CHAPTER I. INTRODUCTION

A. INTRODUCTION

1. Contemporary ecology and ‘responsible knowledge’

Contemporary philosophers of science have come to doubt the possibility of ‘objective’ or ‘value-free’ knowledge as it is presented in its classical formulation. According to certain streams of contemporary thought we can never be external observers, pure ‘knowers’ in the conventional scientific sense of the researcher who makes empirical observations and who then generates theories which are ‘true’ because they actually correspond to the state of affairs in the objective world. Instead it is suggested that we are actually participants in the world and that we construct theories according to our experiences, needs and dispositions. This has opened the way for the ‘subjective’ elements such as values and feelings to impinge upon the previously rigorously ‘objective’ domain of science. With the whole question of what it means to ‘know’ something thrown open, many new questions are currently being raised with regard to what now constitutes appropriate forms of scientific research.

Alongside these epistemological questions there are also pressing issues in the world today which relate to science and which are of an immediately practical nature. I have in mind here our environmental problems in general, the search for ways in which human beings can learn to live in a non-destructive relationship to other life forms on this planet. The term ‘ecology’ now incorporates the recognition that human beings are part of nature and that a purely external point of view of analysis is not possible. For example, Freya Matthews (1988:10) relates how Deep Ecology is concerned with the realisation of nature “as a seamless whole, in which all individuals are inextricably connected with others”. This, Matthews points out, naturally leads to an attitude of caring for the life forms with which we are so intimately connected. Not only is it true that human beings physically share the environment and actively relate with other creatures; contemporary ecological thought also recognises that even in cognitive activity, the way we go about
knowing things, we are exercising an influence which may have positive or negative effects. Hence, as with recent trends in epistemological thinking, contemporary ecological philosophy maintains that we cannot be detached ‘knowers’ of things. The philosopher Martin Heidegger spoke of a form of cognitive relationship with entities which allows them to ‘be’ and realise their potential without undue human interference (Zimmerman, 1993:200-3). The implication of this with respect to scientific research is that beyond merely knowing about entities we may actually learn to become responsible for them in the way we go about our knowing.

2. Goethe’s notion of ‘theory’

The idea that ‘knowing’ can be responsible may appear to be a modern notion, connected to peculiarly present-day dilemmas. Yet this is precisely what the poet and natural scientist Johann Wolfgang von Goethe (1749-1832) meant, when, around two hundred years ago, he made this statement (Goethe, 1988):

Let us not seek for something behind the phenomena — they themselves are the theory.

Goethe was indicating that an authentic science should cultivate a reverence for the experienceable qualities of things rather than a concern with abstract theory-making. His phenomenological approach would only have historical interest were it not for the fact that Goethe’s form of ‘nature study’ is undergoing a major reappraisal in our time. Goethe, along with many of his contemporaries in the so-called Naturphilosophie movement in German culture, was reacting to trends of science in his time which seemed to him to be more fascinated with abstract explanations than with revealing the essential nature of a thing. He felt that in the normal scientific process of investigation what was most precious about a living entity could easily be overlooked, obscured or even destroyed. Although mainly known as a poet, Goethe actually occupied a large part of his life developing a scientific approach

---

1 Goethe’s approach can be related to the contemporary philosophical discipline of ‘phenomenology’ as exemplified by the philosophy of Martin Heidegger. The difference has partly to do with orientation; Goethe’s ‘nature study’ is not essentially philosophical but something ‘experimental’ and ‘practical’.
which he considered had the potential to overcome the limitations of the natural sciences as he saw them. The question which became the focus of my thesis is this: is Goethe’s notion of the ‘theory’ merely of historical interest or does it have particular relevance to today’s environmental issues? Formulated more specifically: does Goethe’s conception of the ‘theory’ (and his associated scientific methods) have something of value to offer us today with respect to the debate about ‘responsible knowledge’?

On the face of it and when considered in the light of the present day epistemological conceptions I have outlined above, Goethe’s statement is problematic. As I have indicated, certain influential contemporary theories of knowledge claim that ‘objective’ knowledge is impossible; that theories are human constructions, that, rather than being something that thinking discovers in or about entities, a theory actually determines our thinking and the way we observe things. Goethe would appear to be saying the opposite of this — that rather than being merely a product of the human consciousness, the theory is the phenomenon itself. For him the task of a responsible science is to reveal the phenomenon as the theory. Goethe is not saying that the theory belongs to the phenomenon as its explanation, or that we form a theory about a thing; he is talking about the identity of the theory and the phenomenon and suggesting that knowledge arises from a thinking which actually participates in the being of a thing.

Goethe’s notion of participatory knowing is related to the ‘organicist’ tradition in Western culture going back to the pre-Socratic Parmenides who said (Hyland, 1973:191): “For it is the same thing to think and to be”. This notion that human knowledge is organically related to reality influenced the Greek thinkers Plato and Aristotle and it can later be found in the ideas of the seventeenth century Dutch philosopher Benedict de Spinoza who was particularly influential on the eighteenth century German Romantic movement of which Goethe was a part. Out of this tradition Goethe evolved a particular ‘holistic’ way of viewing the world which he shared with colleagues in the Naturphilosophie movement such as the philosophers Schelling, Fichte and Hegel who gave to it a precise and comprehensive formulation. Goethe’s notion of ‘theory’ becomes understandable in
the context of this tradition of ‘organicism’. However, while he expressed his ideas in philosophical terms, his major contribution is, I find, not philosophical but practical. Goethe indicated that his theories of natural phenomena should be not merely read and thought about but should, in a sense, be done in order to be properly understood. This has had a determining effect on the structure of my thesis which is both philosophical and experimental.

3. Science and art

My considerations of the contribution of Goethe’s notion of ‘theory’ to contemporary ecological concerns led me to the question of the relationship of science and art in Goethe’s approach to ‘nature study’. Indeed, it was my longstanding interest in the connection of art and science which drew me to this subject of study in the first place. I discovered Goethe to be an individual in whose work art and science come together in a very definite way. His phenomenological approach represents not the integration of art and science but an integral perspective — a recognition of the inherent unity of the two — what could be called a ‘unity without unification’. This, I find, is the key to understanding Goethe’s approach as a new ecological discipline. Accordingly, the visual artwork and poetry in my thesis is not intended to be merely illustrative, or an adjunct to my theoretical and philosophical discussions. I have attempted to work from an ‘integral’ perspective and to give expression to my findings in the most appropriate way. Thus my artwork is intended to be an essential part of my ‘argument’, functioning as a demonstration rather than a discursive statement of my thinking.

A certain limitation should be mentioned right at the outset. Because the thesis is broad in scope, embracing areas of experience normally consigned to the categories of art, science and philosophy, I could not explore the relevant literature very far in any one direction. This would have been far too vast an undertaking. Hence the texts which I refer to, for example when discussing contemporary scientific epistemology, are mostly general ones which provide overviews and salient features. The same thing applies when I am examining the origin of Goethe’s world-view in traditional metaphysics and philosophy. Likewise, in my examination of the four plants, I
recognise that these are only preliminary investigations and are really only pointing a way to further study.

This relates to another point regarding the purpose of my study. I am concerned with ‘understanding’ the plant phenomena in question rather than ‘explaining’ them in some way. A conventional theory has explanatory and predictive power and thus serves a communal need by having ‘objective’ significance. This, however, does not mean that my thesis is merely concerned with my own enlightenment, the development of my personal interests. Present-day phenomenology makes it clear that phenomenological research, while not depending on proofs for validity, has a requirement for intersubjective corroboration (Seamon, 1982:122). I recognise the importance of having my research appraised by others and it is on this basis that people will be able to criticise, learn from and possibly develop my findings further.

