to look more precisely at the unique and wonderful process of photosynthesis (*fig. 4 p.24*).

Photosynthesis is that process whereby the light of the sun becomes the source of energy used by the plants to build first glucose and, from that, all further organic substance; and in this process providing the vital oxygen for our aerial environment. Once again scientific experiments can be easily set up by students to see the difference between photosynthesis and respiration. Some work on organic substances will have been done in the 9th Class organic chemistry, and this knowledge can be drawn on in talking about plants and the substances they produce even using modern chemical terms.

A project to encourage independent work and research on a particular plant of the student's choice can be set. Here botanical detail together with substances produced and used by man and their effects can stimulate discussion — and is also good education for the teacher! Tobacco, cannabis, opium poppy and coffee were amongst those projects read to one class, giving rise to lively discussions.

At this point one has painted a picture of the dominant flora of our planet — the higher flowering plants and the intimate way their life relates to man, the earth and the cosmos.

In his "The Metamorphosis of Plants", Goethe describes the processes of plant growth in a metric form which can sometimes be used in recitation with the class. (A translation by Edgar A. Bowring was published by George Bell & Sons in 1874.)

The earth's mantle of green — the plant kingdom (*fig. 5 p.20*)

Our environment is characterised by a richly diverse plant kingdom on which man is dependent for his very existence. Members of the plant kingdom are found throughout all regions of the land and sea. Even in the most inhospitable places some form of plant life has been able to survive, e.g., tundra and mountain heights. The subtle activities of the non-green plants (fungi and bacteria) are of considerable importance in the biological world.

The order in which we look at the plant kingdom reveals a world of increasing complexity. Here two imaginations at once strike us — the tremendous unity of the plant world in its greenness and devotion to life — its sacrificial life — and at the same time the incredible *diversity* of forms that are met with as a result of the formative forces playing into the moulding of their substance according to the environment in which they grow. Diversities of structure and function are best explained as manifestations of gradual change or evolution (*fig. 6 see front cover*).

This grouping of the plant kingdom in the plant circle is a natural or phytogenetic one in which real relationships are considered, and the life history of the individual recapitulates the life history of the race — in scientific language 'ontogeny recapitulates phylogeny'. This is shown in the imagination, by drawing

the higher plant on the inside of the circle.

I Protophyta (*fig. 7*)

Protophyta — (flagellates, desmids and diatoms) — this consists of a floating mass of microscopic single celled plants — the phytoplankton — or 'pastures of the oceans'; their domain has never been invaded by plants of multicellular construction. It is estimated that they contribute half the photosynthetic productivity of the earth and ultimately support all the animal life in the oceans. Some are found in fresh water too. Ancestors of these forms may have trapped the sunlight in the seas of long ago so that today we can exploit the great deposits of mineral oils.

How these early plants arose is still shrouded in mystery but one thing is certain, their forms are most beautiful and of an infinite variety — infinite joy to the Victorian microscopist! In conjunction with the zoology in the 12th Class a plankton net can be made and if a suitable boat can be found a 'plankton excursion' made (*fig. 8 p.26*).

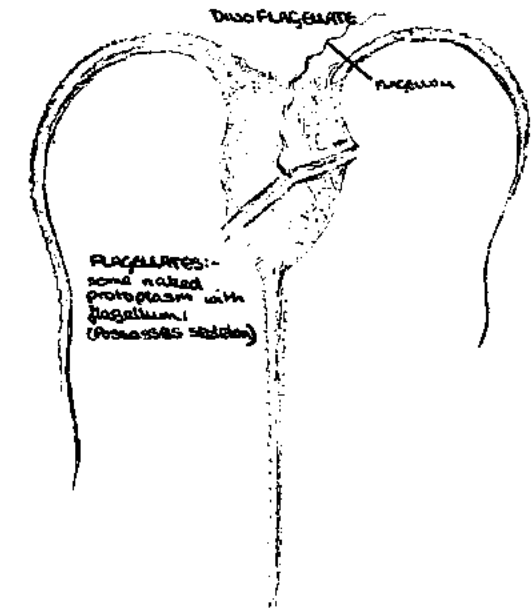


Fig. 7



DIATOMS:
Silica wall - skeleton
with beautiful markings
Fossil diatoms quarried as
diatomaceous earth.

Fig. 8

II Algae (fig. 9 p.24)

The march of evolution has gone a stage further and given us plant bodies mostly of multicellular construction and known as a thallus, again of infinite variety — filaments, plates, colonies and large thalli — all still wholly dependent on a watery environment; these are the marine seaweeds and their cousins the freshwater 'pond scums' and weeds. A beautiful organism for our young people to observe here is Volvox — a microscopic rolling green ball of many cells — a plant colony or unified plant soma? A plant that moves? — an enigma of beauty. The zonation of the seaweeds by colour and distribution on the sea shore can make an excellent ecological excursion if you are near the sea — be sure to go at low tide! Again there are many seaweeds which have a 'story' which can be interjected as time permits.

III Fungi and bacteria

The fungi show certain characteristics which distinguish them from all other plants. They lack chlorophyll and therefore seek out a different form of nutrition although they still retain some common features with green plants — a cellulose cell wall and certain reproductive cells. They have, too, a strange affinity to the animal world in some of their processes of nutrition and the fact that they can produce animal organic substances such as glycogen. This is a large group — moulds, mildews, toadstools, mushrooms and many plant diseases — they are the great scavengers of nature by virtue of their mode of life. Some are deadly poisonous, while others are sought

for their culinary properties; yet others are beneficial in other ways.

The structure of these plants is very simple, and Mucor (pin mould) can be grown to show this. The larger fruiting bodies collected from the Autumn woods can make a good artistic exercise. Again there are individual species with interesting stories to touch on, e.g., yeast, penicillin etc. In the Edinburgh Waldorf School a supplementary microbiology main lesson is given when the study of some of these organisms and the history of their discoveries are gone into in more detail.

IV Lichens

Lichens form a large group of small plants found from pole to equator, from mountain top to sea level. All are dual organisms (alga and fungus) displaying the phenomenon of symbiosis — a living together for mutual benefit. Lichens are natural indicators of industrial pollution of the air and have long been a source of natural dyes, litmus being originally obtained from lichens.

These first four groups all display the quality of root nature — their plant body shows very little differentiation and life processes and absorption is carried out over the total surface.

V Mosses and liverworts (fig. 10 p.25)

These are the most primitive of the green land plants, they are all small in size, have no true roots and the shoot may be a simple stem and leaves, or remain thalloid. Evolutionarily, they form an isolated group not closely related to higher plants as can be seen in their life cycles where the gametophyte is the main plant. They rarely occur as individual plants but form extensive groups or colonies which help to maintain the humidity they need. They are true terrestrial plants colonising bare earth and rocks and, though dependent on water for part of their life cycle, are equally dependent on dry air for their spore dispersal.

Observing mosses and liverworts in the laboratory can give us an experience of the harsh drying nature of the aerial environment on a delicate organism not fully protected against it — a low-power binocular microscope shows us some of the delicate features.

Vascular plants

These are the true land plants, capable of surviving the harsh terrestrial environment by virtue of their internal conducting tissues and their external waxy cuticle. By these means an internal environment is maintained and large forms can develop such as the trees. True roots are now very important in securing for the plant its supply of water and mineral salts. Stem and leaves develop in a galaxy of forms — annual, biennial and perennial, but now always commencing from a diploid zygote — the result of the union of gametes, and thus the dominant plant is the sporophyte.

The further march of evolution brings about the development of the true seed a further elaboration in the drying and warm conditions of earth evolution.

Vascular plants are divided into:

- (a) Seedless plants — ferns and equisetums
- (b) Seedbearing plants
 - (i) Gymnosperms — naked seeds, e.g. conifers
 - (ii) Angiosperms — enclosed seeds
 - (a) Monocotyledons
 - (b) Dicotyledons.

VI Ferns

These are moisture and shade loving plants usually growing in damp ravines and woodland. The dominant organ is the leaf, and their economic value lies in the aesthetic appeal of their foliage. They perennate by an underground rhizome and the leafy crown uncoils in characteristic fashion each spring — Canadian 'fiddle heads'. The life cycle still has a watery phase for fertilization which is a limitation to its success.

VII Equisetum

Today there is but a single genus in this group, though in coal measure times there were plants of tree size dominating the swamps and forests.

Equisetum sometimes called 'horsetail' or 'scouring rush' has a very characteristic mode of growth to give it a jointed appearance and is highly impregnated with silica which gives it its rough texture. It is a plant of ancient lineage having been described by Pliny, Albertus Magnus (12th Century), Culpeper in

his British Herbal, and has been ascribed medicinal properties since earliest times. Rudolf Steiner recognised the qualities of Equisetum and suggested its preparation as a wonderful remedy for plant diseases. If a plant is diseased it means that the normal balance of plant and universe is disturbed, often water is too abundant and then insects and pests will attack. A preparation from equisetum with its silica and warmth element can be sprayed on to redress this state of affairs and re-establish the right balance (see 'Agriculture of Tomorrow' — L. Kolisko).

The life cycle of this plant is similar to the fern, and specimens pose a difficult task in observation and drawing.

VIII Conifers

Here the true seed habit is established and at no time in the life cycle is the plant dependent on an external watery phase — now the earthly environment can be conquered, although the seeds as yet are only borne in cones.

Today coniferous trees are among the dominant forest trees of the world. Majesty and grandeur are their right. Soaring like spears into the blue skies, these mighty giants of the American West Coast — California and British Columbia some 200-300 feet high and 1,000 years old — humble the spirit that views them. Once again there are many trees with many stories. One which made a wonderful link for us, when we taught in Vancouver, was the Douglas Fir — indigenous to the rain soaked coasts of British Columbia. It was discovered and collected by the Scottish plant collector, David Douglas, who was plant-hunting in North America for the Royal Horticulture Society in 1823-24. Seeds brought home to his master at Scone Palace in Scotland grew the first Douglas Fir (named after him) in the U.K. and it is said all subsequent plants are descended from this tree — still to be seen in the Scone Arboretum. Douglas Fir has a bright future as it is unsurpassed by any other conifer in quality of wood. The tallest tree in Lynn Valley, North Vancouver in 1902 was 415 feet and 14 feet in diameter. Man's greed however has caused severe problems in the devastating

clearances of whole areas by indiscriminate logging — the gap is gaping wide! Environmental pressures are now being brought to bear and re-forestation is taking place — but it needs thousands of years to heal such wounds.

The above four middle groups represent the evolution of the dominance of the leaf form.

The flowering plants — the angiosperms

The flowers are the glory and triumph of the plant kingdom. A flower is a shoot modified and refined by a long evolution in an atmosphere so dry that the warmth of the sun becomes the dominant factor. The flower is a modified shoot, its parts are modified leaves, the whole is much condensed, so parts are borne on the receptacle in a tight spiral or in cyclic whorls. Varied as may be the vegetative green leaves of the plant world, a world of metamorphosed wonder is revealed in the floral leaves, and nature surpasses herself in the colours and forms that now arise. Sepals, petals, stamens and carpels are all subservient to the life of renewal and arise in mathematical precision and number according to the family characteristic.

The last four groups of our plant circle show us the development of the flowering plants in an ever increasing response to the conditions of the evolution of the earth (*fig. 11 p.25*).

IX The lilies

These are large, fragrant and watery, and are built on the plan of three in their flowers. They have narrow, simple leaves and never harden into woody forms. They are predominantly herbaceous, a bulb being a typical life form.

X Palms and arums

This group is characterised by its inflorescence being enclosed by a spathe — the only British indigenous species being *Arum macculatum* (Lords and Ladies or Cuckoo Pint) though many plants of economic importance belong here, e.g., banana, date, coconut, etc.

