New Eyes for Plants

A workbook for observing and drawing plants

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and
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Hawthorn Press

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Contents

Foreword

This book invites us to go on a journey, not simply of the imagination but also of activity and transformation. The invitation is to reconnect with the living forms around us by looking and doing so that our eyes are opened to the nature of plant life. The nature revealed has both the truth of scientific knowledge and the beauty of the creative act so that we experience plants as simultaneously archetypal and forever new. The door opens onto a new way of practising science as art that avoids the anaesthesia of a purely objective study of nature by including aesthetic experience or feeling and willing activity as primary, conscious components of our understanding.

Our guides on this journey are two practitioners of this new science, Margaret Colquhoun with a background in conventional science and Axel Ewald, an artist. The book grows out of years of collaborative exploration, research and teaching which has allowed them to construct this beautifully integrated work, with text and image speaking to each other on every page. The drawings resonate with the relationship to nature that inspires the work of Andy Goldsworthy and David Nash, while the text achieves the directness and the simplicity of intimate conversation arising from real understanding. The impulse engendered by this work-book to participate by looking, drawing and experiencing the plants that surround us is irresistible.

The tradition within which this union belongs goes back to Goethe and the romantics, who reacted against Kant's separation of science from art and his denial that there could ever be a "Newton of the grass blades". In one sense he was perfectly right – life resists the mechanical description of the type that characterises Newtonian science, as we can now see so clearly in the attempts of contemporary biologists to describe living processes in terms of genes and molecules. The result is that organisms have disappeared as real entities from biology; life slips through the fingers, leaving us nothing but skeletons. So we need to return to a tradition that allows us to truly encounter the living reality that surrounds us, on which we depend not simply for our survival but also to understand and express our own natures. This emerges repeatedly in the book, as in the following passage describing the meaning of the leaf sequence of a plant, out of which emerges the flower. All the wonderful transformations in the leaf regions are incomprehensible (or even unnoticed) until the plant flowers and then, in retrospect, their meaning is obvious.

Similarly the journey of getting to know someone or something is often like this. Again and again we reach a moment of recognition of the other for what it or he or she is which flowers in us again and again until at a certain moment there is the experience of inner union, of being at one with. It is a state of being, of intimate union, known and described by artists, lovers and mystics – no less by scientists:

> *"The state of feeling which makes one capable of such achievement is akin to that of the religious worshipper or one who is in love" – Albert Einstein.*

As contemporary biology loses its way in the tangled undergrowth of molecular detail and Just So Stories, and an objectivity that turns life into manipulable, marketable commodities – a new biology is emerging that preserves everything of value that has been learned but restores the wholeness, the integrity of life by healing our relationship to it. This workbook invites us to find out how this can be done.

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Preface

This book has arisen out of a series of courses, known as the Life Science Seminar, which we have been offering since 1990 in different locations and varying social contexts within the British Isles. The Life Science Seminar was created in order to *bring together science and art in the doing***.** In the courses carefully guided Nature observation has been complemented by artistic activities which aimed to deepen perception and allow the fruits of the cognitive process to flow directly into the doing. This breathing in and out between science and art has shown itself to be a very satisfying and therapeutic way of learning. Each of the courses, all of which have been open to anyone regardless of age or background, has been a journey of *awakening through experience*, both in perception of the world of Nature around us and of our own inner creativity; a journey onto which the course leaders and participants have embarked together and during which we all have learned from each other.

In writing this book we are responding to repeated requests to share some of the fruits of these journeys and to make them available to a wider audience. Of course, reading a book can never replace the living experience of intensively studying and creating with a group of people. We hope that, nevertheless, this little book will encourage you, dear reader, to embark on your own individual journey of discovery. Maybe you would like to share it with somebody else and ask a friend to accompany you on your excursion into the living world of plants.

This book is not meant as a source of information but rather as a *workbook*, the success of which depends on *your active participation*. Take it with you on your excursions into Nature, see and check for yourself, if you can verify our descriptions. This book describes many exercises which, we hope, will kindle your creative activity and inspire you to invent your own variations. The chapters follow the *course of the seasons*, starting with autumn in chapter 1 and concluding with autumn again in chapter 6. You may want to work your way through this book slowly reading each chapter in the season which it belongs to; or you might as well read the whole book first and then come back to each individual chapter when the relevant season begins.

If we succeed in engendering in you, our reader, a sense of wonder, an active interest in the living world of plants and a creative participation in their growth and development, then we can hope to have laid some seeds for the development of new organs of perception; seeds for the development of *"New Eyes for Plants"*.

We would like to take this opportunity to acknowledge the help, support and inspiration of a number of people without whom this book would not have come about: Firstly the many participants of our courses who provided supportive feedback and critique which proved to be indispensable for the refinement of the pedagogical method; then our teachers and mentors, of whom we can only mention those which have been most instrumental in allowing us to experience different aspects of the application of the Goethean method in science and art: Jochen Bockemuehl, Thomas Goebel and Wilhelm Reichert; and last but not least our publisher, Martin Large, without whose enthusiasm and support our ideas would not have grown beyond a few notes and scribbles into the book it has now become.

1 A Question of Life - or not

Stones and Potatoes

Imagine it is autumn – late October or November. Most of the leaves have turned and fallen, their rich red-gold carrying summer's warmth down, blanketing the earth. Grey ghosts of beech trees swathed in mist; the ground a mud-mixed mush of wet soil, rotting leaves and stems. You are grovelling, back bent, mind blank, hands by boots, both plastered in cloying clay, picking potatoes. Here a handful moves with ease, there one has to be dug out. A gentle rhythm shifts potatoes from soil to bucket. Here's a stone – throw it away – oh no! – perhaps it was a potato! How do I know the difference? What a question! Let's have a rest and straighten the back to consider this one.