4. A Goethean methodology

In my experimental work with four Australian native plants I have used Goethe’s phenomenological method as extended and developed in relation to the four classical elements — earth, water, air and fire — by the biologist Jochen Böckemühl (1985a, 1986, 1988). These elements relate to different qualitative stages of cognition in the understanding of a phenomenon. My reasons for choosing these plants — Grevillea buxifolia, Scaevola ramosissima, Banksia integrifolia and Kunzea ambigua — as the subject of my study are as follows. Firstly there is, to my knowledge, no published evidence of any work being done on these plants using a comparable methodology. I chose a variety of native plants growing in their natural habitats because, to an extent, my study will involve relating the form of the plants to the environmental contexts out of which the plants evolved. These habitats are geographically close to where I live and thus easily accessible for the purposes of this study. The four plants represent a range of plant habits; Scaevola ramosissima has a

---

2 What I am calling ‘conventional’ science is the traditional positivist conception of scientific methodology. I am nevertheless aware that there is a vast discourse today which is questioning these conventions and proposing alternative methodologies. Indeed, Goethe’s methodology can be said to figure amongst these alternatives.
sprawling habit. *Grevillea buxifolia* and *Kunzea ambigua* have shrubby habits. *Banksia integrifolia* tends to be more tree-like in habit.

**Stage one**, which I am calling EARTH, is the recording of empirical, sensory information about the phenomenon in question, what is apprehensible in the here and now. I recorded information about the plant including colour, size, texture, hardness, presence of features such as hairs, smell, taste etc.; in this way I describe the plant, from root to leaf, to flower, fruit and seed.

**Stage two** I am calling WATER, meaning the dimension of time or movement, the ‘fluid dimension’. In this second stage I entered into the dynamic growth processes of the plant, its changes of form over time (metamorphosis), which, for example, in the case of the *Grevillea*, was particularly pronounced in the sequence bud, flower, fruit, seed. The ‘moments’ of growth are united into a continuity of form by means of what Goethe called “exact sensorial imagination”.

**Stage three** I am calling AIR, meaning ‘life-gesture’. What I aimed to understand, at this stage, were the ‘gestures’ or ‘meanings’ of the metamorphic ‘movements’ of the plant form. At this point I have radically departed from what could normally be described as ‘empirical science’; here I purposefully exercised my artistic faculty in order to come to an interpretation of the living ‘gestures’ of the plant. Consequently my findings were at this stage in the form of poems and less realistic sketches and paintings.

**Stage four** I am calling FIRE, meaning ‘creative potency’. The artworks I present at this stage are the most expressive, least realistic, farthest removed from ‘science’ as conventionally understood. Yet this is the point, as I explain, where I reach closest to the ‘theory’ of plants (in Goethe’s sense of the term). I describe the theory as the ‘formative power’ of this plant, its living potency. This, I suggest, is what Aristotle had referred to as the ‘entelechy’ of an organism (Aristotle, 1986).
5. Avenues for further research and application

I suggest the Goethean methodology I have used has great significance for environmental research and development. There is potential for continued research both into the plants I have studied and into Australian flora and fauna in general. This Goethean form of phenomenological investigation also can be used for the research of whole environments, which may include human beings along with animal and plant entities. Such research, I suggest, has direct application to landscape and architectural design as well as to environmental education in general. Whether the research is focussed on individual entities (such as my own investigation of the four plants), or whether it extends out into creative applications, the emphasis in the Goethean approach is always on participatory rather than on detached, abstract knowing. This, I conclude, is the important contribution this approach can make to the contemporary environmental debate about how humans can learn to live more harmoniously with non-human nature.

B. OVERVIEW OF THESIS STRUCTURE

In order to present a clear and accessible overview of the structure of this thesis what follows here is a summary statement of the content of each chapter.

Chapter II. Theoretical Framework

Here I discuss the historical and cultural context, in other words, the ‘world-view’ from which Goethe developed his notion of ‘theory’ as expressed in the statement: “Let us not seek for something behind the phenomena — they themselves are the theory”. In connection with this I also examine what he meant by ‘phenomenon’ and ‘knowledge’. In the second part I look at the world-view of contemporary science using parallel headings: ‘world-view’, ‘phenomenon’, ‘knowledge’, ‘theory’. Here I have isolated three significant streams of present-day thought, each with quite different views on the nature of ‘theory’; namely, realism, relativism and phenomenology. I conclude this chapter by placing Goethe’s thinking in the context
of these contemporary philosophies of science and finding that Goethe is closest to modern phenomenology, as represented by Martin Heidegger.

Chapter III. Goethe and Contemporary Ecology

In this chapter my aim is to focus in the context of contemporary ecological philosophy the previously explored ideas regarding Goethe's scientific approach. Beginning with a general exploration of the origins of contemporary ecology, I move to a closer examination of two strands of contemporary ecological thought — Deep Ecology and Social Ecology. The question of what constitutes responsible 'creative intervention' into nature leads me to the consideration of Goethe's approach as a 'new ecological discipline'. Here I show that, not so much as theory but as an example of practice, Goethe's form of 'nature study' has significance for the present time. As a practice it can be characterised as a relationship of science and art. What is new about Goethe's approach is not so much that it integrates art and science but that it shows an integral character, bespeaking the intrinsic unity of the two. I show why this integral approach is inherently ethical and ecological in nature and thus relates to the ancient meaning of art as techné.

Chapter IV. Goethe's Theory of Plant Development

Developing further the notion that Goethe's form of 'nature study' is really only significant as a practice, I now proceed to show how he practised his experimental work with plants. I look in turn at four of his principles of plant development — metamorphosis, polarity (expansion and contraction), intensification or enhancement, and the 'archetypal plant'. These principles I explicate by following a process of observing the leaves of the field poppy by means of 'aesthetic cognition'. Thereby I show the way of coming to an understanding of the 'theory' of the plant in the way Goethe did — through a deeper and deeper participation in the living process of the plant.
Chapter V. A Goethean Methodology

This examination of Goethe’s own practice leads on to an elaboration of the Goethean methodology I will use for my own plant investigations. The methodology presented here relates Goethe’s indications to the four classical elements — earth, water, air and fire (deriving from the work of Jochen Bockemühl). The experimental process begins with the ‘first impression’ of the phenomenon which is often registered as a mood. Stage one of the experiment is a detailed empirical examination of the plant through an ‘earthy’ mode of observation. Stage two is the participation in the growth processes of the plant through ‘exact sensorial imagination’, a ‘watery’ mode of cognition. Stage three is experiencing the organism in terms of its gestures — an ‘airy’ mode of cognition. Stage four is apprehending the ‘whole’, the ‘theory’, the ‘archetypal plant’. This is the ‘firey’ mode; it experiences the ‘formless’ (theory) as creative potency.