XI Grasses

Though still belonging to the Monocotyledons, the grasses have warmed to the influence of the sun and air. Wind pollination reduces the floral parts to the essential whorls and no colourful corolla appears. The rooting system is vigorous and strong and forms in many cases a dense moist turf, from which shoot up the narrow sharp silica-impregnated leaves. In ancient times it was from these plants that man developed his staple grain plants, and as time permits the seven grains as related to the planets, their qualities in nutrition etc. can be discussed — these often make good examples too for the botanical project.

XII The Dicotyledons

Having contrasted the general characteristics with the Monocotyledons, the family Rosaceae is taken as an example of highest perfection and beauty, together with a comprehensive pattern of growth in its members — trees, shrubs and herbaceous plants. The flower built on the five-part principle in many members ripen into fruits of many kinds; and it is a family which allows wide discussion.

The Rose itself is a plant of perfect balance and is a fitting plant with which to complete our studies, and bring us full circle to the flowering plant again.

Thus, the plant circle is concluded with the angiosperms which exceed all other vascular plants in range of diversity of plant body, habitat and usefulness to mankind. Among the gifts they bestow are foods, textiles, drugs, oils, perfumes, timber and cork.

Janet and David Sharman have been involved with Upper School Science teaching for many years, centred in Edinburgh, Scotland. During a recent sabbatical, they made a valuable contribution to the science programme of the Vancouver Waldorf School.

Himgiri

Himgiri School,
DALHOUSIE (HP)
176304, India

Dear Editor,

I find it necessary to give a comment to a few statements made in the article 'India, prospects for Waldorf Education' by Carol Fraser in the July 1987 issue of your magazine. The impression I am left with after having read the article is quite negative in many respects. First of all, if I had never been been to India I would have learnt from the article that the two kinds of schools here, the government school and the private school are institutions where children are scratching letters in the dust and with pale, serious faces. Further that Indians are puzzled that Westerners can love orphans as their own children.

I agree that the educational system in India has lots of faults, *but*, I do know of both private schools and government schools where creative work is being done, and are far away from Carol Fraser's description. Also, every week the news media are full of discussions as to whether the child really benefits from the traditional, intellectual learning and loads of homework on top of it. (Before a change can come about it has to be questioned by those it concerns.) I also know from my seven years stay in India that even Indians can care for and love orphans as their own children. (I feel it rather embarrassing that one should have to make that clear.)

I would like to know how Carol Fraser can know that no kind of real change has happened after Anthroposophy was received by a few people in India. She is well aware of the existence of Himgiri School which we call a Rudolf Steiner School in the making.

Does she base her statement on a 2-3 week visit to the school more than three years ago, or perhaps on other Westerners' visits also lasting for 2-3 weeks? If she has herself seen the other schools that she mentions which are also trying to work out of the Waldorf impulse, I do not know. It seems to me, quite risky to make statements out of other people's opinions and experiences experienced long ago. Even in India life is changing — and that fast too.

I shall not speak about the collegiate work in the other schools in India that are also trying to become Waldorf Schools — I do not know anything about it — but I know that Himgiri School has taken a long step forwards in this respect since the school started in 1982. And I can assure everyone who is interested in knowing it, that it is a most painful work — it implies a confrontation with an ancient and still strong-going hierarchical social system. Carol Fraser says that a new attitude to teachers is necessary and that they at present are often regarded as little more than servants by the school principal. I'd like to ask — who is going to show a new attitude towards the principals? Where will they get the help from? Or perhaps there are some 'readymade' Indian principals somewhere who do not need *time* to come into what collegiate work in Western Waldorf terms means?

Carol Fraser says further that 'It would seem to me the easiest thing in the world to start a Waldorf School in India'. If that is so, I think she should come and do it instead of telling us, *who are already trying*, what we should or should not do. It does not taste well.

Karin Kochhar

Scene 1. The Court of the Sultan.



Scene 5. Balban, surrounded by the Holy Spirits!



Scene 5. Balban, surrounded by the Holy Spirits!

Together with the foregoing letter to the Editor from Karin Kochhar of the Himgiri School, Dalhousie, India, Rannir Kochhar, one of the teachers in the school, has sent the following description of a play which his Class 7 performed as part of their History main lesson. *Ed.*

Attired in a green robe with silver band around and wearing white necklaces around his neck sat Ghias-ud-din Balban on the throne surrounded by the members of the Turkish nobility. The illusion about Vishal as Balban was complete as he thundered:

'That must teach Meos a lesson not to create disturbance in the Islamic Kingdom . . . Prime Minister, put the spies to work so that they dare not come together and be a threat to our kingdom again . . .'

This was from scene IV of our history play. The slave boy Balban from the first scene had become the Sultan sheerly by dint of his intelligence and perseverance.

While teaching History to class VI-VIII at Himgiri, I had not thought we should work together to write the script of a play out of the contents and involve ourselves in the making of crowns, caps of different kinds for the nobles, soldiers etc, royal fans and other things needed for the stage show. But this is exactly what happened!

On September 11, 1987, the day of 6th Parents' celebrations Aarti was introducing the play to the gathered parents and the other guests of the school: ' . . . History is not mere facts and figures. There are sometimes quite interesting characters . . . while doing our history lessons we came across such a character though not very well known. Balban rose from a slave boy to the most ruthless Sultan in the Slave Dynasty. We found him so interesting that we thought about

writing and staging a play about him. We shall try to portray this character before you and how we have felt and thought about him in our learning.'

The change of scene from the plunders of Mahmud of Ghazni and Mohammad Ghori to the early Muslim settlements on the Indian soil witnessed a change in the tone of my narration too. The excited and passionate rhetoric was gradually shifting to a low pitch. The Slave Rulers appeared on the scene as a big contrast to the Indian monarchs whose powers and authority were waning. The tender hearts and immature minds that were upset and aroused due to the barbaric raids of the plunderers were also at a low key. For them it was as difficult to accept the settlers as it was for the Indians in the 13th century. With this interference of a foreign culture India found itself in a state of flux and it was experiencing something new to grow out of its age-old ways of living and thinking.

The class was very anxious and awake and I always found them inquisitive. Almost each lesson ended on a critical point and like a serial kept them guessing and waiting for the next instalment. Surprisingly many dis-interested in studies otherwise were found waiting eagerly with some information to share or seeking answers to their questions. "Surely, something is happening to my class," told Vijay, the class teacher and observer, in the Saturday staff meeting!

Qutub-ud-din Aibak, Iltutmish and Razia Sultan were fascinating characters and they struggled no less to root the Islamic Kingdom on the Indian soil firmly, but it was Balban whose clear-sightedness and singleness of purpose who bewitched us all. His intrigues and strategies kept us guessing. His perseverance gripped the young minds as his character was unfolded day after day. I tried to feed their emotions as much as I could, as my aim was that they should understand his traits and identify them. The

children of twelve to fourteen must be encouraged to read biographies so as to learn from the diverse experiences of different personalities. The impressions so caused at this stage give strength to their moral inbuilt.

Though the stories had kept the children captivated, they were at sea when it came to the writing of the play. The memory and intellect had difficulties in transforming the facts into visual picturisation. Much spade work was done before reaching an agreement that the long life-span of Balban be compressed into five scenes to portray his character. Five groups undertook the task of writing five different scenes which were to depict different aspects of his life.

The first scene revolved around the teenager, ugly and unimpressive, who was brought to the court of Iltutmish by the slave merchant Jalad-ud-din to be presented to the Sultan. Jalal-ud-din could not sell the slave boy as he felt that he was cut out for something special. The slave boy impressed the sultan with his intelligence and wit while being looked down upon by the wives and courtiers of Iltutmish. On being ridiculed for his bad looks, he very humbly says: "All that glitters is not gold, your Majesty. I shall do my best to serve your highness, I come from the Albari tribe. My father was the chieftain of 10,000 families. My brothers sold me to the Mongols out of jealousy.'

The sultan, impressed by the boy, appoints him to water the Royal garden.

The second scene witnessed Balban elevated to be member of Forty and married to one of Iltutmish's daughters as a reward for saving the Sultan's life from a murderous attack in the Royal garden. In the third scene Balban emerged as the most powerful of the Forty and he managed to put Nassir-ud-din as a puppet Sultan on the throne and become a de facto ruler himself.

The fourth scene found him at the height of worldly fame and achievement. He came to be known as the most ruthless Sultan as he had ordered the merciless killings of the Meos and the Hindus of Kuthar. It seemed like the dream of the Islamic Kingdom had come true. But he was also shown to be kind and benevolent towards the poor. A zamindar was ordered to be flogged to death by a poor woman whose husband he had done to death.

The historical character of Balban was complete in these four scenes. However, I as teacher felt that Balban needed more revelation, he had a spiritual character beside his earthly being. The fifth scene took us to the world of the unknown. Bal-Ban, an old man, restless and insomniac spoke to himself so as to clear his conscience of misdeeds he committed as a ruthless Sultan. He entertains the 'Holy Spirits' that surround him: "But you can't torture Balban the man. It was Balban the Sultan, who under the directions of Allah had ordered you to be killed. Allah wished that the Muslim Kingdom must expand and flourish. I had no personal enmity with you!"

The old, helpless Sultan was also heard saying, after he got the news of his beloved son Muhammad's death:

'There is justice on this planet. I know Allah

punishes you for your misdeeds on this earth where you commit the crimes. The Day of Judgement is but the fantasy of a poet.' And he further told his Prime Minister: 'My end is near. I see the slave boy, who entered this palace many years ago and rose to be the most ruthless Sultan. Prime Minister, remember to treat my corpse as of an ordinary human being so that I may go back to Allah having realised my folly.' He was seen collapsing in a praying posture.

The preparation began with tremendous energy and enthusiasm after the format was ready. The students were curious to find out how the Muslims dressed themselves, what their religious customs were like, what the court etiquette was etc. Art books were borrowed and purchased to satisfy this inquisitiveness. The suggestions started flowing through as the rehearsals began. A dialogue was added here and deleted there. The verisimilitude required more characters. Students from other classes were invited to take up roles. Our cast included students from lower kindergarten to Class X. It was interesting to observe how some exhibited directorial abilities as they worked on the minutest of the details. The others had an eye for designing as they chose different sets of costumes that the different characters were to wear. There was no dearth of talent and each contributed the best they could.

Our main lesson in the morning found us busy with making one thing or the other. There were crowns, caps for the nobility and the soldiers, fans, rolling letters and soldier's sharp pointed staffs to be made. Some scenes were rehearsed and a part of illustrated artistic work for a file on the subject was made. Each one was working with zeal and interest as it was their work, their show; I had never seen them so occupied and absorbed as now. Each day added improvement to the previous days' work. Slowly each detail was attended to. My high pitched punctuations interspersed the rehearsals whenever I found someone saying the dialogue without involving his/her feelings. Sometimes a scene was rehearsed many times till the improvement was visible and the actor had got the point home. It was pleasant to hear Bradley's parents saying that it was for the first time that he had done his role so naturally and confidently. Bradley had joined Himgiri mid-term, in July, from a school in Bombay.

It took us about six weeks to complete this project, working one and a half hours daily from 8.45 am to 10.15 am. And I can say for sure that there is no-one in the class who does not know the history of the Slave Dynasty and most probably each one will remember it for good as it has touched their feeling and willing together with their thinking.

The children at Himgiri are freer, more creative and imaginative while learning through this process. It gives me lots of strength and encouragement when I see them moving around confidently without having a worried look on their faces and I visualise them to grow into balanced and peaceful human beings!

Computers and General Education

Computer Literacy and Computer Business

by HORST ADLER

You may have noticed that home computers are nowadays sold with precisely the same aggressive tactics as were customary in the selling of encyclopedias, the 'education' of our children providing the lever.

'If you care about the future of your children, you had better acquaint them now . . .'