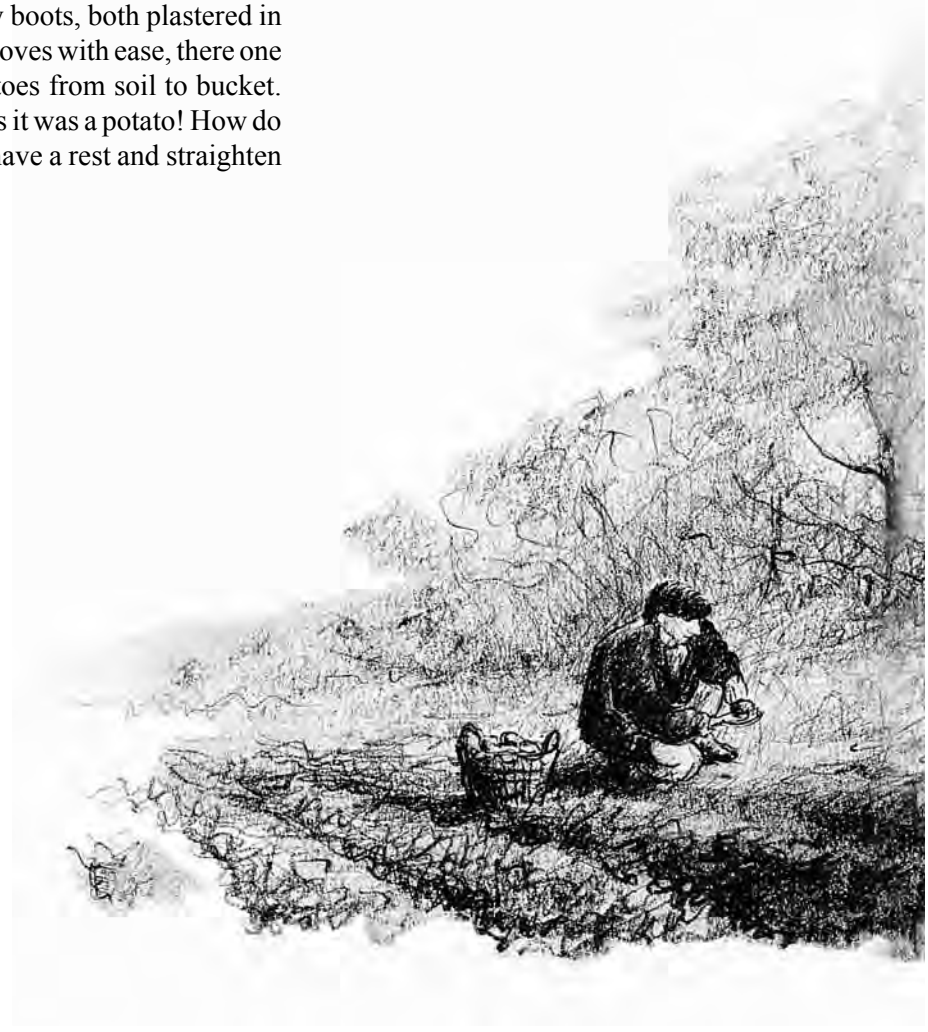


Fig. 1. Picking potatoes in autumn – how do I know the difference between stones and potatoes? [pencil].