Chapter VI. A Goethean Study of Four Native Australian Plants

Here I present my study of four plants which are native to the Sydney area — Grevillea buxifolia, Scaevola ramosissima, Banksia integrifolia and Kunzea ambigua — using the methodology of Goethe/Bockemühl as outlined above. At each stage of the investigation I present my findings in an appropriate way. In stage one of the process the information deriving from an empirical examination of the plants is recorded systematically in written form. In stage two I describe some of the metamorphic sequences of the plants and record movements in visual form by means of realistic drawings which show different ‘moments’ in these movements. In stage three I express these movements as ‘gestures’ of the plants’ formative principle. Here I work in the forms of both poetical and visual expression. In stage four I look more deeply into these ‘gestures’ to find their ‘creative potency’. Here, because I am not regarding something which has an objective existence, my poetic and visual expressions attain their most expressive, non-realistic form.
Chapter VII. Summary and Conclusions

The conclusions I draw relate firstly to my experiments with the plants, and secondly to the potential for further research and application. I suggest that I have not explained anything about these plants (in the usual scientific sense of theory) but have nevertheless developed an understanding of the plants in a way which can complement conventional scientific knowledge. My findings have relevance to the modern scientific discipline of morphogenesis (or dynamic morphology), the exponents of which acknowledge a connection to Goethe. Because of the inherent creative nature of the Goethean way of working I find direct applications in the areas of landscape and architectural design. I also see the relevance of my Goethean approach to environmental education. I end by suggesting that the Goethean approach to nature study is responsible, not because it attempts to overcome environmental problems which threaten human existence, but because it tries to understand non-human phenomena in our environments in and for themselves.
CHAPTER II. THEORETICAL FRAMEWORK

The intention here is to explore the cultural context which gave rise to Goethe's statement, "Let us not seek for something behind the phenomena — they themselves are the theory". Goethe's ideas are presented in relation to some of the trends in the contemporary philosophy of science and are appraised regarding their relevance to present day culture.

There are three parts to this chapter: Part A focuses on Goethe's philosophy of science while in Part B I present an overview of the contemporary philosophy of science. Part C is a discussion of Goethe's ideas in relation to the contemporary philosophy of science. Parts A and B are divided into four sub-sections: 1. World-view; 2. The Phenomenon; 3. Knowledge; 4. The Theory.

The overall strategy in choosing these sub-sections was to begin with a broad perspective and then to narrow the focus. Thus, in the first sub-section, Goethe's world-view is explored — his interests and ways of seeing things, the traditional ideas from which he drew his inspiration. In the second sub-section Goethe's ideas concerning the 'phenomenon' are examined. 'Phenomena' is one of the two keywords I have identified in the above statement. The question here is, how does Goethe's understanding of 'phenomenon' relate to his world-view? The third sub-section represents a further focussing of Goethe's world-view upon the particular question of what it meant for him to 'know' a phenomenon. This leads on to the fourth sub-section — the meaning of 'theory' in the light of Goethe's world-view, 'theory' being the other key-word in the above statement.

A. GOETHE'S PHILOSOPHY OF SCIENCE

1. World-view

Goethe was not primarily a philosopher; he did not write any treatises in which he systematically developed metaphysical or philosophical ideas. Neither can he be called a scientist in a narrow sense; his style of experimentation was informed by
both his philosophical and artistic leanings. He thought of himself as a ‘nature looker’ (Naturschafter) rather than a scientist. He cannot be called simply a philosopher, a scientist or an artist; he was all of these and his ‘science’ must consequently be thought of as consisting of all these elements.

His world-view can be understood both through the fragmentary ideas he expressed in his articles and through the kind of philosophies he was most attracted to. He studied past philosophy, particularly that of Spinoza, Bruno, Francis Bacon and the Neo-Platonic tradition in general. He had an early love for the writings of Jean Jacques Rousseau and this continued throughout his life. He immersed himself in the art and science of his time and was influenced by the ideas of philosophers such as Schelling and Hegel and, speaking generally, was connected with the seventeenth to eighteenth century movement of German ‘organic’ philosophy called Naturphilosophie. To discuss Goethe’s world-view is not a simple matter of aligning him with any particular philosopher. He was a creative thinker who absorbed ideas from many sources. Here only the primary sources will be discussed.

It was during his student days that he discovered Rousseau, and the impression was profound and lasting. One (perhaps over-enthusiastic) biographer, J. G. Robertson (1932:3), writes that

he experienced the full brunt of the spiritual awakening that was ushered in by Rousseau; and, indeed, he became the apostle of that awakening in Germany, and led it to a higher consummation than it reached in France itself.

Goethe shared with Rousseau a spirit which resisted the rationalistic and mechanistic materialism that had become characteristic of the Enlightenment. He drew from Rousseau a vision of the ‘natural man’, the human being who is free from the restrictions and distortions of society, and who may follow his life’s course in freedom. It was Rousseau’s view that human beings should seek the law of their being from within themselves and in this the ‘feelings’, ‘inner voice’ or ‘heart’ are as important as the dictates of the rational mind. Goethe was greatly inspired by such views, as was Kant, Lessing and many others of the German Romantic movement (Cassirer, 1945).
Another profound influence upon his thinking was Spinoza's metaphysics; Goethe first read Spinoza in his early twenties (Robertson, 1932:62). Baruch Spinoza (1632-1677) in his philosophical works had presented the universe as a totality, a whole, all the parts of which obey necessary laws grounded in the nature of the whole. This became the essence of Goethe's own view of nature. Spinoza proposed that the divine is wholly merged with the world, that God cannot be conceived as a remote cause of things. He believed that the creating aspect (\textit{natura naturans}, or 'nature naturing') and the created aspect (\textit{natura naturata}, or 'nature natured') are both distinguished and united within the whole which is Nature itself, or God. In other words, God is wholly natural, not supernatural and belonging to an unknowable Beyond. Thus Spinoza is generally considered a pantheist, and in terms of Christian theology, an atheist.

Goethe also felt an early sympathy for the philosophy of Giordano Bruno (1548-1600), to whom he returned when he was in his sixties (Steiner, 1988:164). Bruno himself was principally inspired by the pre-Socratic philosophers, by Aristotle and the Neo-Platonic tradition of cosmological thought. Bruno, as did Plato, considered the universe to be a living being, an organic whole. He thought of Soul as the living unifying principle, immanent in the universe in all of its parts, as the individual soul of a living being is completely present in each of its members (Michel, 1973:255). Such ideas were later to reappear in the philosophies of Spinoza and Leibniz. God, for Bruno, is the Supreme One; yet God penetrates nature; all matter is thus divine.

Bruno regarded 'universal reason' as the creator and director of the universe. He calls it the \textit{inner artist} that forms matter and shapes it from \textit{within} outwards. He wrote: "\textit{Natura est Deus in rebus}, Nature is the art of God" (Michel, 1973:60). Bruno related the quickening, unifying creative principle of the universe to the act of an artist, but only to distinguish the activity of nature from human activity. Humanity works its creation on nature, it reconstitutes what is already constituted, it works 'from without'. Nature, however, works from within. Bruno writes in his metaphysical tract \textit{De las causa, principio et uno}:

We call it the inner artificer because it shapes matter and figures it from within, in the same way that from within the germ or the root it causes the
stem to issue forth; from within the stem it sends forth branches; twigs from the branches; and buds from the twigs; from within it shapes, figures, entwines and innervates, as it were, the leaves, flowers and fruits. (Michel, 1973:90)

As I will be showing, this kind of ‘organic’ understanding of the universal creative process is inherent in Goethe’s views on ‘the phenomenon’ and ‘the theory’.

Goethe was also, from the 1760s onward, profoundly influenced by the philosopher Herder who had become a close friend (Robertson, 1932:24). Herder and Goethe were both indebted to Leibniz’s version of Plato’s cosmological scheme which was brought into a contemporary (eighteenth century) perspective by Charles Bonnet through his book Contemplation de la nature (Nisbet, 1972:8). The aspect of Neo-Platonism which most strongly influenced Goethe we would today call ‘holistic’. As indicated above, Goethe first encountered a ‘holistic’ world-view in the teachings of Bruno and Spinoza where the universe is considered to be a ‘whole’, a single being. For these thinkers all things are thus characterised by their relatedness, for all are manifestations of the One, or Being as such.