Here is an example how the media try to push the idea down our throats — an American television commercial trying to sell household computers:

In the first Mum, Dad and Son are at the quaint old railroad depot. Mum and Dad wave Son goodbye as the train pulls out. Son is off to college to realise the American dream: a future with an expense account and so many tax lawyers that the IRS will never lay a paw on his annual income.

In the next shot the train is pulling into the same depot it just left. Mum and Dad are standing there looking lugubrious, and no wonder. There is Son about to disembark with his luggage. He looks wretched. He has been kicked out of college.

The invisible narrator says the lad lacked the computer savvy needed to pass. Mum and Dad didn't buy him a computer when he was a little boy.

Do you want this to happen to your child? If not, better buy him a computer at once. The narrator recommends the computer made by the sponsor.

Computer-assisted learning

If the phenomenon of overselling the computer as an indispensable teaching aid were restricted to television commercials, it would not be too bad, for television commercials are not renowned for their impartial presentation.

But it is much worse, since the phenomenon has also intruded into the scientific world. I recently came across a new scientific journal called *Machine-Mediated Learning*. To begin with note that, if you have followed the development of this area, and if you are linguistically sensitive, then this title should make you rather suspicious. We started with *Computerised Instruction*; via *Computer-Aided Instruction* it became *Computer-Assisted Learning*. And now it is *Machine-Mediated* . . .

I can think of only one explanation for such frequent renaming: a new name was needed each time the previous one had lost its lustre. A convincing

demonstration that the whole idea of machine-mediated learning is a dreadful mistake would certainly be pertinent to this journal's area of interest, but it is very unlikely that such a result would reach the pages of the journal, since its Editorial mentions only one criterion in the evaluation of articles considered for publication, viz. 'the extent to which they facilitate the development and utilisation of effective machine-mediated learning systems'. The conclusion is clear: rather than classifying this journal as scientific literature, we should classify it as propaganda.

Computer aids

There is a widespread, but generally unchallenged, belief that making something 'computer-aided' amounts to making it better. Computer-aided design, computer-aided management, computer-aided composition, you name it. (The misery of computer-assisted examinations, better known as 'multiple choice' should have cured us.)

Take, for example, the word processor. It is sold as a time-saving device. Recently experiments have been made with people that were both experienced writers in longhand and experienced users of word processors. The outcome was, firstly, that the linguistic quality of the letters produced with the aid of a word processor was not noticeably higher than that of the hand-written ones, and, secondly, that they required 50% more time to be written. The use of the word processor turned out to be so time-consuming because it is so easy to make a change in your text: it is an open invitation to write first, and to correct and improve (often to think) later, thus eroding the intellectual discipline. I think word processors should carry a notice saying:

'Warning! The Educator General has determined that computerised word processing is detrimental to the development of your writing proficiency'.

Computer literacy

To the best of my knowledge it was not industry that invented the term 'computer literacy', but society. Quite early in the game it was firmly implanted in the people's mind that computers were there to save our economies (and later also the economies of the

countries of the Third World). For a while, no one knew how, but unfortunately someone hit upon the bright idea that information was a 'resource', so that solved that problem, the more so since, for the first time in history of mankind, we had now a valuable resource of infinite supply. Then people remembered how oil had created immense riches for a happy few. This time that should not happen again, so 'computer literacy' for the millions was invented to solve that problem. What this term should mean is still an open question (in fact the U.S. Department of education provided funds to develop a 'working definition'). But that did not prevent our visionaries from happily proceeding to invent the post-industrial society, a kind of renaissance world of high technology, in which people, if not happily teleconferencing, would devote their ample leisure time to creative video-games.

There is nothing novel in people expecting that Heaven on Earth will be established in the near future (though to me this vision is more like Hell on Earth). Novel, however, is that computers will do the job. I am not exaggerating: expectations are so unrealistic that what should be reasoned discourse sounds more often than not like people participating in a strange ritual, faithfully reciting prayers in a language they don't understand.

Computer studies

What could be the role of general education in all this? We should keep in mind that it is not the computer hardware but the software, i.e. the programs controlling the computer's operations, that constitute the heart of the matter. The computer hardware is no more and no less than an extremely handy device for realising any conceivable abstract mechanism without changing a single wire. Studying computers as electronic technology contributes little to the understanding of their potential. However, programming, i.e. the design of such abstract mechanisms, is much too difficult to teach to the public at large.

But the business world is urging schools to 'familiarise' pupils with computers and there is often the feeling 'well, with a little personal computer and a simple programming language you should be able to show the kids something, shouldn't you?'. Regrettably — showing the kids 'something' is precisely what is happening in many upper school courses in computer studies.

I said 'regrettably' because then the pupils get such a misleading experience that it will never clear up the confusion. They are likely to acquire patterns of thought that are deeply inadequate when they wish to become professional computing scientists.

Pupils who have learned a (conceptually often entirely inadequate) programming language rather than the (art and) science of programming, tend to confuse — if I may use the analogy — the composition of a symphony with the writing of its score.

Furthermore, programming some toy problems (writing a simple tune) on a little personal computer will not help to develop any feeling for the conceptual challenge implied by any nontrivial software development task (composing a symphony) and as a result people's expectations remain unchecked by an understanding of the limitations both of the equipment as well as of their abilities to master it. They are, so to speak, led to confuse the skills required of a barber

with those of a highly qualified team of specialised surgeons.

These conceptual problems are compounded by quantitative characteristics of modern computing equipment: storage capacity and processing speed are so huge that what takes place inside a computer at work completely baffles the human powers of imagination. And, when I say 'completely' I mean 'completely'. A simple factor of 10 makes all the difference: I remember asking a housewife who did not believe this how many children she had, knowing that she had six of them. Then she saw the point.

Confront this with the fact that for several decades, computers gained a factor of 2 in processing speed and memory size each year: that is a factor of 1,000 per decade and of 1,000,000 within 20 years. When what was a gradual difference becomes big enough it becomes an essential difference because the analogies break down.

It should become clear from the preceding that a computer course at school level can hardly be expected to give the interested pupil — the future businessman, engineer, natural scientist etc. — a balanced opinion about the potential and the pitfalls of professional computer usage.

And for pupils wishing to become professional computing scientists the situation is far worse: They are likely to acquire patterns of thought that are deeply inadequate and have to be undone at university. For instance the widespread teaching of the programming language BASIC should be rated as a criminal offence: it can mutilate the mind beyond recovery.

Computer systems promotion

We should try to make our children more immune for all the humbug and dishonesty in which the world of computing abounds. I believe that it can be done. We should teach them the critical, sceptical reading of advertisements.

Advertisements are a significant source of information in at least one respect: they reveal the manufacturer's perception of his customer's appreciation of his products.

It must be possible to make evident that so-called Artificial Intelligence or Expert Systems are more the product of a public relations effort than of a scientific one. This will hopefully make people immune to advertisements such as the recent one, that under the slogan 'You can't reach the top by being a pencil pusher', is suggesting that, in order to become vice-president, it suffices to buy one of the company's 'Thought Processors'.

Pupils should learn to identify the misleading messages coming from the professional public relations men, viz. the advertisers. This might also give them some immunity against more subtle misrepresentation such as the one given by the enthusiastic computer user (fascination with the equipment being the hallmark of the amateur). The trouble with the latter is that he need not be dishonest: he may be a propaganda victim himself.

Personal computing in business

In the early days of business computers, one of the most sober articles on office automation appeared on the solemn pages of the *Financial Times*. It discussed the possibility of replacing a secretary by an office computer. Having estimated the huge amount of

shelves and wall space that, at the very least, would have to be filled with computer cabinets, the article ends with the conclusion that the traditional secretary is cheaper and more pleasant both to work with and to produce.

Regrettably, this enlightened warning has not been heard. By the time the mass-produced personal computer (PC for the cognoscente) arrived, the space requirements were reduced to a square foot of desk space (however, now walls and shelves were lined with impenetrable computer manuals).

And the public perception created was that of 'antitechnology technology', IBM using an icon of antitechnological innocence as trademark of its PC: the Charlie Chaplin tramp, Charlie with the rose.

Huge quantities of personal computers swamped the corporate world, sold as universal office automation tools. Vendors were preferably dealing with such a high level of the management hierarchy that incompetence in computing was assured and objections from the technically competent staff could be overruled. In retrospect this development has been a disaster, since almost all the 'opinions' pushed by the commercial propaganda were false. And, in addition, the brainwashing campaigns have been so effective that for many those opinions have become dogma that can no longer be challenged without committing heresy. As an example of the ridiculous style of advertising, I remember the recommendation that such-and-such a personal business computer could take '200,000 business decisions per second' for you.

Two years ago, still, it required the courage of an outsider, a columnist of the New York Times, to describe the Emperor's New Clothes:

'Personal computing seems to promise simplicity and deliver complexity. Hardware is not compatible with other hardware or, when it is, requires a mechanical genius to connect the pieces. Manuals are incomprehensible. Software is an almost endless source of frustration.

'Confronted with such intricacies, the computer neophyte may feel that either someone has pulled the wool over his eyes or the rest of the world is a lot smarter than it appears'.

But meanwhile the corporate world itself seems to have come to its senses. Let me quote from the editorial of a recent issue of a leading business data processing journal:

'PCs have touched a large population. Productivity lagged mightily while we learned to use them. Intellectual discipline was eroded and now stands at an all time low. It will be years before our business institutions catch up and recover organisationally from all the amateur computer users . . .

'What the field needs is not rank amateurs who can use a PC, but seasoned leaders to help us assimilate what we have and lay the foundation for the next surge. These people are in short supply and are hard to grow . . .

Remember that the corporate world lamenting here about the PC-induced erosion of intellectual discipline in their own quarters is the very same group that tried hard to export intellectual erosion by urging schools and colleges to make their pupils and students 'computer literate' and to provide crash courses in the use of personal computers. And vendors have been providing 'generous' grantmanship assistance as well as 'free' computers to schools to secure shares of the education marketplace they consider to be crucial for their future business success.

First signs of change

But the tide may be turning. There are encouraging signs that the period in which each newly coined slogan could overnight be turned into a respectable educational topic is drawing to a close, and those signs go beyond the badge I received last year with the text 'Stop BASIC before it stops you'. The fact that the Siberian Branch of the U.S.S.R. Academy of Science has launched a serious effort to prevent BASIC from being introduced in Soviet high schools is a more telling sign.

And also for the computer industry the tide seems to be turning. Not only that computing companies in Silicon Valley offering 'artificial intelligence' systems and other pipe dream gadgets are folding up at a much higher rate than they are erected but even market leaders such as IBM have been facing an increasingly stagnating market in the last few years as corporate customers are now beginning to realise that the 'next generation' products offered by the computer industry as solutions to their old problems are rather often a source of terrifying new ones.

I consider that to be good news because it could drive home the message that neither slogans like 'knowledge-based decision aids', nor a combination of *ad hoc* and brute force will do the job. It is regrettable that large groups come to their senses only after their daydreams have turned into nightmares, but, this being so, we should occasionally welcome the nightmares.

Conclusions

The computer literacy movement is aiming at introducing the masses to computers by providing some minimal level of instruction in order to allow them to be 'comfortable' with the new technology. There is no good reason for Waldorf schools to jump onto the computer literacy bandwagon so typical for the era of 'minimal competence education' (more so, since this bandwagon appears to have already gone into a skid).

What is required is a careful analysis of the relevance of the young field of computing to the time-honoured goal of general education as the basis of a thoughtful adjustment of the Waldorf curriculum.

In two subsequent articles I shall outline how the essential nature of the computer can be understood properly, and how I think the upper school curriculum should take developments in the discipline of computing science into account.

Acknowledgement

I am greatly indebted to Prof. E. W. Dijkstra, the Newton of computing science (and by some regarded as a Don Quixote of computing practice), whose imprint is present in almost every section of this article¹.