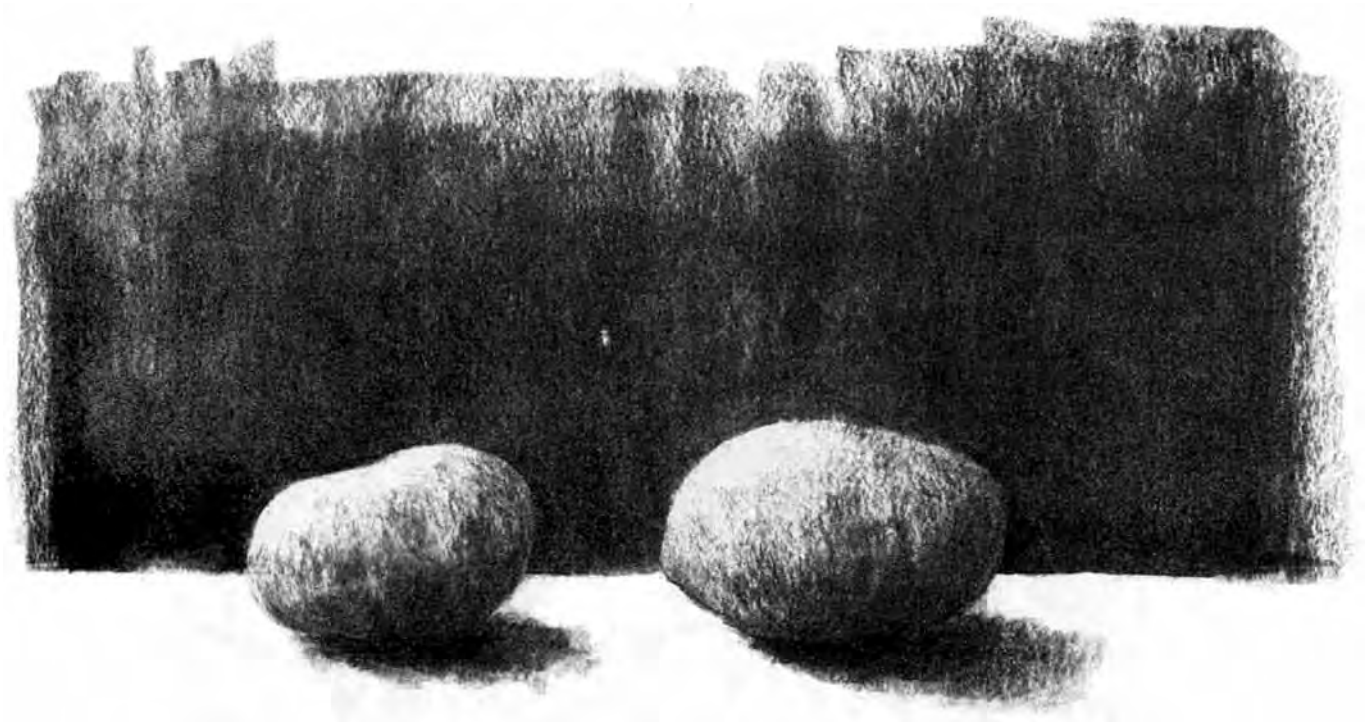


Fig.2. Stone or potato? [charcoal]

How do you tell the difference between a stone and a potato? (Fig. 2) Both are rounded and smooth, hard and heavy. Both fall to the ground if I drop them, make a similar impact in the soil, a similar sound in the bucket. Both are impervious to the light, cast shadows, resist the pressure of my finger, have a crusty exterior. But the inside of a stone is rather like the outside – at least with these sandy crumbling lumps lying here – whereas the inside of a potato is quite different from the outside! Where the rabbits have chewed them they glisten white, and some have gone mushy inside. This reminds me of the ones we planted in the spring. Perhaps it is one of them that is now a rotting wet mass. But where have the new ones come from – these hard rounded nuggets of food for the winter?

Thinking back to the spring, those we planted were quite different with their wizened, wrinkled skins and here and there white whiskers and little purple green sprouts (Fig. 3). You had to be very careful to put them in the ground with the whiskery roots down and the sprouts up and, of course, you had to remove all but the biggest sprouts. But how did such a wizened old thing produce all this mass of golden fruits? ("earth apples" they call them in some countries!). Of course there was a big green bushy plant there in between (Fig. 4), but does this explain how the new potatoes came about?

Fig. 4. Fully grown potato plant. [pencil]

Fig. 3. Sprouting potato [pencil].

Fig. 5. Beech tree and beech nut (not to scale). [charcoal on Ingres paper]

Come to think of it, how on earth did all these mighty beech trees along the field grow out of those tiny little beechnuts that are scattered around among the fallen leaves? (Fig. 5). It really seems rather impossible that this could happen – and yet it does!

By now one of the differences between stones and potatoes begins to be quite obvious: left to itself, the potato will change in time out of itself. Left under a sink, in a cellar or clamp, all the potatoes throughout the northern hemisphere of the globe will start to shrivel and make white whiskers and shoots at the beginning of the year. The stones which have managed to find their way into the cellar will not. They may be rubbed or chipped from the outside but they *do not grow*. Growing is a change in time which is inexplicable from the outer conditions such as warmth, light or water alone. It may be speeded up or slowed down by outer circumstances but growth itself is, to a certain extent, independent of external factors. It just seems to happen!

We are able to recognise the difference between stones and potatoes without too much difficulty. Holding one of each in our hands we might even be able to say with conviction that one is "alive" and one is not. But what does this mean and how can we begin to investigate this quality of being able to change, to grow, of *being alive* which the potato has and the stone has not?

Doing Science

The activity of doing science is the *pursuit of knowledge*. This is not only something that other people in white coats in laboratories do on our behalf but it is also what we ourselves do many times every day when we discover something we did not know yesterday. Science belongs to the basic daily activity of every human being; indeed it seems to be a basic human necessity. It began in each of us as children when we learned to wonder; when we started to explore things in our surroundings out of interest. Wonder or interest leads to questions and finding out the answers to the questions, one could say, is *doing science*.

Let us begin by simply looking at the world around us – and then reflect on the process itself of finding out how things work. Take a candle in some kind of holder and place it on a white tablecloth or similar light, smooth surface in a poorly lit room. Take a box of matches and light the candle. Place an object – the box of matches will do – on the cloth fairly near the candle (Fig. 6). What do you see on the table? Move the matchbox nearer to and further away from the candle. Lift the candle and move it whilst keeping the matchbox still. Observe everything very carefully and see if you can find a law which will encompass all the observable phenomena so that you can eventually predict exactly what will happen whatever you do.