This ‘holistic’ world-view, coming through Leibniz to Goethe (and to German Romantic ‘organic’ philosophy in general) had its source in Plato’s Timaeus which states that the universe constitutes a single unity, a dynamic, organic and divine whole of which man is an essential part. Out of this Goethe arrived at the idea that nature comprises a continuous chain of entities (the traditional Great Chain of Being), a chain which is composed of discrete elements which are continuously and dynamically linked to form a single whole. Furthermore, he believed that within this organic picture there is a hierarchy of wholes, each enclosed within a larger whole and that knowledge, in order to be a true reflection of the universe, must itself constitute an integral whole. This view closely reflects Leibniz’s metaphysics (Nisbet, 1972:11-20). The implication of this is that all natural entities share the attributes of the universal whole. Such a view of nature as a living, creating whole finds expression in Goethe’s fragment Nature, where he writes (Goethe, 1988:5):

To each she appears in a unique form. She [Nature] hides amid a thousand names and terms, and is always the same.
Goethe himself was well aware that his world-view was outside that of conventional science and theology which dismissed it as pantheistic or mystical. Yet, as Cassirer (1950:122) has noted, the ‘organic’ world-view, the idea that nature is itself divine, is as fundamental in the development of Western philosophy and metaphysics as is the Aristotelian tradition of viewing God as the Demiurge, the Prime Mover or Absolute Cause, standing over and above things and arranging them.

2. The Phenomenon.

‘Phenomena’ is the first key word I have identified in Goethe’s statement, “Let us not seek for something behind the phenomena — they themselves are the theory”. There is no particular text where Goethe has elaborated his ideas on the nature of the phenomenon. Certain references can however be found in the form of fragments such as the one in question; from these clues, and in relation to his primary philosophical influences, it is possible to gain a picture of his understanding of the ‘phenomenon’.

From the above discussion of his world-view it is clear that, in a general sense, Goethe understood natural phenomena as manifestations of the divine, as reflections of the ‘whole’ out of which they are created. Goethe could not think, for example, of a plant as ‘merely’ a material entity, but as an expression of the living, universal creative principle. It was for this reason that Goethe’s attitude towards the things of nature was one of reverence, as has been noted by many commentators (for example, the biologist Adolf Portmann [1987]). For Goethe a phenomenon had a symbolic character. He writes:

It is impossible to perceive directly the true which is identical with the divine. We can see it only in its reflection, in similes, in symbols, in individual and related phenomena. (quoted in Bertaini, 1951:82)

In other words, he did not regard a phenomenon as limited to what is materially visible but as a window onto a greater reality.
I have discussed Goethe's relationship to the ideas of Bruno, Spinoza and the Neo-Platonic tradition in general. Goethe shared an interest in these philosophies with many of his contemporaries who participated in the Naturphilosophie movement. Goethe acknowledged his debt to the philosophers Fichte, Schelling and Hegel in one of his essays (Goethe, 1988:30). It is useful here to examine, at least briefly, the ideas of these contemporaries, for it is in the milieu of their thinking that Goethe formulated his own conceptions of 'the phenomenon'.

Johann Gottlieb Fichte (1762-1814) drew his ideas from the 'organic' tradition in general, and principally from Spinoza. Fichte gave expression to the idea of the absolute unity of human existence with the divine in what has been called his 'absolute idealism'. For Fichte, the absolute divine principle is the self or Ego. Thus his thinking could not recognise a phenomenon as having any reality 'in itself' outside of consciousness. He writes (Fichte, 1956:75):

our consciousness of external things is absolutely nothing more than the product of our own presentative faculty, and that, with respect to such things, we know only what is produced through our consciousness itself, through a determinate consciousness subject to definite laws ... In what we call knowledge and observation of outward things, we at all times recognise and observe ourselves only.

Now, while Goethe acknowledged his connection to the ideas of Fichte there is nothing to indicate that he adopted such an 'absolute idealism'. Nevertheless, as will be made more clear further on, Goethe did understand nature as being, in a certain sense, ideal or divine — that is, created out of archetypes or formative principles.

With the philosophy of Friedrich William von Schelling (1775-1854) Goethe found a closer accord. Goethe had read a pre-publication text of the philosopher's treatise Bruno or On the Divine and Natural Principle of Things (the title is a reference to Giordano Bruno) and later communicated his impression of it in a letter to Schiller: "What I understand of it, or believe I understand, is excellent and coincides with my deepest convictions" (Schelling, 1984:9). In Bruno and Schelling's other works we find the expression of a philosophical system which had many connections with that of Fichte but significant differences as well. Schelling's philosophy did not express an 'absolute idealism'. It was informed by the same
tradition of ‘organic’ thinking but his orientation was not towards an absolute subjectivity or Ego. In Schelling’s notion of the Absolute a thing could not be absolutely ideal or absolutely real. He considered that absolute Unity gave rise to the Other (the world of multiplicity or phenomena) from out of itself by metaphysical dialectical process. He saw the divine Ideas, not as the creative principles according to which a divine Ego shapes existence (the idea found both in Fichte and further back in Kant) but as self-subsistent principles acting within nature.

Hence we find in Schelling’s thought a concept which resembles Bruno’s notion of an inner artificer acting within things. This was the formative idea behind his philosophy of nature. For Schelling, natural phenomena are self-subsistent, creating themselves out of themselves. In his Ideas for a Philosophy of Nature (1988:34) he declares:

you destroy all idea of Nature from the very bottom, as soon as you allow the purposiveness to enter her from without, through a transfer from the intelligence of any being whatever.

He writes in the same text (1988:32), with particular reference to plant phenomena, that

the purposiveness of natural products dwells in themselves, that it is objective and real, hence that it belongs, not to your arbitrary but to your necessary representations. For you can very easily distinguish what is arbitrary and what is necessary in the conjunction of your concepts. Whenever you conjoin things which are separated in space in a single aggregate, you act quite freely; that unity which you bestow on them you transfer to them simply from your thoughts; there is no reason residing in the things themselves which required you to think of them as one. But when you think of each plant as an individual, in which everything concurs together for one purpose, you must seek the reason for that in the thing outside you; you feel yourself constrained in your judgement; you must therefore confess that the unity with which you think it is not merely logical (in your thoughts), but real (actually outside you).

This passage will become particularly relevant when I come to discuss Goethe’s notion of the ‘archetypal plant’. Schelling thus understands organic phenomena, not merely as dim reflections of transcendent, unifying Ideas (Reality), in the way Plato’s Ideas or Forms are often interpreted, but as real entities in which the Idea works as a formative principle.
Georg Wilhelm Friedrich Hegel (1770-1831) was another German philosopher of the Naturphilosophie movement who knew Goethe personally. That Hegel took a deep interest and had a high regard for Goethe’s scientific ideas is attested in his Philosophy of Nature Vol. 3 (1970b) where he discusses Goethe in some detail. Hegel’s understanding of ‘the phenomenon’ shows a definite connection with the thinking of Schelling. Hegel saw the world as a unity of absolute Spirit or Subjectivity which works itself out or externalises itself in time, through a dialectical process which has distinct ‘moments’. He, as did Schelling, thought it untrue to say that the dimension of unity is more real than that of the world of multiple phenomena, for the potential for differentiation is inherent in the unity of Spirit. As Hegel writes in his Phenomenology of Spirit (1977:100):

> The unity, of which it is usual to say that difference cannot issue from it, is in fact itself one of the two moments; it is the abstraction of the simplicity or unitary nature over against the difference. But in saying that the unity is an abstraction, that is, is only one of the opposed moments, it is already implied that it is the dividing of itself; for if the unity is a negative, is opposed to something, then it is eo ipso posited as that which has an antithesis within it.

This statement places Hegel with the tradition of ‘organic’ philosophy, which understands the divine as immanent in things, and the universe as an integral and dynamic ‘whole’. Hegel philosophised from an integral frame of reference, embracing and transcending subject and object in a dialectical, creative process of becoming.