Horst Adler is a parent at Michael Hall and a computing scientist currently working in industrial research. He is also attending the Michael Hall Education Seminar.

REFERENCES

- 1 Erik Sandberg-Diment, *New York Times*, quoted in the 'Words of Wisdom Award' section of the computing journal *Abacus*, Winter Issue 1987, p73, Springer-Verlag, New York.
- 2 Rebecca Barna, Editorial, *Datamation*, January 1987.
- 3 E. W. Dijkstra, *Computers and General Education: a position paper*. Unpublished Technical Note EWD868, 1st December 1983.

Books

Vision in Action *The art of taking and shaping initiatives* by Christopher Schaffer, Tjino Voors, Hawthorn Press.

Are you involved in taking or supporting some initiative and need to examine how sound it is? Or are you already involved with one that is running into difficulties? Would a picture of the stages initiatives 'go through' be useful particularly if it is accompanied by some framework to diagnose your situation, see possible pitfalls and chart a course 'through' them? Do you need to look at the way you work together as a group or to find suitable ways of funding initiatives? If so you will find a rich source of help in this very reasonably priced book compiled by experienced practitioners in these fields.

'We live in a complex world created by nature, but also in a large, increasingly complex world created by people. How vital it is therefore, to broaden and deepen our understanding of human nature, to strive with others to translate vision into action, facing and working consciously through the problems and pitfalls which inevitably arise. This is the very stuff from which development comes.'

This book gives a pretty comprehensive survey of the field and earths it by giving practical exercises for groups to increase their own awareness of where they actually are, where they want to go and what problems confront them. This practical approach is backed up by case studies and by check lists of questions to be worked through on issues such as 'starting and nurturing social initiatives', 'why do initiatives fail?' (problem diagnosis) and others. An interesting description of the various dragons, at least 14, waiting to devour the new born initiative is given as a diagnostic tool to become clear about the challenges which they face.

Many communities seeking to work without hierarchy find difficulty in discriminating between trust and competence, good will and expertise; the chapter on mandate organisations could well help them. It is often in this area that issues are avoided because openness and real support have yet to be developed. Individuals and groups often get stuck in a groove with fixed images of themselves and others; 'to rid ourselves of fixed images of others, to develop a picture based on warm understanding, carrying in it a recognition of their striving spirit and that which they are struggling to transform — is a vital social deed.'

This and much else is what the book is about.

Russell Evans

Invisible Africa — A Search for the Grail in Africa — Selected Essays — Novalis Press, P.O. Box 90, Kenilworth 7745 R.S.A. 218pp—paper

This is a collection of essays written about Southern Africa by various South African writers from different walks of life, all of whom have been inspired by the works of Rudolf Steiner. They set out to give a picture of the spiritual impulses underlying the history and development of all the peoples in Southern Africa. The essays are varied in content and attempt to come to grips with the problems to be faced.

From a historical point of view it is known that Prince Henry the Navigator, working with the order of Christ

— the successor of the Knights Templar — wished to make contact with the legendary Prester John and the Christian communities in Ethiopia. This was part of the task of Bartholomew Diaz and Vasco da Gama, the first Portuguese explorers to round the Cape on their way to the East. Later the Portuguese Admiral D'Almeida, who had connections with various esoteric teachings, was killed at the Cape in mysterious circumstances. Simon van der Stel, one of the early Dutch governors of the Cape, probably had connections with the Rosicrucian movement. An attempt is made to explore the significance of these facts; as the subtitle of the book states, it is a search for the Holy Grail in Africa.

With regard to the black people of the sub-continent, reference is made to the African writer Credo Mutura and his books 'Indaba My Children' and 'Let Not My People Die'. Mutura claims to speak of the spiritual development of the black people from the earliest times. Geographically Africa is close to the ancient Lemuria. How has this fact affected the development of the continent?

The articles on 'Threefold Social Organisation' and 'The Role of Waldorf Education in South Africa' provide good expositions of the economic and educational ideas of Rudolf Steiner. The task will be to publicise these ideas in such a way that the various strata of the South African population will wish to adopt them as viable for themselves.

At the time of his death in Cape Town in 1961, Dr. Zeylman van Emmichoven, the leader of the Anthroposophical Society in Holland, described Table Mountain as 'the altar upon which rests the foot of the World Cross'. From this standpoint some of the essays deal with the social problems of South Africa. We must recognise 'apartheid' is not merely a South African problem. There are no easy solutions. These essays are the beginning of a serious study of all that is involved from the standpoint of spiritual science. In order to reach a wider audience it will be necessary for these ideas to be expressed in a form that is comprehensible to all; some of the writers use a terminology that will only be understood in anthroposophical circles.

The fledgling Novalis Institute of Art and Culture in Cape Town has performed a valuable service in publishing this book (which is still in its proof edition). It should be read widely in Southern Africa, Europe and America. The task ahead of transforming these ideas into reality is enormous, and deserves the support and understanding of all of us.

Hugh Fynes-Clinton

Peter in Blueberry Land by Elsa Beskow and **Children of the Forest** by Elsa Beskow children's picture books, Floris Books £5.95 each, hardbacks.

Elsa Beskow, born just over a century ago devoted her life to writing and illustrating more than 30 picture books for children. In 'Peter in Blueberry Land' her keen observation of nature transports us into the magical realm of insects as the story flits gaily along with the delicacy of a dandelion clock answering to every wisp of the mind's fantasy. In 'Children of the Forest' Elsa Beskow's vivid imagination liberates a family of red spotted toadstools to take an active part in the life of the forest. Minor adventures with frogs, squirrels, a frightening troll, a viper, ants and other creatures follow in quick succession. The black and white sketches in the latter publication display the artist's dynamic sense of line; while in both books it is softened through her sensitive use of colour in a charmingly evocative sequence of colour harmonies.

The Waldorf Song Book. Collected and edited by Brien Masters. Floris Books. £3.95. A book for Class use.

This is a well produced book. It is easy to handle and the notation is very clear. The price is extremely reasonable. The book is intended for pupils of the first eight classes in the Waldorf Schools and is arranged chronologically.

At the back of the book are some useful notes about the songs and rounds. Personally, I would have welcomed even more details, especially as to the source of the music but, no doubt, these have been kept to a minimum for economic reasons.

There is a representative choice of folk songs from all parts of Britain and a few 'art' songs. I regret that there is nothing by Benjamin Britten amongst the latter but this is the only omission I find hard to understand.

Teachers will find this a most useful book and the pupils will certainly enjoy learning these songs and rounds.

Class teachers will be glad to find that the festivals and seasons have been catered for and that suitable material for simple part singing has also been included. Whilst most of the material is well known the unfamiliar music which has been included is to be welcomed and has been carefully chosen.

This book deserves to become a standard in all Waldorf Schools and anywhere else where children sing.

Peter Heathfield

The Incarnating Child by Joan Salter. Hawthorn Press. 189pp, paperback.

Both elements on the cover of this book are arresting: the title and the child's picture, particularly as they are mutually superimposed. 'The Incarnating Child' is not an expression heard at many street corners. Yet the rainbow glow of this illustration tells us that the author's is not to be an aloof language. Indeed, Joan Salter, finds ways of bringing difficult anthroposophical concepts right into the kitchen: 'playthings must have a 'do-with' quality'. At the same time she gives parents life-saving imaginations, such as the 'Madonna's Cloak'.

Her wide-ranging approach to childhood will give parents of different backgrounds, with varying needs, increased confidence in their task of 'parenting'. Her nursing background enables her to deal with immunisation in an outstandingly balanced way. Her compassion for humanity never flinches in the face of marriage ruptures or the exhaustion caused through baby's night-time crying. She clearly and clinically puts Maria Montessori and Jean Liedless into their true perspective. Equally clearly, yet with an amazingly imaginative eye, she relates the baby's body gestures to stages of Creation. Clothing, feeding, toys, stories, children's pictures, lullabies and

many other aspects of the first seven years all have their place in this admirable work. Yet, despite its success, she is not singing the praises of the Gabriel Baby Centre (Melbourne). Her endless refrain is: 'Home, sweet home' — in a thoroughly 20th Century manner.

The Enchanted Hog A Romanian fairy tale by Petre Inspirescu. Illustrated by Christiane Lesch, Floris hardback £5.95.

Being Romanian, this tale will be comparatively unknown. It is all the more stimulating, therefore, to find well known themes in fairy tales in new guises, all of which can lead one further towards the significance of these powerful images. Touchingly fresh in this 'Beauty and the Beast' variation are the three pairs of iron shoes with which the princess crosses cliffs and chasms going 'one step forward and two back', or the exhausted day and a half she spends with her child at her breast. Although the wild hog becomes dis-enchanted through the sacrifice of his loving wife at the climax of the story, the reader is likely to remain enchanted for some time after by the illustrations of Christiane Lesch.

The Golden Age of Chartres by René Querido. Floris Books and Anthroposophic Press. 157pp.

'Great beauty and deep religious aspiration come together. By contemplating the inner and the outer, the soul is lifted to a crossing of the threshold between the physical and the spiritual, where true imagination is born of a deeper seeing, a beholding that is not simply of the senses.' This is part of the description of the glass and sculpture of Chartres cathedral in Chapter III of this book. To the wealth of artistic and iconographical bibliography hitherto available, the author adds a special contribution. He characterises the teaching of the Masters of Chartres in fascinating sequence: principally Bernardus Sylvestris, John of Salisbury and Alanus ab Insulis. Each one brings his particular colour to the glowing spectrum of The School of Chartres, which the author presents in a remarkably supra-denominational manner, against a wide-ranging background of Platonic and Aristotelian thought from Classical Greek times on the one hand and, on the other, the contemporaneous anthroposophical world-view.

Altogether, a valuable piece of research which should enable many fellow students to take their work much further, and also tourists to prepare themselves — along with one of the readily available guide-books — more adequately for one of the world's unique experiences.

Mary's Little Donkey and The Flight to Egypt by Gunhild Sehlin. Floris. 157pp laminated. £4.95.

This is an extension of *Mary's Little Donkey* which appeared in English in 1979. In the continuation, the 'events of Bethlehem' are further experienced through the eyes (and ears, of course!) of the beast of burden who carried Mary to the place of the Holy Birth. The little donkey will, by now, be familiar to — and, in many cases, a favourite of — many young readers.

Gunhild Sehlin fills out the biblical narratives, so economically told by St. Luke and St. Matthew, with not only artistic but also theological licence. One particularly engaging episode is when the camels, that have borne the magi to Bethlehem via Herod's Court, realise from their conversation with the donkey that 'they think more about a good man than a rich one'.

The original illustrations by Jan Verheijeu have been retained. Many will find the new, pleasantly slightly rounded typeface an improvement.



Stable-warmth — between the two journeys of 'Mary's Little Donkey'.

Books Received in German

Painting with Water Colours by Brunhild Muller. Verlag Freies Geistesleben.

This book is number 9 of a series of books which are meant to be used as a working aid for children, parents and teachers. The subject of the book is painting with water colour paints and is intended for children ranging from two to 12 years old.

It is the most comprehensive and elucidating booklet I have come across on this subject. The author describes in a detailed way how to prepare a painting lesson, answering those questions about which paper to use, which utensils, the size of the brushes, and how to go about preparing the paper. There are many clarifying colour photographs relating to her descriptions of how children of a particular age may paint.

She mentions various subjects one can make use of to give more content to a painting lesson, like colour stories, the four seasons, moods of nature and some poems. The book also contains a few words about formative painting, using themes like a field full of flowers or a lantern procession.

The last subheading is devoted to painting with plant watercolours, including a detailed description of how to mix the colour, and which kind of paper to use. There is an excellent bibliography added to it.

Katinka Holst

Autumn frolics with leaves and kites (from 'Das Jahreszeitbuch').