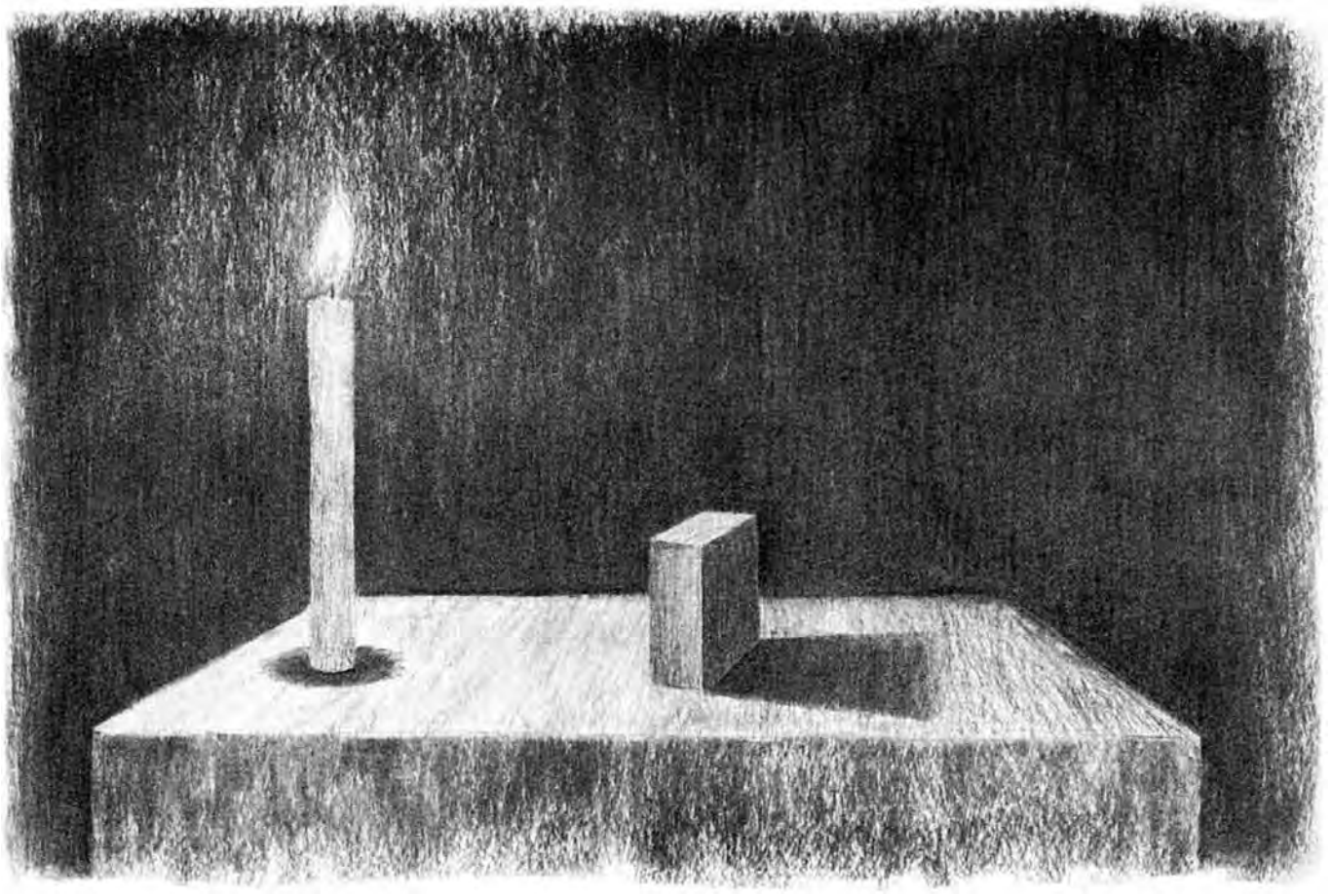


Fig. 6. Experiment using a candle and a matchbox to cast shadows onto the surface of a table. [charcoal]

Now take a twig from a beech tree and look at the buds (Fig. 7). Is it possible to find a law with which to predict how next year's shoot with all its leaves will come out of the bud? You can watch the leaves unfold in spring and the new twig grow (Fig. 8). You can note very exactly the sequence of events and the shapes of the leaves but can you explain or predict how many leaves there will be and exactly when and how they will grow or even which bud will open and which not?

Fig. 8 . The same beech twig as in Fig. 7, unfurling into leaves in spring. [pencil]

Fig. 7. Beech twig with buds in winter. [pencil]

Or perhaps you'd like to plant a seed and watch the resultant seedling appear, grow up, flower and produce seeds itself. You may be able to describe and draw, as we have done for this groundsel plant (Fig. 9), the sequence of events from seed to seedling to flowering plant and so on, but can you find the laws of plant development in the same way as were able to describe the laws of shadows "growing"? What is the difference?