Because Hegel understood the world of phenomena as the differentiation of Spirit, he was able to understand that within that world different phenomena have a different ontological status. A plant, thus, is quite a different kind of being from a rock, or an animal. Hegel wants to know, for example, what a plant is ‘in itself’. Human beings confront a world of phenomena which they characteristically try to master and exploit. As he observes (Hegel, 1970a:195):

> In general, the practical approach to nature is determined by the self-seeking of appetite. Need impels us to turn nature to our advantage, to exploit and harness and in short to annihilate it.
To know what a thing is is not merely to give it a name, to classify it and “transform [it] into something universal” (1970a:198). Hegel is concerned, in his Philosophy of Nature, to illuminate phenomena as unique manifestations of Spirit, to understand them, not according to our needs and determinations, but out of their own natures.

It is here that we find a close connection with Goethe’s understanding of ‘the phenomenon’. Goethe, like Hegel and Schelling before him, believed that nature is destroyed if we see it in any other way except as arising out of itself, that its ‘unity’ or ‘idea’ is concrete in the thing itself. In his essay A Study Based on Spinoza Goethe talks about the nature of a living being and its relationship to infinite or total existence. Here he is dealing with the paradox of a phenomenon’s uniqueness and universality. He states (1988:8):

Although all finite beings exist within the infinite, they are not parts of the infinite; instead they partake of the infinite.

Regarding an organic phenomenon’s self-emergence he writes (1988:8):

We have difficulty believing that something finite might exist through its own nature. Yet everything actually exists through its own nature, although conditions of existence are so linked together that one condition must develop from the other. Thus it seems that one thing is produced by another, but this is not so — instead, one living being gives another cause to be, and compels it to exist in a certain state.

Elsewhere he notes (Goethe,1988:47):

All organic being differentiates itself within itself, and maintains the unity of multiplicity.

Goethe is concerned, above all, with the integrity of the phenomenon; he strove in his experimental research to reach a point where he would be able to see a phenomenon in this light.

Accordingly he defines three different levels of phenomenon according to the degree of insight one has into their nature (Goethe,1988:24-5). He calls the empirical phenomenon that which everyone finds in nature, the objects that confront us in day to day life. Experimental work upon the empirical phenomenon, by producing it in conditions different from what it was first observed, gives rise to what he calls the
scientific phenomenon. The pure phenomenon comes forth from the other phenomena by a “self-distilling” process whereby the experimenter attains a “higher standpoint” by setting aside what is accidental and finding what is necessary in the phenomenon. This is a pathway of research which seeks the phenomenon on its own terms or as it arises out of itself.

3. Knowledge

Goethe’s comments on ‘the phenomenon’ are scattered throughout his essays and other writings and the same thing applies to his thoughts on what it means to ‘know’. Nowhere is there to be found a systematic exposition on this subject but much can be gleaned from his fragmentary indications and through reference to the ideas of philosophers who most influenced him.

I have established Goethe’s relationship to Bruno, Spinoza and the Neo-Platonic tradition in general. Throughout this organic tradition there weaves a particular notion regarding human knowledge; namely, that the human being, by virtue of his very organic connectedness to the universe, can come to understand the phenomena of the universe; we can know what we, in some sense, are. Plato spoke of the apprehension of the Forms or Ideas. According to Plato, that which arises in consciousness through the sensuous appearance of things is mere opinion. However a person who apprehends the Forms or Ideas by means of the ‘pure intellect’ goes beyond the particularities of the sense world; it is only then, according to Plato, that we may speak of ‘truth’. As Henri Bortoft (1986:82) points out, the Idea has often been interpreted as being a general concept abstracted from many instances (an abstract universal) whereas, for Plato, the Idea is actually an aspect of the phenomenon itself — its unity aspect.

H.G. Gadamer has noted that the philosophers of the Medieval period, as in classical times, conceived “knowledge as an element of being itself and not primarily as an attitude of the subject” (1979:416). This was true, too, of Giordano Bruno, at least in the way he understood knowledge on the ‘highest’ level. For Bruno, the aim of all knowledge is truth, which is unity. But, as Michel (1973:58) points out, that
does not mean Bruno believed, in Neo-Platonic fashion, in the unlimited capacity of the intellect to know God in His essence. In his *De l'infinito* Bruno distinguished four stages of truth; *sensus, ratio, intellectus* and *mens*. Reason (ratio) performs the decisive step in passing from the plurality of perceptions and sensations (*sensus*) to the unity of the idea. Natural knowledge is discursive knowledge, proceeding by argumentation or discourse. Michel writes (1973:70), according to Bruno,

the intellect, which dominates and unites concepts that reason has only elucidated and set in order, is certainly the final term of natural knowledge.

Above *intellectus* is *mens*, which acts, not discursively, but by "pure intuition". The *mens* is the instrument of highest philosophical contemplation. Bruno believed that there is a limit to intellectual knowledge, and that to rise to the divine through pure intuition was to go beyond all 'natural' forms of cognisance, this illumination being the free gift of the divinity and the reward of faith (Michel, 1973:70).

In a later century, in the organic philosophy of Spinoza, no such limit was placed on the capacity of human rationality. For Spinoza, to know something was to be conveyed a piece of divine knowledge. He saw knowing, not as a shadowy abstraction, but as a mode of the life-force, of the divine itself. Spinoza recognised three levels of knowledge; firstly opinion, which put the human being at the mercy of the extended modes of Nature or objects; secondly science, which acts to order external things by seeking their underlying idea; and thirdly *scientia intuitiva*, which, as Gilson and Langan (1963:36) summarise it,

grasping the supreme clear and distinct ideas of the divine substance, its attributes and its modes, would put the soul in a position, viewing all of reality *sub specie aeternatatis*, [as flowing from the Divinity] to exercise adequate control over everything we do.

Spinoza had complete faith in the rational mind, for he believed that the rational necessity by which the mind thinks logically is precisely the divine, rational necessity by which things actually come into existence. Spinoza wrote: "The order and connection of ideas is the same as the order and connection of things" (quoted in Gilson & Langan, 1963:138).
These kinds of metaphysical considerations were of practical significance for Goethe; they informed his work in both science and art. Goethe was, amongst other things, deeply interested in the historical development of scientific practice. He initially admired the philosophy of Francis Bacon and regarded him as an authority on the scientific method, in particular the inductive process (Nisbet, 1972:27). Bacon had laid the foundations for an empirical scientific method; he indicated that conclusions can only be reached from a close observation of the phenomena themselves. Bacon believed that the scientist must begin by collecting his material from observations and sensory impressions alone and without any theoretical preparation or the involvement of abstract or a priori ideas. He considered that only when the data is prepared should the work of examining it begin; then individual cases can be compared until a rule is found (induced) which covers that definite set of phenomena.

Goethe appreciated Bacon’s concern with ‘the things themselves’ rather than abstract speculation; it connected with his own understanding of and reverence for ‘the phenomenon’. What Goethe found he could not agree with were the forms of scientific rationalism as exemplified in his time by the scientific methods of Newton. Already in Goethe’s day ‘subjective’ or ‘intuitive’ factors in experience, such as expressed in the philosophy of Spinoza, were considered irrelevant and of no scientific importance. A powerful science was being forged from a fusion of rationalism and empiricism as a means of ‘unlocking’ nature’s secrets. In Newton’s hypothetico-deductive method an experiment is carried out in order to test a hypothesis (hypotheses non fingo); a theory is then deduced regarding the phenomenon from abstract (mathematical) principles. Goethe carried out an extended polemic against Newton and his followers, in particular with regard to his theory of colour. In the end Goethe could not align himself with the methods advocated by Bacon because he came to see that human knowing involved more than simple induction from observation, and because he realised that Bacon’s empiricism actually led on to the triumph of rationalism in the work of Newton and his followers (Nisbet, 1972:30). Neither the inductive nor the hypothetico-deductive methods, as he saw them being practised in science around him, could accommodate what he regarded as the highest possibilities of human knowing.
We get an insight into what Goethe considered those highest possibilities to be if we turn to his relationship with the philosophy of Immanuel Kant. In his essay *The Influence of Modern Philosophy* (1988:28) Goethe remembers his first encounter with Kant's *Critique of Judgement*:

With this book a wonderful period arrived in my life. . . . I did not always agree with the author's way of thinking, and occasionally something seemed to be missing, but the main ideas in the book were completely analogous to my earlier work and thought.