Shirley Noakes

A Round in Four Parts

In a simple, natural manner



Clouds of rain, blue a-bove; Eas-ter sun and Whit-sun dove.

A round from the Class IV section of 'The Waldorf Song Book'.

Favela Monte Azul edited by Ute Craemer. Verlag Freies Geistesleben. 253pp paper. DM19.

This informative, shocking, moving and compassion-awakening volume brings the reader up-to-date with the anthroposophically inspired social work that is being done in the Favela in Sao Paulo, founded by Ute Craemer and now in its 23rd year.

Freiheit durch Gewalt? Zum Phänomen des Terrorismus by Stefan Leber. 125pp paper. DM18. Verlag Freies Geistesleben.

Terrorism loses sight of the individual. It is possessed by ideologies and fanaticisms. Power seeking in one form or another lies at its roots, a living and deadly contradiction to social trends in recent centuries. Stefan Leber traces this disturbing phenomenon back to its historical origins and forwards to the possibility of social forms in which the individual can find himself fully membered within society.

Johannes Kepler — Mathematiker der Weltgeheimnisse by Ernst Bindel. 2nd ed, 133pp paper. DM19. Verlag Freies Geistesleben.

Kepler's inner search for 'the God within' might be seen as both the by-product and also the motivator of his research. Bindel illustrates this through the way he pursues and presents Kepler's penetrating power of thought and mathematical imagination. Against the perspective of his destiny, he shows how Kepler fits into the pattern that forms the background of the natural scientific world picture, but also hints at more far-reaching forms of knowledge.

Immanuel Hermann Fichte by Hermann Ehret, Verlag Freies Geistesleben. 233pp with 33 illustrations. Hardback. DM58.

Hermann Korff described the early Romantic movement as a 'spiritual forest fire, sparked off by Fichte's philosophy'. Among his ardent students at Jena — where he lectured on Sundays — were Schlegel and Novalis. The latter's Magical Idealism took Fichte's thought into a different direction than that of Naturalism. Fichte's son, Immanuel Hermann (1796-1897), was born two years after his father had been appointed to the chair of philosophy, thus growing up in the spiritual atmosphere that seethed around his father's notion of the boundlessness of the Ego. This biography and appraisal of the son's work is the fruit of more than 40 years' research, bringing forward a wealth of hitherto unknown details from his writings, letters and relevant documents. It amplifies Rudolf Steiner's tribute to him as a forerunner of the Science of the Spirit.

Der Grosse Alexanderzug by Hans Baumann. Verlag Freies Geistesleben. 148pp. DM24.

As often the pure narrative told to a class can precede by a year what later will be covered in the history main-lessons, similarly can the material in modern language lessons follow after. Hans Baumann's 55 episodes from



A motif from the 'The Golden Bird' (Grimms' Fairy Tales).

the eventful life of Alexander the Great are ideal for this purpose. They convey in breadth and clarity the towering character of this King of Greek culture.

Der goldene Vogel. 14 Grimm's Fairy Tales, illustrated by Lydia Postma Urachhaus. 113pp.

A particularly engaging feature of this production is Lydia Postma's illustrations. In an age of children's picture-books, it can easily be assumed that pictures and the child's mind are inextricably bound together. So they are. But Lydia Postma's colours and form-gestures are subtly subdued — to the extent that they may avoid getting in the way of the child's inner picture-making faculty. She creates an interesting balance between freedom and suggestion. Surprisingly, perhaps, her colour-tones predominate in reticent tertiaries. The 14 tales selected are a healthy mixture of favourites and others. Urtext.

Das Jahreszeitenbuch by Christiane Kutik, illustrated by Eva-Maria Ott-Heidmann. Verlag Freies Geistesleben. 320pp hardback. DM48.

An abundance of stories, songs, recipes, poems and games has been gathered together here as a result of much first-hand experience. Ideal for the family bookshelf, the contents of this substantial volume will help parents weave a rich cultural life into the rhythmical arcade of the year.

Farbenlehre by J. W. Goethe. Vols 4 and 5, with introduction and commentary by Rudolf Steiner, edited by Gertrud and Gerhard Ott. Verlag Freies Geistesleben. 536pp paper. DM35.

These two volumes form the second part of Goethe's 'Theory of Colour', and complete the set of five. They consist of Goethe's research into this branch of scientific thought from earliest Greek times through to the then present; and also include Rudolf Steiner's introduction and commentary. That Goethe's significance in this field cannot be underestimated is emphasised when one realises what a revolution his approach brought about within the natural scientific modes of thought that he contested. Heisenberg called it 'a battle'. This carefully edited version of the *Farbenlehre* is an important contribution to this continuing battle and will be of wide interest, particularly to scientists, artists and historians.

The Little House in the Edinburgh Book Festival 1987

Because three people were responsive people and immediately said 'yes' to their part of a question, the Little House could begin! The first question was to Jenny Brown, most capable and enterprising of directors of the Edinburgh Book Festival. Question to her was: 'If someone would design and build a little wooden playhouse for children on lines indicated by Rudolf Steiner, would you like to have it in the next (1987) Book Festival?' (The Edinburgh Book Festival is held biennially in tents in the gardens of Edinburgh's most prestigious, Georgian, West-end Charlotte Square.)

Jenny immediately said 'yes', gave us space and many other facilities and the backing of her committee.

The next question was to Jack Reed who runs the Garvald Centre in Edinburgh for people with special needs. Question to him was: 'Could he build such a little house in the Centre's workshops?' and he unhesitatingly said 'yes'.

The final question was to Joan de Ris Allen, R.I.B.A., A.R.I.A.S., designer of many beautiful anthroposophical buildings in Great Britain, U.S.A., Norway and elsewhere and an outstanding student of geometrical studies under Dr. Hermann von Baravalle in New York, and she also said 'yes': and so the way lay open.

All this happened in September 1986 and in less than a year, a colourful, unusual, beautifully designed and built little house stood under the trees, near the entrance of the Book Festival and was an outstanding attraction and centre of interest.



Above the entrance was a plaque stating that the building was a tribute to Rudolf Steiner. This prompted many enquiries about him, in response to which we were able to make available Paul M. Allen's booklet 'Rudolf Steiner, the Man and his Work'.

The house, on a pentagonal base, consisted of two rooms leading into each other, beautifully coloured by

Wolodymyr Radysh in azure blues and greens in one room and in pinks and yellows in the other. Specially designed child-sized tables, chairs, bed, cot, and kitchen unit (no water but taps and knobs that worked) were provided, also beautiful wooden bowls, spoons, forks and knives made by the trainees in the Garvald Factory, as well as colourful patchwork quilts and bedding.

The children loved it all! They immediately felt at home and wanted to play with everything and everybody around. Wonderful imaginary meals were cooked and served and much washing-up and tidying effected while wearing the aprons (with pockets) provided.

Incidentally, the Garvald Centre has made a model of the Little House which makes an unusual and delightful dolls' house. This seems an enterprise which might be widely undertaken, so that children — not only those privileged to go to a Steiner School — can play with forms and artefacts which will help their development.

Remarkably the Little House was much preferred, by smaller children especially, to the much more lavish attractions of the main children's tent next to it, where a witches' den, dragons and quantities of books were provided.

The Book Festival Committee hope we will bring back the building for their next event in 1989 and meantime we are negotiating with the authorities to have it in position during the five months, April to September 1988, of the Glasgow Garden Festival where they expect a million visitors.

'Seeing is believing' and the Little House undoubtedly caused a stir in this somewhat conservative city of ours. We had visitors from all over Scotland and England as well as from Canada, U.S.A., Australia, New Zealand, Japan, and many European countries as shown by our Visitors' Books.

We sincerely hope that we have not only brought joy to many children but may have furthered the knowledge of Rudolf Steiner and his ideals to many people, and that others may be inspired to similar activities.

Marion Millett

Correspondence

Rudolf Steiner School,
South Devon

Dear Editor,

Following the vivid account of the way in which a New Zealand Waldorf School handled the AIDS question (reported in December 1986, *Child and Man*), it may be worth noting that a German anthroposophical doctor, Dr. Olav Koob, has written a pamphlet on the background to this disease. He sheds a lot of light on the nature of illnesses, particularly ones which come as epidemics. He has woven in several of Rudolf Steiner's indications which help us to understand why new illnesses are emerging.

Anyone who wishes to have the 11 page English translation can write to the Rudolf Steiner School, Hood Manor, Dartington, Totnes, South Devon enclosing a donation towards the school's urgently needed building funds of not less than £2.

Christopher Cooper

Dear Editor,

As the last issue of *Child and Man* dealt with multicultural education and the name of Israel was there in your editorial introduction, I would like to report about what has been and is being done in Israel.

In the course of last summer (August 1987), at the Summer Festival in the Harduf Community, three conferences were held, all devoted to Waldorf Education.

The first conference was an open public conference and by ways of lectures, workshops and discussions a most broad picture of Waldorf Education — through child development and the unfolding of human threefoldness in childhood — was created. The second conference has been addressed to educationists, teachers from the state system, and opened the space for a deeper discussion by way of introducing Waldorf Education as a social impulse.

The third event, for the members of Harduf Community, worked with more specific themes in the journey of early childhood, as a part of the community's intention to open a Waldorf School in the near future.

In many ways the second conference was the most special one as it was the first time educationists in Israel came together to hear about Waldorf from a Waldorf teacher from Europe with many years' experience.

As the fruits of this first meeting, some very significant comments, as for the possible future of Waldorf in Israel, were said. I think they expressed some of the main issues and difficulties that Israel 1987 — with its cultural climate and religious atmosphere — can offer as the ground, the spiritual soil, for the seeds of a new form of education, in fact, a new form of culture.

I shall only point out two of the aspects from what was said there and then.

1. In Israel today, Old Testament lessons are being given from Class I right through to Class XII, during all the academic year, three/four times a week! (This is among the *non-religious* circles!) Clearly, it is a fundamental factor in the cultural life and having only the main lessons of Class III — the main practice in Waldorf Schools — would not be acceptable. Therefore a way must be found to bring more of the Old Testament stories into the Israeli classroom bearing in mind the Waldorf curriculum, without falling into oneness. Maybe there would be occasions in the rest of the curriculum where material from the Old Testament could also feature? (This is not even to consider 'free religion lessons' in the climate of the extreme Jewish right wing.)

2. Serious financial difficulties in the state system left the curriculum almost naked from any artistic subjects or outdoor activities. In this state of affairs it is hard to believe that Waldorf Education will get any governmental support. The results will be: the serving of a comparatively small social cross-section. Even the question of governmental recognition without support is still very much open.

Funny as it might sound, it is possible that these very facts — where the state cannot provide proper education and does not pretend to — (as a very central figure in the ministry of education called the parents lately to take their own initiatives, and indeed private alternative schools do blossom in the country) — such circumstances may bring about the right momentum for the new impulse.

Today in Israel there are two Waldorf Kindergartens in Jerusalem, fairly new, and the intention to open a school; another Kindergarten in Harduf — three years old — and some goodwill to establish a Waldorf School in Harduf in the next few years.

Michal ben Shalom

111 Gallowgate,
ABDERDEEN

Dear Editor,

We were all saddened to hear of the death of Nat Bowron last December. He was highly regarded in the Waldorf Schol Movement in Britain. I personally respected Nat's knowledge and expertise, having stayed with him during the Easter conference at King's Langley in 1985. Although it was an excellent conference, I received much instruction outside the official sessions, when I talked with Nat and his wife Kathie in the evenings.

I would like to share with your readers some advice I got from Nat in his last letter to me.

It is good to hear when people at least try to use knowledge gained and passed on to them. I find so many people these days only rely on their own ideas and do not refer much to Steiner! It all seems so strange.