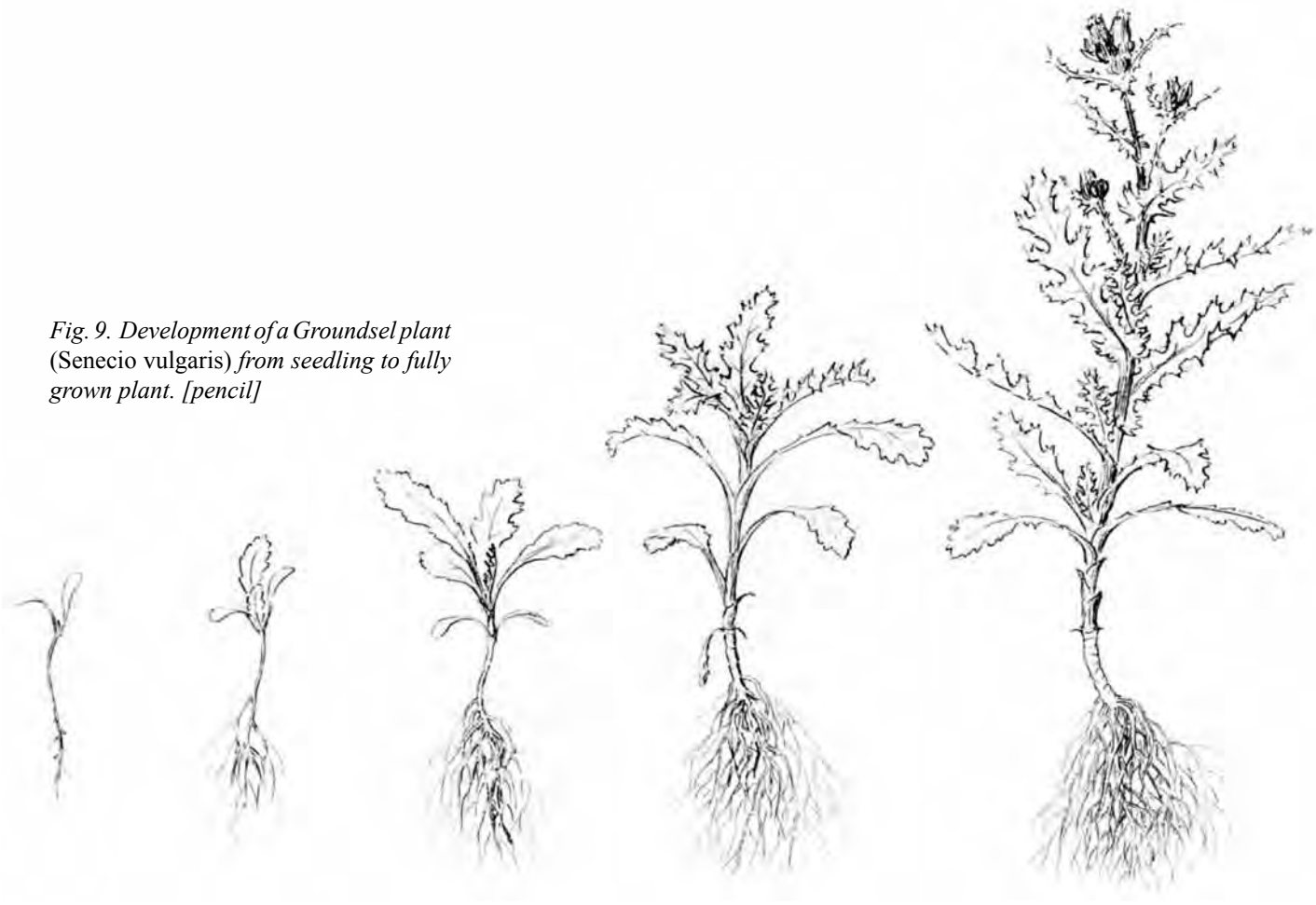


Fig. 9. Development of a Groundsel plant (Senecio vulgaris) *from seedling to fully grown plant. [pencil]*

We are back to the stone and potato question. Both stone and potato cast shadows. So do beech buds and groundsel seeds. But potatoes, buds and seeds have something that stones and matchboxes do not. This "something" is capable of producing a change in time for which outer circumstances alone are unaccountable. This apparently self-impelled development is inexplicable to that aspect of our understanding which can comprehend the shadow experiment. However hard we try and get near to an "explanation" through ideas of atoms, molecules, auxins (plant hormones) and the like no self-respecting scientist would ever admit to

being able to understand or explain the secret of life in the same way that it is possible to see through and comprehend absolutely clearly the cause and effect of shadow production from a given source of light. Roots are *not* the cause of the plant shoot. The sun does *not* create the flower. And yet there seems to be an inner lawfulness about the sequence of events we have described which happens more or less similarly to every groundsel that grows and to every beech bud unfolding or potato sprouting in the spring. How can we study this more exactly? How do we begin to investigate the phenomena of living organisms? How do we develop a way of perceiving and thinking which will do justice to life processes, and enable us to research into that "something" which makes the potato different from the stone and which makes groundsel grow? We will need this if we are to understand organic Nature as clearly as we can understand how shadows are cast.

Who is shining the Light?

The laws of shadow production are so obvious to healthy common sense that from any given set of circumstances involving a light source, a solid object and a plane surface we can easily predict the resulting shadow with the help of a simple geometrical construction. If a candle 6" high is placed a distance of 6" away from a matchbox 2" high, what is the length of the shadow on the table? The drawing (Fig. 10) shows you how to find the size of the shadow by drawing a straight line which projects the height of the matchbox onto the line representing the table. You can draw this to scale and check your findings with the real candle, matchbox and table.