It is most instructive to find out about one of the points with which Goethe could not agree. He writes about this in another essay entitled *Judgement through Intuitive Perception*. Kant saw the limit of human knowing in its discursive functioning; that is, its capacity to order the data of sense perception. He denied that the human mind could understand things as they are 'in-themselves'; that is, in their essential or divine nature. Nevertheless, in his *Critique of Judgement* (1987:291-292), Kant writes:

We can conceive of an understanding that, unlike ours, is not discursive but intuitive, and hence proceeds from the synthetically universal (the intuition of a whole as a whole) to the particular, i.e., from the whole to the parts. . . . we do not have to prove that such an intellectus archetypus is possible. Rather, we must prove only that the contras (between such an intellect and) our discursive understanding — an understanding which requires images (it is an intellectus ectypus) — and the contingency of its having this character lead us to that idea (of an intellectus archetypus). . . .

Goethe made special mention of this passage in the essay *Judgement through Intuitive Perception*. It seemed to Goethe that Kant was expressing here a certain ambivalence and a "roguishly ironic way of working". Goethe writes (1988:31):

At times he seemed determined to put the narrowest limits on our ability to know things, and at times, with a casual gesture, he pointed beyond the limits he himself had set. He had no doubt observed man's precocious and cocky way of making smug, hurried, thoughtless pronouncements based on one or two facts.

Goethe goes on to say that, while Kant seems to be pointing to divine intellect, there is no reason why intuitive perceptive or 'determinative' knowledge (thinking from the whole to the parts) is not in principle possible. He indicates that it is precisely
towards this possibility that he had striven in the development of his scientific method.

The meaning of what Goethe called 'determinative' knowledge is further illuminated if we look again at the philosophical systems of Fichte, Schelling and Hegel, all of which were influential on Goethe. Each of these philosophers was concerned with the nature of human thinking and knowing. Fichte declares in his *Vocation of Man* (1956:21):

My knowledge of external things . . . does not flow from them; their pretended influences and operations cannot bring me a knowledge which is not in themselves. The ground upon which I assume the existence of something beyond myself does not lie outside of myself, but within me, in the limitation of my own personality.

He writes in the same text (p.60): "I am subject and object". Fichte epistemology was idealistic in the extreme; he believed that the activity of the 'I' transforms the world that is given into a world that is thought. In other words, he conceived that, in the human consciousness, the world is not merely organised and rationalised — it is created. This is what Fichte regarded as the 'universal science'.

Schelling's epistemology is related to this in that he saw human knowing, at its highest level, as not merely reflective of things which have already been determined — that is, on external nature — but as participatory and intuitive, capable of moving from the whole to the parts, of being determinative in the sense Goethe meant. An 'idea' for Schelling is not a representation, a picture, but a creative power. In his *Bruno or On the Natural and the Divine Principle of Things* he develops the notion of *intellectual intuition*, which Kant called *intellectus archetypus*. He writes (1984:122):

All our effort is directed toward knowing things as they are exemplified in the archetypal understanding, of which we see only images in our understanding.

Schelling differs from Fichte in that, while Fichte saw the idea as the product of human subjectivity, Schelling saw it as having actual concrete existence. This
apparent contradiction in terms is explained by Steiner (1988:172-3) in the following way:

What takes place in the 'I' when it is knowing nature seemed to Schelling to be at the same time that which is objective about nature, the actual principle within it. External nature was for him only a form of our nature concepts that has become fixed. What lives in us as a view of nature appears to us again outside, only spread out, spatial-temporally. What confronts us from outside as nature is a finished product, is only something already determined, the form of a living principle that has become rigid. We cannot gain this principle through experience from outside. We must first create it within our inner being.

In other words, Schelling does not dissolve the objective world into an absolute idealism. Yet, like Fichte, he recognised a form of knowledge which is creative or determinative, which grasps the essential formative principles of things. This led Schelling to a concern with what constitutes an authentic way of knowing a phenomenon. He asks in his *Philosophy of Mythology* (quoted in Zuckerkandl,1956:ix):

> What philosophy is requisite if we are to live up to the subject, be on level with it? The question is not how the phenomenon must be turned, twisted, narrowed, crippled so as to be explicable, at all costs, upon principles that we have once and for all resolved not to go beyond. The question is: 'To what point must we enlarge our thought so that it shall be in proportion to the phenomenon . . .

As shall be seen below, this statement is perfect accord with Goethe’s thinking on the subject.

In the philosophy of Hegel the notion that Universal Mind or Spirit is made concrete in the form of things, is worked in great detail. As with the other German Romantic thinkers, including Goethe, Hegel did not limit ‘mind’ to the human brain. For them the whole universe is an intelligent creation. Hegel makes explicit, in his evolutionary ontology, the way human subjectivity evolved out of lower forms of life through which universal mind progressively manifests itself as objective form. As Hegel saw it, Pure Being, Mind, contains all possibilities within it in potential. Mind first manifests as concrete ‘things’ — rocks, plants, animals — and through a living metamorphic process it attains inwardness or subjectivity in the form of the conscious human being. As Mure (1940:65) explains:
Spirit is . . . a subject which from phase to phase reconstitutes, or comes to fuller possession of, its own nature. Of this self-reconstitutive principle philosophy is the primary instance, because to philosophy alone the principle becomes evident in and as the whole developing series of phases which, in Hegel’s view, is crowned by philosophy.

Mind thus evolves to a greater and greater level of self-realisation, towards the possibility of absolute self-knowing.

Hegel, too, was concerned with the question of authentic knowledge. Hegel believed that the real task of philosophy is ‘to think life’; that is, he considered that thought itself had to be, in a sense, ‘living’ in order to adequately comprehend the living world process. He considered this ‘living thinking’ to be the dialectic process. In the introduction to his *The Philosophy of Right* (1942:34-35) he writes:

This dialectic is not an activity of subjective thinking applied to some matter externally, but is rather the matter’s very soul putting forth its branches and fruit organically.

In his *Philosophy of Nature* (Vol.1) Hegel was concerned to bring to light a way of thinking or knowing which does not degrade or destroy the living essence of the things of nature. He comments (1977a:198):

The more thought predominates in ordinary perceptiveness, so much the more does the naturalness, individuality, and immediacy of things vanish away. As thoughts invade the limitless multiformity of nature, its richness is impoverished, its springtimes die, and there is a fading in the play of its colours.

He goes on to say how the normal theoretical scientific approach achieves the opposite of what it intends:

We want to know the nature that really is, not something which is not, but instead of leaving it alone and accepting it as it is in truth, instead of taking it as given, we make something completely different out of it. By thinking things, we transform them into something universal; things are singular however . . . the lion in general does not exist.

He goes on to further criticise the theoretical approach in that it fixes the subject over and against the object:

Our aim is . . . to grasp and comprehend nature . . . to make it ours, so that it is not something beyond and alien to us. This is where the difficulty comes
in. How are we as subjects to get over into the object? If we venture the leap over this gap, and, while failing to find our footing, think that we have found nature, we shall turn that which is something other than we are into something other than what it is. Both theoretical relationships are also the precise opposites of one another, we turn things into universals or make them our own, yet as natural things they should be free for themselves. This is the crux of the issue concerning the nature of cognition, and is the concern of philosophy.