About getting 'mood' into the classroom. Try this: choose a story suitable for your class, or much better, make one up. When you are satisfied that much later say in the last two weeks of term, you will be able to recount the story, tell the children that you have a story for them and that you will be telling it at a certain time and day of the term (at least three weeks ahead); this is to arouse anticipation in the class. *NOW* during this waiting period you must not let the children cajole you into telling the story before the stated time, *AND YOU*, during this time must ponder the story. Perhaps like this, that you take it in parts, and tell, one evening, a part to yourself and then very quietly, picture it in your minds' eye as vividly and in as much detail as you can. Do this for two or three nights, recalling to yourself very briefly, the picture in the mornings. Then take the next parts of the story for two or three days and so on till the end. When you have done this for the whole story in parts, then, for two or three nights recall all the pictures you made and do not spend too much time on this so that you 'see' the whole story from the beginning to end quite quickly (without words). Now cut down the number of pictures to as few as possible to remind you of the story. All you have to do now is to remember the chosen pictures and when you stand up to tell your story to your expectant class, when you recall the pictures and describe them you are telling the children something 'real' that you see. Enjoy the story yourself and do *not* act any part of it but keep quite still. Use your voice to give colour to your words. Acting in front of children commences in class 4.

I am sure that this advice will be of use to new Waldorf Teachers and will help enliven their work in the classroom.

William H. Milne

World List of Waldorf (Rudolf Steiner) Schools

ARGENTINA

Buenos Aires Colegio Incorporado 'Paula Albarracín de Sarmiento' — Rudolf Steiner-Schule, Warnes 1357, 1602 Florida, Pcia. de Buenos Aires.
Buenos Aires Escuela San Miguel Arcángel, José María Moreno 1221, 1607 Villa Adelina. Buenos Aires.

AUSTRALIA

Association of Rudolf Steiner Schools in Australia, Box 82, P.O., Round Corner, Durul. 2158. Participants in Association

Bowral Eukarima School, Centennial Road, Bowral, N.S.W. 2576.
Hazelbrook Blue Mountains Waldorf School, 77 Clearview Parade, Hazelbrook.
Maitland Linuwel School for Rudolf Steiner Education, 133 Morpeth Road, East Maitland, N.S.W. 2323

Melbourne Melbourne Rudolf Steiner School, 15 Wonga Road, Waranwood, Vic. 3134.
Mount Barker Waldorf School for Rudolf Steiner Education, Sims Road, Mount Barker S.A. 5251.

Perth Waldorf School for Rudolf Steiner Education, Lot 105, Progress Drive, Bibra Lake, WA 6163.

Sydney Glenaeon School, 5a Glenroy Ave., Middle Cove, N.S.W. 2068.

Sydney Lorian Novalis School for Rudolf Steiner Education Ltd., 456 Old Northern Road, Durul, N.S.W. 2158.

Sydney Lorian Novalis College of Teacher Education, address as above.

Thorn Chrysalis School for Rudolf Steiner Education, Darkwood Road, Thorn, N.S.W. 2492.

Yarramundi Aurora-Meander School for Rudolf Steiner Education, Lot 1 Mountain Ave., Yarramundi, N.S.W. 2753.

AUSTRIA

Graz Freie Waldorfschule, St. Peter Hauptstraße 182, A-8042 Graz.

Innsbruck Freie Waldorfschule Innsbruck, Grabmayrstraße 23, A 6020 Innsbruck.

Klagenfurt Rudolf Steiner-Schule Klagenfurt, Wilsonstraße 11, A 9020 Klagenfurt.

Linz Freie Waldorfschule, Baumbachstraße 11, A 4020 Linz.

Salzburg Rudolf Steiner-Schule, Bayerhamerstraße 35, A 5020 Salzburg.

Wien-Mauer Rudolf Steiner-Schule, Endersstraße 100, A 1238 Wien 23.

Wien-Pöchlarn Rudolf Steiner-Schule, Gaymüllergasse 3, A 1180 Wien.

BELGIUM

Aalst Michaeli, Herishage 39, 9300 Aalst.

Antwerpen De Hazelaar, Lange Lozannasstraat 117, 2018 Antwerpen.

Antwerpen Rudolf Steinerschule, Traasvaalstraat 21 & Prins Albertlei 19, 2600 Berchem.

Antwerpen Hibernia Rodestraat 33 & Keizerstraat 62, 2000 Antwerpen.

Brasschaat Boskapellei 50, 2130 Mariaburg-Brasschaat.

Brugge Guido Gezelschool, Hoogstraat 28, 8000 Brugge.

Bruxelles (Watermaal-Bosvoorde) Ecole Rudolf Steiner, Avenue Van Becelaere 96, 1170 Bruxelles.

Enpen Waldorfschule, Neudorferstrasse 73, 4730 Raeren.

Geel Vrije Rudolf Steinerschule, Kasteelaan 54, 9000 Geel.

Hasselt Rudolf Steinerschule, Luikersteenweg 49, 3500 Hasselt.

Leuven De Zonnepijper, Weldadigheidsstraat 74, 3000 Leuven.

Lier De Sterredaaiers, Maljekotsstraat 41, 2500 Lier.

Turnhout Michaelschool, Steenweg op Oosthoven 27a, 2300 Turnhout.

Wilrijk/Anwerpen Rudolf Steinerschule Lohangrin, Boomvestenweg 94, 2610 Wilrijk.

BRAZIL

Sao Paulo Escola Rudolf Steiner de Sao Paulo, Caixa postal 21.108, CEP 04698 Sao Paulo, Rua Job Lane 900, CEP 04639, Sao Paulo/Brasil.
Sao Paulo Colegio Micael, Rua Pocho Alexandrino Soares 68, Jardim Boa Vista (Butantã), 05584 Sao Paulo/Brasil.

CANADA

*Member of Association of Waldorf Schools of North America.

ALBERTA

Edmonton Aurora Rudolf Steiner School, 8540-69 Avenue, Edmonton, Alberta T6E 0R6.

BRITISH COLUMBIA

Kaslo Mountain Lake School, P.O. Box 1270, Kaslo, B.C. V0G 1M0.

Kelowna Waldorf School Association of Kelowna R.R.6, Hughes Road, Kelowna, B.C. V1Y 8R3.

Nelson Kootenay Valley School K-5, Box 165, Nelson, B.C. V1L 5P9.

Quadra Island Waldorf School K-5, P.O. Box 503, Quathlaski Cove, B.C. V0P 1N0.

*Vancouver Vancouver Waldorf School K-12 2725 St. Christophers Road, North Vancouver, B.C. V7K 2B6.

ONTARIO

Kitchener/Waterloo Waldorf Education Interest Group, Contact: Donna Huston 519-884-3192, Kitchener/Waterloo.

London, Ont. London Waldorf School, 1697 Trafalgar Street, London, Ontario N5W 1X2.

Milton Milton Waldorf School, P.O. Box 3, Milton, Ontario, L9T 2Y3.

Ottawa Ottawa Waldorf School K-5, 1119 Lazard Street, Ottawa, Ontario K2C 2R5.

*Toronto Toronto Waldorf School K-12, 9100 Bathurst Street, Box 220 Thornhill, Ontario L3T 3N3.

QUEBEC

*Montreal Ecole Rudolf Steiner de Montreal, K-8, 12050 Avenue de Bois de Boulogne, Montreal, P.Q. H2M 2X9.

CHILE

Santiago Colegio Giordano Bruno un Colegio Waldorf, Av. Cristobal Colon 3837, Correa Nunoa 15033, Santiago-Chile.

Santiago Colegio Rudolf Steiner, Biarritz 1953, Providencia, Nunoa, Santiago-Chile.

COLOMBIA

Cali Colegio "Luis Horacio Gómez", Carrera 55 No. 11-19 Barrio Santa Anita, Cali.

Medellin Colegio Isolda Echavarría, Lic. de Func. No. 000841 de 1985, Medellin.

DENMARK

Ålborg Rudolf Steiner Skolen, Tenhøjvej 14, 9220 Ålborg.

Århus Rudolf Steiner-Skolen i Århus Strandvejen 102, 8000 Århus C.

Århus Rudolf Steiner-Vestskolen, Helsingørsgårdsvej 32, 8210 Århus V.

Allerød Rudolf Steiner Skolen i Allerød, Lyngvej 202, 3450 Allerød.

Copenhagen Rudolf Steiner-Skolen i Hørtevej, Stokholtsvej 26, 2730 Herlev.

Copenhagen Vidar Skolen, Brogaardvej 61, 2820 Gentofte.

Fredericia Rudolf Steiner Skolen, Kolding Landevej 7, 7000 Fredericia.

Hjörning Rudolf Steiner Skolen, Vester Thyrupvej 30, 9600 Hjörning.

Kvistgård Rudolf Steiner Skolen, Kvistgård Stationsvej 2A-B, 3490 Kvistgård.

Merløse Rudolf Steiner Skolen, Bagmarken 58, 4370 St. Merløse.

Odense Rudolf Steiner Skolen i Odense, Lindvedvej 64, 5260 Odense S.

Odense Rudolf Steiner Skolen på Blankevej, Blankevej 133, 5220 Odense SO.

Risskov Rudolf Steiner-Skolen i Vejby-Risskov Skøjtevej 1, 8240 Risskov.

Silkeborg Rudolf Steiner-Skolen, Stavangervej 3, 8600 Silkeborg.

Skanderborg Rudolf Steiner-Skolen Skanderborg, Grønnedalsvej 10, 8660 Skanderborg.

Vejle Johannesskolen, Rudolf Steiner-Skolen i Vejle, Sukkertoppen 4, 7100 Vejle.

Vordingborg Rudolf Steiner-Skolen, Ørevvej 2, 4760 Vordingborg.

ECUADOR

Quito Jardín Escuela Particular Waldorf, Gral. Perrier 695 e Iberia, Vicentina, Quito.

FINLAND

Foreningen for Steinerpedagogik ry, Lehtikuusentie 6 Larkträdsvägen, SF-00270 Helsinki 27.

Helsinki Helsingin Rudolf Steiner koulu-Rudolf Steiner skolan i Helsingfors, Lehtikuusentie 6 Larkträdsvägen, SF-00270 Helsinki/Helsingfors 27.

Helsinki Helsingin Seudun uusi Steiner-koulu, Paraistentie 3, 00280 Helsinki.

Jyväskylä Jyväskylän Rudolf Steiner-koulu, Vapaudentie 54, 2. krs, 40100 Jyväskylä (941) 244 249.

Karjalohja Karjalohjan vapaa kyläkoulu, Lohilampi, 09220 Sammatti.

Lahti Lahden Rudolf Steiner-koulu, Toivontie 3, SF-15900 Lahsi 90.

Oulu Oulun Rudolf Steiner-koulu, Kaupaseurantie, 90250 Oulu 25.

Tampere Tampereen Rudolf Steiner-koulu, Satukunnankatu 13, SF-33100 Tampere 10.

Turku Turkin Rudolf Steiner-koulu, Mestarin-
katu 2, SF-20810 Turku 81.

Vantaa Vantaan Rudolf Steiner-koulu, Migårdinkuja 01510 Vantaa 37.

GERMANY

Hand der Freien Waldorfschulen e.V., D-7000 Stuttgart 1, Hindelhofstraße 32.