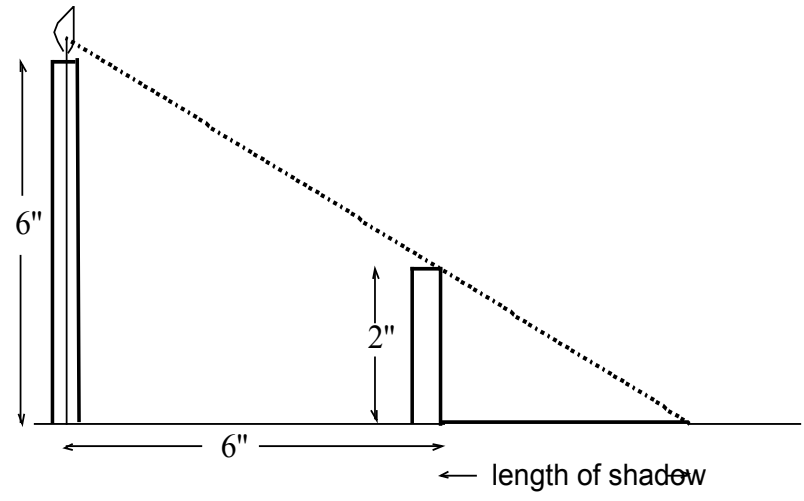


Fig. 10. Diagram illustrating the geometrical construction of shadow projection

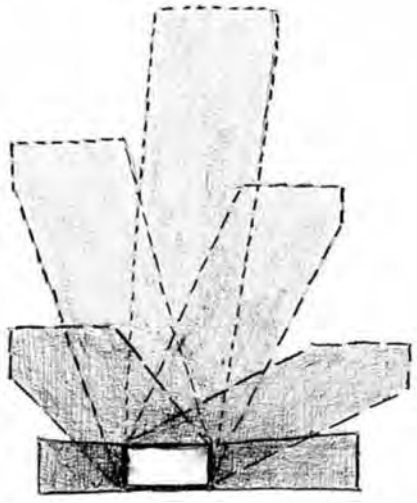
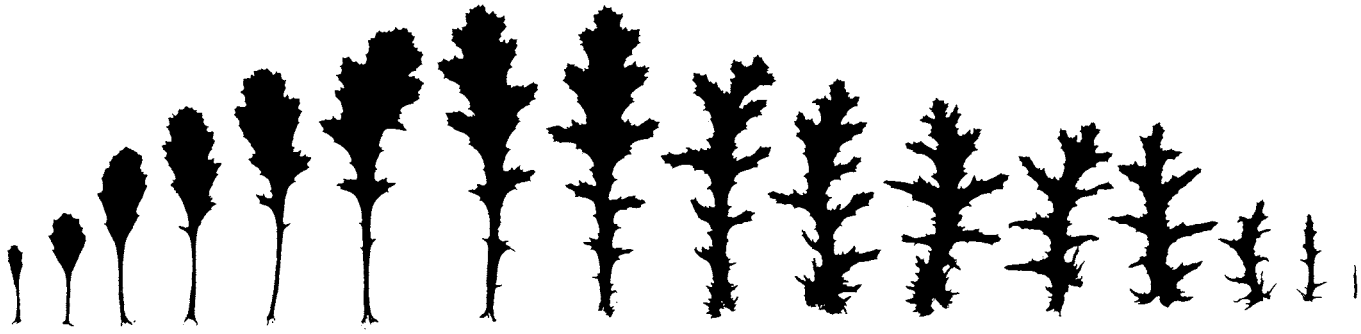


Fig. 11. Shadow patterns produced by a matchbox corresponding to a number of different positions of the lightsource (candle).

Once you have understood this "straight-forward" principle of shadow projection you can construct and predict the shadows of even more complicated objects. Also the perhaps otherwise perplexing outcome of the following experiment will become transparent to your understanding: With the matchbox standing on a white sheet of paper slowly move a lighted candle around the matchbox varying the height as well as the distance. Trace the outline of the shadows corresponding to a number of different positions of the candle onto the paper. The result might look like our illustration (Fig. 11). These patterns can be seen as a metamorphic sequence of two-dimensional forms resulting from a continuous event which happened in time in three dimensions. *We* have created a metamorphic sequence of forms. They can easily be reproduced in exactly the same way as long as the same set of circumstances is repeated.

This sequence of separate forms drawn in two dimensions is literally a shadow representation of a continuous event (involving somebody moving a candle) which happened in time in three dimensions. Something comparable to this, from a certain point of view, we can also find in our groundsel plant if we remove the leaves and lay them flat on a piece of paper, in the same order in which they grew on the plant. Fig. 12 shows a sequence of separate forms, appearing in two dimensions (flat), as a representation of a continuous event (groundsel growing) which happened in time in three dimensions. (These are photocopies made from pressed

Fig. 12 (below). Leaf sequence of Groundsel (Senecio vulgaris).



leaves, all of which were taken from the same plant at the same point of time. If you want to do this for yourself make sure that you only pick the leaves from the main stem and arrange them in the order in which they grew on the plant. For instructions on how to press leaves please consult the appendix.)

You can also do this for yourself taking care only to remove the leaves on the main stem (Groundsel grows everywhere all the year round – its Anglo Saxon name groundeswelge means "ground swallower" and its modern Scots name is "Grundy swallow"). In doing this you might find yourself wondering what has caused this remarkable phenomenon?

Who is shining the light? What is projecting these forms into the physical planes of the leaves of a growing plant? What is more, how do we begin to investigate who might be shining the light?

J. W. v. Goethe – An Artist's Contribution to Science

It may be apparent by now that there is a large part of the process of "coming into being" of forms in organic Nature which is invisible to our eyes and incomprehensible to our normal powers of intellect. This gulf which obviously exists between the non-living and the living worlds was generally acknowledged by scientists (and mankind in general) to be present since science began and indeed, until recently, was considered to be insurmountable. "Life-force" or "ether" was the mystical factor that one had to add to the non-living parts to make sense of how something manifested life. Kant, the philosopher whose ideas still stand behind much of our modern way of thinking, even tried to justify why human beings could not bridge this gulf. He said the type of intelligence needed in order to "know" organic Nature would be an "intuitive intellect" ("intellectus archetypus") which was beyond the capacity of mankind. This is still believed by some people.