This is a clear philosophical statement of what is also the fundamental concern of Goethe — to be able to know things in a way which enables them to remain ‘free for themselves.’ Indeed, Hegel cites Goethe’s science as an example of an approach which he believes achieves such a ‘living thinking’. As he explains (1977a:202-3):

When nature is viewed by an alive and open mind, as it is in the apt and effectual manner we find often in Goethe, this mind feels the life and universal relatedness within nature; it has a presentiment of the universe as an organic whole, a rational totality, just as it experiences an inner unity with itself through the living individual. We can assemble all the separate constituents of the flower, but this will not make the flower. Intuition has therefore been reinstated in the philosophy of nature, and set above reflection, but this gets us nowhere, because one cannot philosophise on the basis of intuition. Intuition has to be submitted to thought, so that what has been dismembered may be restored to simple universality through thought.

These passages have been quoted at length because it would be difficult to find a more penetrating commentary on Goethe’s scientific endeavours. To return to Goethe himself now — it was precisely these abstract forms of thinking which Goethe criticised in the science practised by the followers of Newton. Alluding to such scientific methods, he averred (Goethe,1988:307): “Nature will reveal nothing under torture”. Goethe made many such critical comments. One of his Maxims (Goethe,1988:309) reads as follows:

The present age has a bad habit of being abstruse in the sciences. We remove ourselves from common sense without opening up a higher one; we become transcendent, fantastic, fearful of intuitive perception in the real world, and when we wish to enter the practical realm, or need to, we suddenly turn atomistic and mechanical.

And another (Goethe,1988:309):

We can grasp immediate causes and thus find them easiest to understand; this is why we like to think mechanistically about things which really are of a higher order.
Goethe believed that only when thinking learns to \textit{participate} in the phenomenon does it allow a thing to be ‘free for itself’. He observes in his essay \textit{The Enterprise Justified} (Goethe, 1988:61):

When in the exercise of his powers of observation man undertakes to confront the world of nature, he will at first experience a tremendous compulsion to bring what he finds there under his control. Before long, however, these objects will thrust themselves upon him with such force that he, in turn, must feel the obligation to acknowledge their power and pay homage to their effects.

In his essay \textit{The Experiment as Mediator between Object and Subject} he writes of the task of the ‘true botanist’ (Goethe, 1988:11):

Like the sun which draws forth every plant and shines on all, he must look upon each plant with the same quiet gaze; he must find the measure for what he learns, the data for judgement, not in himself but in the sphere of what he observes.

Goethe shared with others with whom he participated in the \textit{Naturphilosophie} movement a deep concern with the destructive effects of science which almost reads as a premonition of contemporary environmental concerns. These tendencies were obviously quite visible two centuries ago, and Goethe and his colleagues took it as their task to forge a new science of nature based upon the living principles of nature itself.

Goethe understood knowledge on the highest level to be determinative and intuitive. This is a thinking which moves from the whole to the parts, which comprehends the concrete form of a thing \textit{in the way it comes into being out of its living essence}, which, in other words, participates or ‘lives into’ the generative or creative process of the thing. This is to be distinguished from a thinking which is merely reflective, which, for example, records the various characteristics of an organism and relates them according to criteria (such as similarity of size, number, colour, etc.) in order to form taxonomic groupings. Goethe did not wish to force the organism into an \textit{a priori}, logical scheme, but to inwardly experience the formative ‘idea’ which is alive in the phenomenon itself. Henri Borto\-ft (1986:66) explains the significance of such ‘participatory’ knowledge:
The participatory view of the role of consciousness in knowledge is... an evolutionary view, in the widest sense, because the state of 'being known' is an evolutionary development of nature itself. When consciousness is properly prepared it becomes the medium in which the phenomenon itself comes into presence. We call this 'knowing the phenomenon', and understand it subjectively. But in a more comprehensive view it is the phenomenon itself which appears in consciousness when it is known.

As described in the previous section, Goethe believed that the phenomenon shows itself on different levels. On the highest level, the pure phenomenon, is where external appearance distils itself into intuitive insight. This knowing is not static and fixed into an abstract schema. Goethe writes (1988:304):

At [the] higher level we cannot know but must act, just as we need little knowledge but much skill in a game.

He believed that the true nature of a phenomenon is not merely grasped through conceptualisation but through the unifying of concept and experience in a form of 'activity' (Handeln). As Peter Salm (1971:16) comments:

The nature of such activity is difficult to define, is nevertheless so central to Goethe’s outlook that it comes close to being an analogy to life itself.

Actually the word ‘analogy’ is probably not quite accurate, for Goethe thought that knowing on this level is, like life itself, dynamic and evolving. It is not merely emulating life, depicting life; it is literally alive. Or we could put it in Hegel’s terms and speak of this knowing as “the matter’s very soul putting forth its branches and fruit organically”.

In order to clarify this notion of a ‘living thinking’ I will refer to an actual phenomenon which Goethe studied — colour.\(^3\) Goethe developed his theory of colour in opposition to that of Newton, who had used a prism to separate a beam of light into a spectrum, each colour refracting to a different degree which he related to its wavelength. Newton was thus not concerned with the individual qualities of the

---

\(^3\) This, of course, raises issues about in what sense we can say that colour is ‘alive’. Goethe wrote: “Colours are the deeds of light, what it does and what it endures” (Goethe,1988:158). He was not speaking metaphorically but out of his actual experience of colour. Such a statement is perfectly in keeping with his organic world view, with the idea of the universe as a living organism. Thus it is, too, that Hegel is able to talk about a ‘geological organism’ (Hegel,1979b:45) although he is not implying that a rock is ‘alive’ in the same way as a plant is, any more than a plant is ‘alive’ in the same way as an animal is.
colours in themselves; for example, the blueness of the blue which has a sense of darkness or 'inwardness' about it; the radiant lightness of yellow. To explain this phenomenon, Newton wished to fit it into a predefined, logical schema; that is, he wished to quantify it, and he did so in terms of its 'degree of refraction'. He considered that the qualities themselves had no intelligibility but had to be explained or derived from something else; namely, the logical relationships of numbers. This is precisely what Goethe objected to; Goethe could not see, for instance, why the colour blue has its unique quality of blueness in terms of its 'degree of refraction.' Goethe tried to think about and understand colours from out of their actual phenomenality — that is, the quality of their appearance.

When he did so, Goethe discovered in the phenomena of the colour different dynamic qualities, such as those I indicated above. Thus his reference to the effulgence, the radiating quality of yellow in his Theory of Colour. The dynamic nature of the colour is so understood when thinking, in a sense, 'enters' and experiences the essential nature of the colour, when it learns to participate in colour's inner activity. Henri Bortoft makes this clear (1986:14):

When observing the phenomenon of colour in Goethe’s way it is necessary to be more active in seeing than we are usually. The term ‘observation’ is in some ways too passive. We tend to think of an observation as just a matter of opening our eyes in front of the phenomenon, as if it were something that happens to us when visual information flows in through the senses and is registered in consciousness.

Bortoft goes on to say (1986:14) that Goethe's method of observation is to put one's attention into seeing: “It is as if we plunged into seeing. In this way we can begin to experience the quality of the colours.”