Aachen Freie Waldorfschule Aachen, Kaiser-Friedrich-Allee 1, D-5100 Aachen.
Augsburg Freie Waldorfschule Augsburg, Dr.-Schmelzing-Straße 52, D-8900 Augsburg.
Bad Nauheim Freie Waldorfschule Wetterau, Frankfurter Straße 103, 6350 Bad Nauheim.
Balingen Freie Waldorfschule Balingen, Hürdnagelstraße 3, D-7460 Balingen-Fronmün.
Benefeld Freie Waldorfschule Landsholheim Benefeld, D-3036 Bomlitz-Benefeld ub. Walsrode-Hann.
Berlin-Dahlem Rudolf Steiner Schule Berlin e.V., Auf dem Grat 3, D-1000 Berlin 33.
Berlin-Zehlendorf Emil Molt Schule, Freie Waldorfschule, Clavieße 60-66, D-1000 Berlin 37 (Zehlendorf).
Berlin-Kreuzberg Emil Molt Schule, Freie Waldorfschule, Standort Kreuzberg, Alte Jakobstr. 12, D-1000 Berlin 61.
Berlin-Nord c/o Rudolf Steiner Schule Berlin e.V., Auf dem Grat 3, D-1000 Berlin 33.
Bexbach Freie Waldorfschule Saar-Pfalz, Parkstraße, D-6652 Bexbach.
Bielefeld Rudolf Steiner Schule Bielefeld, An der Stiftskirche 13, D-4800 Bielefeld 1.
Bochum Rudolf Steiner Schule Bochum, Hauptstraße 238, D-4630 Bochum 7.
Bonn Freie Waldorfschule Bonn, Stettiner Straße 21, D-5300 Bonn 1 (Tannenbusch).
Braunschweig Freie Waldorfschule Braunschweig, Rudolf-Steiner-Straße 2, D-3300 Braunschweig.
Bremen Freie Waldorfschule Bremen, Touler Straße 3, D-2800 Bremen 1.
Chiemgau Freie Waldorfschule Chiemgau, Bernauer Straße 34, D-8210 Prien.
Darmstadt Freie Waldorfschule Darmstadt, Arndtstraße 6, D 6100 Darmstadt-Eberstadt.
Detmold Freie Waldorfschule Lippe-Detmold, Dresdener Straße 1, D 4930 Detmold.
Dortmund Rudolf Steiner Schule, Mergelsteinstraße 51, D 4600 Dortmund 50.
Düsseldorf Rudolf Steiner Schule Düsseldorf, Diepenstraße 15, D 4000 Düsseldorf 12.
Eckernförde see Rendsburg.
Elmshorn see Kiel.
Engelberg Freie Waldorfschule Engelberg, Rudolf-Steiner-Weg 4, D-7065 Engelberg, Post Winterbach-Wurt.
Essen Freie Waldorfschule, Schellstraße 47, D 4300 Essen 1.
Esslingen Freie Waldorfschule Esslingen, Weißstraße 90, D 7300 Esslingen.
Evinghausen Freie Waldorfschule Evinghausen, D 4550 Bramsche 8 (Evinghausen).
Filderstadt Freie Waldorfschule Aichtal-Filderstadt, Schulstr. 13, D 7024 Filderstadt 4 (Plattenhardt).
Flensburg Freie Waldorfschule Flensburg, Valentiner Alle 1, D 2390 Flensburg.
Frankfurt Freie Waldorfschule, Friedlebenstraße 52, D 6000 Frankfurt 50 (Eschersheim).
Freiburg Freie Waldorfschule Freiburg i. Br., Schwimmbadstraße 29, D 7800 Freiburg i. Br.
Freiburg Freie Waldorfschule St. Georgen, Bergstraße 11, D 7800 Freiburg.
Gladbeck Freie Waldorfschule Gladbeck, Horsterstraße 82, D 4390 Gladbeck.
Göppingen Freie Waldorfschule Filsal, Ahornstraße 41, D 7320 Göppingen-Faurndau.
Göttingen Freie Waldorfschule Göttingen, Martin-Luther-Straße 10, D 3400 Göttingen.
Hagen Rudolf Steiner Schule Hagen, Enneper Straße 30, D 5800 Hagen-Haspe.
Hamburg-Bergedorf Rudolf Steiner Schule Bergedorf, Am Brink 7, D 2050 Hamburg 80.
Hamburg-Bergstedt Rudolf Steiner Schule in den Waldorfern e. V. Hamburg-Bergstedt, Bergstedter Chaussee 203, D 2000 Hamburg 65.
Hamburg-Harburg Rudolf Steiner Schule Harburg, Ehesorfer Heuweg 82, D 2104 Hamburg 92.

Hamburg-Mitte Rudolf Steiner Schule Hamburg-Mitte e.V., Grabenstrasse 32, D 2000 Hamburg 6.
Hamburg-Nienstedten Rudolf Steiner Schule Nienstedten, Elbchaussee 366, D 2000 Hamburg 52.
Hamburg-Wandsbek Rudolf Steiner Schule Wandsbek, Rahstedterweg 60, D 2000 Hamburg 72 (Farmen).
Hannover Freie Waldorfschule, Rudolf-von-Bennigsen-Ufer 70, D-3000 Hannover 1.
Hannover-Boitfeld Freie Waldorfschule Hannover-Boitfeld, Weidkampshäide 17, D 3000 Hannover 51.
Heidelberg Freie Waldorfschule Heidelberg, Mittelgiewannweg 16, D 6900 Heidelberg-Wiehlagen.
Heidenheim Freie Waldorfschule, Ziegelstraße 50, Postfach 1340, D 7920 Heidenheim/Brenz.
Heilbronn Freie Waldorfschule Heilbronn, Max-von-Laue-Straße 4, D 7100 Heilbronn.
Hildesheim Freie Waldorfschule Hildesheim, Brauhäuserstraße 6, D 3200 Hildesheim.
Kakenstorf Rudolf Steiner Schule Nordheide, Lange Straße 2, D 2117 Kakenstorf.
Karlsruhe Freie Waldorfschule Karlsruhe, Königsberger Straße 35a, D 7500 Karlsruhe 1.
Kassel Freie Waldorfschule Kassel (einschl. Berufsbildendes Gemeinschaftswerk mit Ausbildung für Facharbeiter und staatl. anerk. Erzieher), Hunrodsstraße 17, D 3500 Kassel-Wilhelmshöhe.
Kiel Freie Waldorfschule Kiel, Hofholzallee 20, D 2300 Kiel 1.
Kiel/Elmshorn Freie Waldorfschule Kiel, Zwischschule Elmshorn, Bismarckstraße 13, D-2200 Elmshorn.
Köln Freie Waldorfschule Köln, Martinusstraße 28, D 5000 Köln 71 (Esch.).
Krefeld Freie Waldorfschule Krefeld, Kaiserstraße 61, D 4150 Krefeld.
Loheland Rudolf Steiner Schule Loheland, D 6411 Kunzell 5/Fulda.
Ludwigsburg Freie Waldorfschule Ludwigsburg, Bonnighheimer Straße 2, D 7140 Ludwigsburg-Eglosheim.
Lübeck Freie Waldorfschule Lübeck, Dieselstraße 18, D 2400 Lübeck-Eichholz.
Lüneburg Rudolf Steiner Schule Lüneburg, Dahlenburger Landstraße 151, D-2120 Lüneburg.
Mainz Freie Waldorfschule Mainz, Merkurweg 2, D 6500 Mainz-Finthen.
Mannheim Freie Waldorfschule, Neckarauer Waldweg 131, D 6800 Mannheim 24.
Marburg Freie Waldorfschule Marburg, Ockershäuser Allee 14, D 3550 Marburg/Lahn.
Mülheim/Ruhr Freie Waldorfschule in Mülheim, Karl-Forst-Straße 13, D-4330 Mülheim/Ruhr 13.
München Rudolf Steiner Schule, Leopoldstraße 17, D 8000 München 40.
München-Gröbenzell Rudolf Steiner Schule München, Schulhaus Gröbenzell, Spechtweg 6, D 8038 Gröbenzell.
München/Daglfing Rudolf Steiner Schule, Zwischschule Daglfing, Max-Proebstl-Straße 7, D-8000 München 81.
Münster Freie Waldorfschule Münster, Laerer Landweg 153-157, D 4440 Münster.
Neu-Isenburg Rudolf Steiner Schule Neu-Isenburg, Zeppelinsstraße 10, D 6078 Neu-Isenburg.
Nürnberg Rudolf Steiner Schule, Steinplattenweg 25, D 8500 Nürnberg.
Neuwied Rudolf Steiner Schule Mittelrhein, Freie Waldorfschule in Neuwied, Mittelweg 10, D 5450 Neuwied-Block.
Nürtingen Rudolf Steiner Schule, Erlenweg 1, D 7440 Nürtingen.
Offenburg Freie Waldorfschule Offenburg, Rheinstraße 3, D 7600 Offenburg.
Oldenburg Freie Waldorfschule, Kleinsstraße 43, D 2900 Oldenburg.

Ottersberg Freie Rudolf Steiner Schule, Amtshof 5, D 2802 Ottersberg 1.
Pforzheim Goetheschule - Freie Waldorfschule, Schwarzwaldstraße 66, D-7530 Pforzheim.
Reinscheid c/o Waldorfschulverein, Remsstraße 81, 5630 Reinscheid.
Rendsburg Freie Waldorfschule, Nobiskrüger Allee 75/77, D 2370 Rendsburg.
Rendsburg/Eckernförde Freie Waldorfschule Rendsburg, Zweigschule Eckernförde, Schleswiger Straße 312, D 2330 Eckernförde.
Reutlingen Freie Georgenschule, Moltkestraße 29, D 7410 Reutlingen.
Saarbrücken Freie Waldorfschule Saarbrücken, Großwaldstraße 2, D 6623 Altenkessel.
Schloß Hamborn Rudolf Steiner Schule Landsholheim Schloß Hamborn, D-4799 Borchsen - Schloß Hamborn.
Schopphelm Freie Waldorfschule Schopphelm, Stettiner Straße 9, D 7860 Schopphelm.
Schwäbisch Gmünd Freie Waldorfschule Schwäbisch Gmünd, Heinrich-Steinle-Weg 1, D 7070 Schwäbisch Gmünd.
Schwäbisch Hall Freie Waldorfschule Schwäbisch Hall, Teurerweg 2, D 7170 Schwäbisch Hall.
Siegen Rudolf Steiner Schule Siegen, Marienborner Straße 151, D 5900 Siegen 1.
Stuttgart Freie Waldorfschule Uhlandschöke, Hauptmannstraße 44, D 7000 Stuttgart 1.
Stuttgart Freie Waldorfschule am Kräherwald, Rudolf-Steiner-Weg 10, D 7000 Stuttgart 1.
Stuttgart Michael Bauer Schule, Freie Waldorfschule mit Förderklassenbereich, Othellostraße 5, 7000 Stuttgart 80.
Trier Freie Waldorfschule Trier, Montessoriweg 7, D 5500 Trier.
Tübingen Tübingen Freie Waldorfschule, Roldornweg 30, D 7400 Tübingen-Waldhäuser-Ost.
Überlingen Freie Waldorfschule am Bodensee, D 7770 Überlingen-Rengoldshausen.
Ulm Freie Waldorfschule Ulm und angeschlossene Sonderklassen für Lernbehinderte, Römerstrasse 97, D 7900 Ulm.
Villingen-Schwenningen Rudolf Steiner Schule, Schluchsestraße 55, D 7730 VS-Schwenningen.
Wahlwies Freie Waldorfschule Wahlwies, D 7768 Stockach 14.
Wangen Freie Waldorfschule Wangen, Rudolf-Steiner-Straße 4, D 7988 Wangen i. Allgäu.
Wanne-Ekel Hiberniaschule, Holsterhauser Straße 70, Postfach 2849, D 4690 Herne 2.
Wattenscheid Widar Schule Wattenscheid, Hantropfer Straße 95, 4630 Bochum 6.
Wiesbaden Freie Waldorfschule Wiesbaden, Kohlreiterstraße 43, D 6200 Wiesbaden.
Witten Rudolf Steiner Schule Witten, Bifferbecksstraße 2, D 5810 Witten-Heven.
Würzburg Freie Waldorfschule Würzburg, Oberer Neubergweg 14, D 8700 Würzburg.
Wuppertal Rudolf Steiner Schule, Schluchtstraße 21, D 5600 Wuppertal 2 (Barmen).
Wuppertal Christian Morgenstern Schule, Waldorfschule für Erziehungshilfe, Haderslebener Straße 14, D 5600 Wuppertal 2 (Barmen).
Wuppertal West Freie Waldorfschule Wuppertal-West Schluchtstraße 21, D 5600 Wuppertal 2.