However, just over 200 years ago, one of Germany's greatest artists, the poet and playwright *Johann Wolfgang von Goethe (1749–1832)*, started to study plants among other natural phenomena. He had always taken his inspiration for his artistic work from the "universally open holy secrets" of Nature which he believed revealed themselves in the manifest world of sense-perceptible phenomena if only you knew how to look. He experienced both art and science as springing from or leading to that "primal source of all being" out of which has sprung the whole of creation. In turning from art to science – or rather using his art in science – he developed a way of looking at plants which enabled him to *do* what Kant had claimed to be impossible.

Most of Goethe's contemporaries did not take his scientific discoveries seriously. It was considered then, as now, that one person cannot be a genius in two such apparently polar opposite fields as science and art.

His many volumes of observations of clouds, plants, minerals, animals, colour and man lay in archives in Weimar. It was only when, 100 years later, the young scientist and philosopher *Rudolf Steiner (1861–1925)* was asked to edit this material, that the full extent and relevance of Goethe's scientific writings was acknowledged. Rudolf Steiner subsequently developed Goethe's work further as a scientific path of investigation which is accessible to everyone. He named Goethe the "Copernicus and Kepler of the organic world" in recognition of his deed; that deed of laying the foundation for a method of investigation into living organisms. Goethe's "way of seeing" was considered to be as great a contribution to the development of organic science as the clarity of perception and thinking introduced by these two giants to physics and astronomy.

In the course of this book we will try and take the first steps on a journey inspired by Goethe into the "hidden secrets" of the plant world. It will be a journey of exploration in which you are invited to take an active part – not just scientifically but also artistically. Goethe was great both as artist and scientist. To follow in his footsteps by doing science in an artistic way and by allowing art to be inspired by our search for the truth of those inner laws which created both ourselves and the world around us will be our striving. Goethe said:

"He who has art and science also has religion.
He who has neither had better have religion!"

Alongside the experiments and exercises in observation we will invite you to dip into the creative side of yourself and practise artistic exercises which will hopefully enable you both to see more deeply in your "daily science" and to free your imagination as an "artist of life" in general.

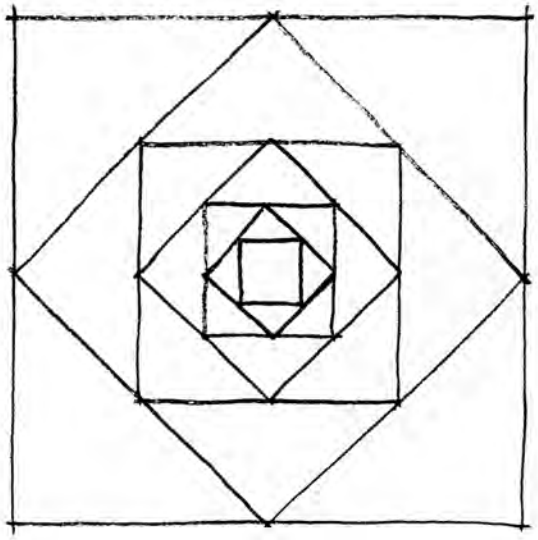
Doing Art

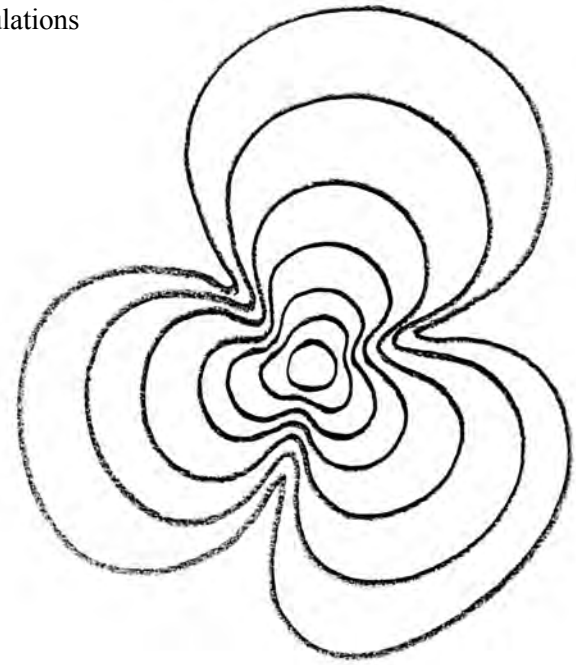
Whenever we change something in the outer world, in our immediate environment, we become creative as "everyday artists". Apart from their practical purposes, the arrangement of furniture in our living room, the daily choice of our garment, our handwriting or even just scribbles which we make on a notepad while telephoning are *outer expressions of inner qualities*. We find them reflecting our sense of order, the way we want to be seen, our personality or a temporary mood. Is there a way of working with our creative potential which goes beyond the mere expression of our subjective individuality and explores how our creations can bear the stamp of objective inner necessities, or lawfulness and truth? Can *doing art* shed any light on the questions which we have asked in this chapter?

Let us draw two "telephone pad scribbles" – only this time in a more disciplined and conscious way (and without the telephone!). It is advisable that you draw them on a large sheet of cheap drawing paper (newsprint or sugar paper) with either a soft pencil or crayon.

For the first drawing (Fig. 13) start with the outermost square. Try to draw the straight lines without a ruler – the effort which it takes to accomplish this is part of the exercise! For each of the four lines which make up the square you have to consciously set off with a new aim. Add the next square inside the first one by placing the points in the middle of the sides of the previous one. Proceed further inside following the same principle.