ITALY

Milano Scuola Rudolf Steiner, Via Celeste Clericetti 45, 20/33 Milano.
Roma Scuola Rudolf Steiner "Giardino del Cedri", Via delle Benedettine 10, 00135 Roma.

LUXEMBOURG

(Grand-Duché) Kindergarten: Rue de Trèves 154, Cents - Luxembourg. Primerschule: Rue Sak, Luxembourg-Limpertsberg.

NETHERLANDS

Band van Vrije Scholen in Nederland Secretariaat: Hoofdstraat 20, 3972 LA Driebergen.

**Incl. Upper School. *Only Kindergartens*

Alkmaar Rudolf Steinerschule, Sperwerstraat 1, 1826 KL.
Alkmaar Vrije School Bovenbouw, Loudeweg 20A, Postbus 222, 1860 AE BERGEN.
Almelo Vrije School Almelo, Biesterweg 6, 7608 RN.
Almere Vrije School, Heertensstraat 33A, 1324 MC.
Alphen A/D Rijn Vrije School, Liszthof 90, Postbus 165, 2400 AD.
Amersfoort Vrije School, Romestraat 74, 3816 SE.
Amstelveen Parcivalschool, Lindenlaan 317, 1185 LM.
Amsterdam Geert Groteschool, Hygieaplein 47, 1076 RS.
Apeldoorn Vrije School, Morinistraat 8, 7312 KC.
Arnhem Parcivalschool, Woudrichemstraat 141, Postbus 30093, 6803 AB.
Assen Vrije School, Carsnumstraat 2, 9404 RV.
Bergen Vrije School, Prins Hendriklaan 58, 1882 EL.
Bergen Vrije School Bovenbouw, van de Veldeaan 179, 1860 AE Bergen.
Bilthoven Rudolf Steinerschule, Weltevreden 6, Postbus 332, 3720 AH.
Den Bosch Rudolf Steinerschule, Waalstraat 30, 5215 CK.
Boxmeer Vrije School, Jeroen Boschstraat 49, 5831 VV.
Breda Rudolf Steinerschule, Minckelerstraat 27, 4816 AD.
Bussum Vrije School Michael, Enther de Boer van Rijklaan 22, 1403 GD.
Delft Vrije School, De Meestersstraat 2, 2613 XB.
Deventer Vrije School, Houmark 6, 7411 CG.
Dordrecht Vrije School, Wijsstraat 119, 3311 BV.
Driebergen Vrije School, Faunalaan 250, Postbus 207, 3970 AE.
Ede Vrije School, Nachtegaallaan 47a-49, Postbus 40, 6710 BA.
Eindhoven Vrije School Brabant, Woenselstraat 316, Postbus 1073, 5602 BB.
Eindhoven-Zuid Vrije School, Hadewychlaan 3, 5643 RT.
Emmen De Vrije School Michael, Prinsenlaan 80, 7822 CJ Emmen.
Gouda Vrije School, Ridder v. Caisweg 256a, 2805 BC.
Groeninge De Vrije School Bovenbouw, Wassenberghstraat 26, 9718 LL.
Den Haag Vrije School, Waalsdorperweg 12, 2597 JB.
Den Helder Vrije School, Reggestraat 38, 1784 XN, 02230-35755.
Haarlem Rudolf Steinerschule, Engelandlaan 2, 2034 NA.
Harlem-Noord Vrije School Kennemerland, Weltevredensstraat 9, Postbus 2161, 2002 CD.
Harderwijk de Valentijnschool, De Ruyterlaan 19, Sleylaan 122, 3851 BV Ermelo.
Helmond Vrije School Peelland, Helmondse laan 71, 5702 NM.
Hilversum Vrije School, Oude Amersfoortseweg 198, Postbus 1643, 1200 BP.
Hoorn Weisfriese Vrije School, Nachtegaal 146, 1628 DJ.
Krimpen A/S IJssel Krimpener Vrije School, Hobbemalaan 2, 2923 XH.

Leeuwarden Michaelschool, Emmanuel Murandstraat 37, Postbus 1140, 8900 CC.
Leiden Rudolf Steinerschule, César Franckstraat 9, 2324 JM.
Leiden-Noord Vrije School Mareland, Maresingel 19, 2316 HA.
Leiden Vrije School Bovenbouw, Kerkstraat 11, 2514 KP Den Haag.
Maastricht Vrije School, Heugemer Pastoorstraat 12, Postbus 2026, 6201 CC.
Meppel Vrije School, Julianasstraat 22, 7941 JC.
Middelburg Vrije School Zeeland, Willem Arondeusstraat 59, 4333 DD.
Nijmegen Steinerschule, Meyhorst 24-74/76, 6537 GR.
Nijmegen Vrije School 'Oost', Groesbeekseweg 146, 6525 DN.
Nijmegen Regionale Bovenbouw, Villa Novastraat 6, 6542 JA.
Oldenzaal Vrije School, Jacob Caisstraat 2, 7576 BS.
Oosterhout Vrije School, Brabantlaan 7, Postbus 4010, 4900 CA.
Oud Beijerland Vrije School Hoeksche Waard, Kortenaarstraat 2, Postbus 1176, 3620 AD.
Roermond Vrije School, Midden Limburg, Schouwberg 27, 6041 AG Leeuwen/Roermond.
Rotterdam Vrije School, Vrededijkweg 30, Postbus 4292, 3006 AG.
Tiel Johanneschool, Kloosterhof 4, 4003, DH.
Tilburg Vrije School, Wilhelminapark 54, 5041 ED.
Uden Vrije School, Bosveld 120, 5403 AG.
Utrecht Vrije School, St. Maartensdreef 1, 3564 TA.
Venlo Rudolf Steinerschule, Noord-Limburg, Zusterstraat 5, 5914 XX VENLO.
Voorschoten Rudolf Steiner Kleuterschool, Burg de Koolplantsoen 19, 2253 KD.
Wageningen Vrije School De Zwaneridder, Nolensstraat 3, 6702 CS.
Winterswijk Vrije School, Wielewaalsstraat 2, 7102 HB.
Zaandam Vrije School Zaanstreek, Galjoenstraat 111B, 1503 AR.
Zelst Zeiszer Vrije School, Socrateslaan 22, 3707 GL.
Zeist Siichuse Vrije School, Regional Bovenbouw, Socrateslaan 24, 3707 GL.
Zoetermeer Vrije School, Schansbos 5-6, 2716 GV.
Zutphen Vrije School 'de IJssel', Henri Dumantweg 4, 7201 EV.
Zutphen Vrije School 'de Berkel', Weerdsdag 14b, 7206 BR.
Zutphen Vrije School Bovenbouw, Weerdsdag 14a, 7206 BR.
Zwolle Vrije School, Bachlaan 6-8, 8031 HL.

NEW ZEALAND

Auckland Michael Park School K-12, 55 Amy Street, Ellerslie, P.O. Box 28-150, Remuera, Auckland 5.
Christchurch Christchurch Rudolf Steiner School K-12, 19 Omberville Terrace, Opawa, Christchurch 2.
Dunedin Kotuku School K-2, 95 Norwood Street, Normanby, Dunedin.
Hastings Rudolf Steiner School K-12, 415N Nelson Street, P.O. Box 888, Hastings.
Wellington Raphael House Rudolf Steiner School K-7, 27 Mauihi Street, Belmont, Lower Hunt, Wellington.

NORWAY

Steinerskolene i Norge. Secretary: Finn-Einar Kellström, Flyveien 2, 0384 Oslo 3.

Asker Rudolf Steinerskolen i Asker, Nes terrasse 45, 1360 Nesbru.
Bergen Rudolf Steiner-Skolen i Bergen, Rieber-Mohns vej 15, 5040 Paradis.

Bærum Steinerskolen i Bærum, Grav Gårdsvæg 5, 1342 Jar.
Drammen Steinerskolen i Drammen, Tredje strømt terrasse 13, 3000 Drammen.
Fredrikstad Steinerskolen i Fredrikstad, Nabbetorpveien 99, Boks 1188, 1601 Fredrikstad.
Haugesund Steinerskolen i Haugesund, Solvang, 5500 Haugesund.
Hedmarken Steinerskolen i Hedmarken, Hedmarken gård, Boks 100, 2310 Ottestad.
Horum Rudolf Steinerskolen i Hurum 3483 Knaa.
Lillehammer Lillehammer Steinerskole, Bakkegranda, Sigrid Undset's vei 70, 2600 Lillehammer.
Lørenskog Steinerskolen i Lørenskog, Postboks 13, 1473 Skårer.
Nesodden Rudolf Steinerskolen på Nesodden, Eysteins vei 48, 1450 Nesoddiangen.
Oslo Rudolf Steinerskolen i Oslo, Postboks 25, Hovtveit, 0705, Oslo 7.
Rygge Steinerskolen i Rygge, Boks 130, 1510 Rygge.
Stavanger Steinerskolen i Stavanger, Nylandsgr. 1, 4000 Stavanger.
Trondheim Steinerskolen i Trondheim, Postboks 3521, 7001 Trondheim.
Vestfold Steinerskolen i Vestfold, Postboks 10, Vestskogen, 3140 Borghem.

PERU

Lima Collegio Waldorf Lima, Apido. 03-0164. Salamanca. Lima 3.

SOUTH AFRICA

Southern African Federation of Waldorf Schools - Secretariat: Waldorf School, Constantia.
Cape Town Waldorf School, Spaanschemat River Road, Constantia, 7800, Cape Town.
Cape Town Michael Oak Waldorf School, 4 Marlow Road, 7700 Kenilworth, Cape Town.
Durban Natal Waldorf School, P.O. Box 503, Hillcrest 3650.
Johannesburg Michael Mount Waldorf School, P.O. Box 67 587, Bryanston, 2021, Johannesburg.
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Göteborg Rudolf Steinerskolan, Birkagatan 61, S 41656 Göteborg.
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Kälmar Stillelsen Kälmar Waldorfskola, Dronning Blankas Väg 10, 393, 52 Kälmar.
Lund Rudolf Steinerskolan i Lund, Hardeberga, S 24107 Södra Sandby.
Norrköping Rudolf Steinerskolan i Norrköping, Box 748, S 60116 Norrköping.
Örebro Örebro Waldorfskola, Box 140 29, 700 14 Örebro.
Spånga Ellen Key skolan, Stockholms Norra Waldorfskola, Duvbovägen 94, 163 58 Spånga.
Stockholm Kristoffersskolan, Box 124, S 16126 Bromma.
Stockholm Martinskolan, Söders Waldorfskola, Munstyskavägen 18, S 123 57 Farsta.
Umeå Waldorfskola, PL 5285, S 90251 Umeå.

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Biel Rudolf-Steiner-Schule, Rosenheimweg 1, CH 2502 Biel.
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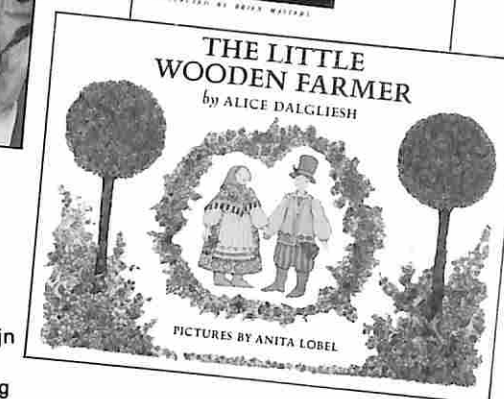
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