The second drawing is evolving from a small circle in the centre. A second curve is drawn around the first one beginning to slightly undulate in bumps and indentations. The following curves pick up these undulations and amplify them.





Figs. 13 (left) and 14 (right). Exercises with straight and round lines. [pencil]

How do you experience the difference between these two drawings? What is it like to draw them and how do the results affect you? You are using straight lines in the first drawing and curved ones in the second. Is your involvement the same in both cases? How do you proceed from one square to the next? There is a very clear law which *determines* one square out of the previous one. We have to be quite awake and constantly measure and judge in order to correctly draw this form. In comparison the second drawing leaves you more possibility for variation and allows you to dream a little in the doing. But what is leading you from one curve to the next? Are these lines drawn arbitrarily? Can you experience an inner necessity which lets one form *grow* out of the other? You will have noticed that if you are not fully *inside* the rhythmically growing movement with your feeling involvement you fall out of the living rhythm and your drawing will look awkward and stiff. If on the other hand you allow your "dreaming" to go wild the drawing will look chaotic and inconsistent.

You might find that these two drawings in a certain sense echo our question concerning the difference between the inorganic and the organic world. They also introduced us to the polarity of lawfulness and arbitrariness, order and chaos and the possibility of a playful movement between them. Creatively working with this tension is the daily work of any striving "artist of life".

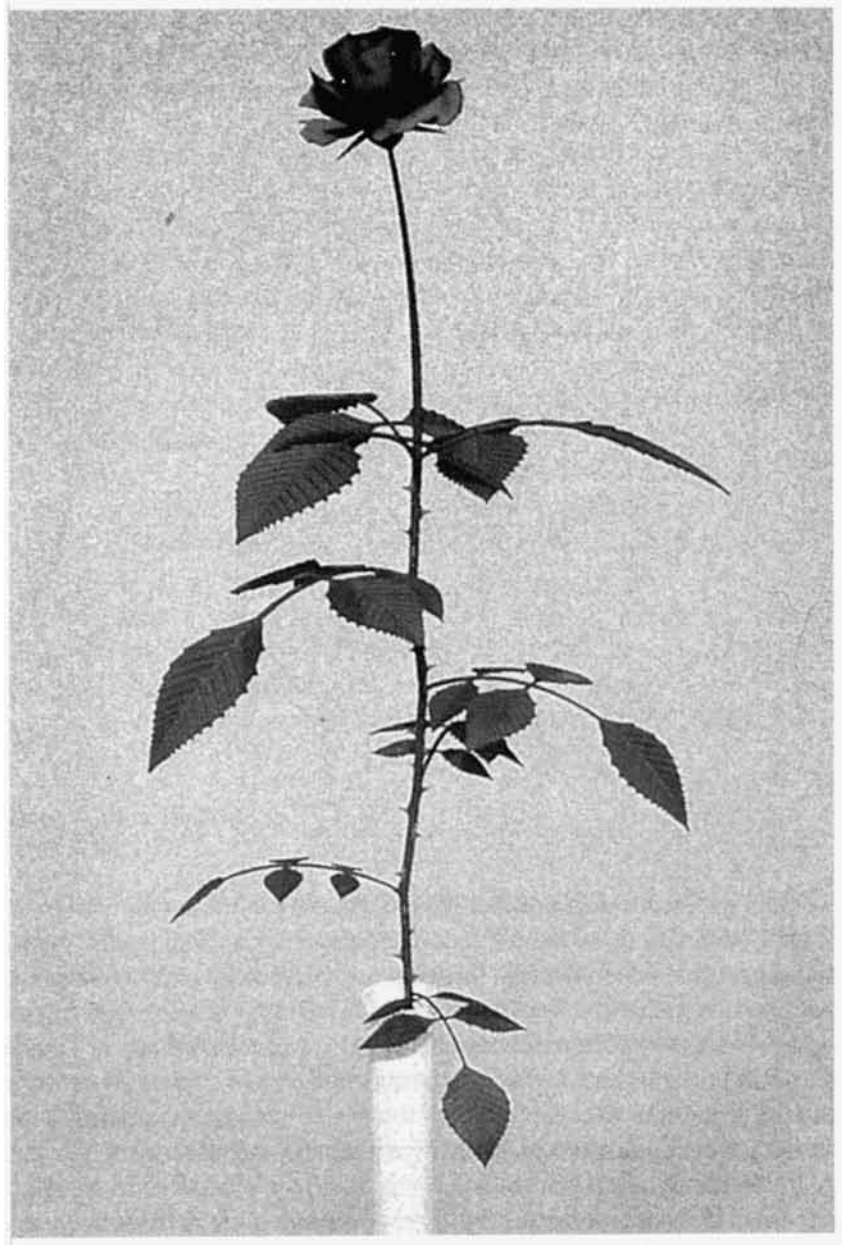


Fig. 15. Image of a rose which has been produced by a computer. Compare this with an artist's rendering of the plant on the opposite page. What attributes and qualities of plant life and of inner lawfulness and truth do these two representations of plants convey to you?

“Dead” or “Alive”

Let us conclude this chapter with two pictures of plants. One is the work of an artist, the other is a computer graphic. Look at them carefully. What attributes and qualities of plant life and of inner lawfulness and truth do these two representations of plants convey to you? Think of the activity involved in creating these two images. Can you imagine the “creative process” of the artist in drawing this picture and the activity of the computer programmer, computer and printer in producing the other image?

Fig. 16. Artist’s rendering of a rose. [watercolour]