Goethe found that he could best grasp a colour in this way if, after observing its physical manifestation, he ‘took it into his imagination’ in order to experience its quality inwardly. He called this process Exakte sinnliche Phantasie or ‘exact sensorial imagination’. He considered that in this way the relationship of one colour to another, the unique living ‘gesture’ of a colour (its dynamic quality), could be more clearly experienced. As Bortoft (1986:14) explains:
Combined with active seeing, ['exact sensorial imagination'] has the effect of giving thinking more the quality of perception and sensory observation more the quality of thinking. The purpose is to develop an organ of perception which can deepen our contact with the phenomenon in a way that is impossible by simply having thoughts about it and working over it with the intellectual mind.

This is indeed how Goethe speaks about such 'participatory' knowledge himself. In his essay *Significant Help Given by an Ingenious Turn of Phrase* (Goethe, 1988:39) he refers to a contemporary writer, Dr. Heinroth, who is himself commenting on Goethe's scientific approach:

Dr. Heinroth...calls my approach unique, for he says that my thinking works objectively. Here he means that my thinking is not separate from objects; that the elements of the objects, the perceptions of the object, flow into my thinking and are fully permeated by it; that my perception itself is a thinking, and my thinking a perception.

4. The Theory

(a) 'Form' and 'Idea'

From out of these considerations of 'living thinking' and 'participatory knowledge' we come to Goethe's notion of 'the theory'. To repeat the already-quoted maxim of Goethe's in its complete form (Goethe, 1988:307):

The ultimate goal would be, to grasp that everything in the realm of fact is already theory... Let us not seek for something behind the phenomena — they themselves are the theory.

We are now in a position to see this statement from a broader perspective.

Goethe, as with Schelling and Hegel (and Plato before them), saw the form of a phenomenon as its 'idea' (not merely the shape which we tend to think of it today). Form, in terms of Goethe's *pure phenomenon*, is the 'formative idea' of the phenomenon, its unity dimension, its living essence which determines its coming into being, its shape and the interrelated functioning of its parts. This 'idea' of the phenomenon is what Goethe called its 'true theory'. This notion of theory is
connected with the original meaning of the Greek word *theoria*, 'to behold something'.

Goethe does not mean a theory *about* a phenomenon in the conventional sense; *the phenomenon is already the theory* in that it is a particular objectification or formation of Spirit (Mind, Intelligence) as such. However, on the empirical level, the theory is still in potential; it attains consciousness in the human knower. As Henri Bortofof puts it in the above quotation, the state of 'being known' is an evolutionary development of nature itself. There is nothing 'behind' the phenomenon like an unknowable Kantian 'thing-in-itself', abiding in an eternal, metaphysical Beyond. The theory *is* the phenomenon; but that doesn't mean it is immediately or directly visible to the senses. The theory must be sought for, actively thought, 'distilled' in consciousness so that deeper and deeper dimensions of the phenomenon may come to light.

If the theory is not visible to the senses, in what way can it be said to be real and experienceable? Through intuitive perception was Goethe's answer, and here he spoke in accord with the whole 'organic', tradition of philosophy. Intuitive perception is 'objective thought', thinking with the quality of perception. Kant and Schelling had called it 'archetypal' intellection. Goethe had to struggle to explain and clarify his meaning of 'theory' with some of his closest associates. In a famous interaction between Goethe and the poet Schiller, described in the essay *A Fortunate Encounter* (1988:18-21), Goethe recounts how he told Schiller about his notion of the 'archetypal plant'. Schiller responded, "but that is just an idea," to which Goethe replied, "if it be an idea, then I can see it with my own eyes". When he spoke thus of seeing the 'theory' of the plant (archetypal plant) "with his own eyes", he was undoubtedly meaning with 'objective' thinking (or 'judgement that SEES' as it has also been rendered (Jolly & Koeppf, 1978:23)).

In his essay *The Experiment as Mediator between Object and Subject*, Goethe indicates that the scientific experiment is the process by which the phenomenon is

---

4 I explore more deeply the Greek and Latin meanings of the word 'theory' in Chapter II.B.4.

5 For example, the *scientia intuition* of Bruno and Spinoza.
'distilled' in consciousness. For Goethe, a theory could not be said to belong to either the 'object' or the 'subject' but is that which 'comes alive' between the two. The theory, as with life itself, can not be bounded by human categories of thought (as Hegel had noted (1970a:196): "Nature itself, as it is in its universality, cannot be mastered . . . nor bent to the purposes of man.") The theory is unlimited in nature; it is the 'infinity' of the phenomenon. Yet it is glimpsed in an authentic experiment, and that insight can grow through successive experiments.

Actually, Goethe used the word 'theory' in a positive and in a pejorative sense. The positive sense, meaning the authentic theory, is what he was referring to when he said that the theory is in the thing itself. He used the word pejoratively when referring to the conventional meaning of theory. Thus he writes:

Theories are usually the premature conclusion of an impatient understanding which would prefer to get the phenomenon out of the way. (Goethe,1988)

and:

Throughout the history of scientific investigation we find observers leaping too quickly from phenomenon to theory; hence they fall short of the mark and become theoretical. (Goethe,1988:308).

In these examples Goethe's criticism was directed against those experimenters who failed to recognise the theory in its full majesty and unlimitedness. As he writes (Goethe,1988:22):

An organic being is so multifaceted in its exterior, so varied and exhaustible in its interior, that we cannot find enough points of view nor develop in ourselves enough organs of perception to avoid killing it when we analyse it.

To 'see' the theory, then, requires a certain kind of thinking activity on the part of the experimenter which Goethe called 'intuitive perception'. However, it is quite clear that Goethe did not consider the attaining of such perception an easy thing. In the following passage Goethe lists some of the pitfalls facing the would-be experimenter on the journey towards the pure phenomenon (Goethe,1988:14):

We can never be too careful in our effort to avoid drawing hasty conclusions from experiments or using them directly as proof to bear out some theory. For
here at this pass, this transition from empirical evidence to judgement, cognition to application, all the inner enemies of man lie in wait: imagination, which sweeps him away on its wings before he knows his feet have left the ground; impatience; haste; self-satisfaction; rigidity; formalistic thought; prejudice; ease; frivolity; fickleness — this throng and its retinue. Here they lie in ambush and surprise not only the active observer but also the contemplative one who appears safe from all passion.

In the process of the ‘distillation’ of the theory Goethe thus understood that there is a sense in which the experimenter himself is ‘distilled’ through self-understanding. For Goethe, the refinement of the phenomenon and the experimenter are one and the same thing. In his essay *Fortunate Encounter* he describes the immense difficulties faced by one who would try to come to a “purer, freer state of self-awareness” (Goethe, 1988:21). On the other hand, he also declared elsewhere (Goethe, 1988:61) that there is

a potential for infinite growth through constant adaptation of [the experimenter’s] sensibilities and judgement to new ways of acquiring knowledge and responding with action.

(b) Goethe’s Phenomenological Method

Goethe’s experimental method is as follows. In the first stage a phenomenon such as a plant or an animal is approached in terms of its concrete, directly experienceable reality; this is the empirical phenomenon. He writes (Goethe, 1988:17):

*We cannot exercise enough care, diligence, strictness, even pedantry, in collecting basic empirical evidence; here we labour for the world and the future.*

Goethe’s cautions are applicable right from the beginning of the experiment; one tries to not approach the phenomenon armed with preconceived theories (even though, of course, the experiment is originally motivated by certain aims and intentions); one attempts to be patient and not rush into premature conclusions. The experimenter opens to and takes in what the senses perceive.

In the second stage the empirical phenomenon is distilled into the scientific phenomenon. Here the relationships between the phenomena in question begin to come to light. Goethe writes (1988:16):
When we have done an experiment . . . found this or that piece of empirical evidence, we can never be careful enough in studying what lies next to it or derives directly from it.

Such a focus of experimental action is in accord with Goethe’s holistic or organic world conception. Thus he states (1988:15):

Nothing happens in living nature that does not bear some relation to the whole. The empirical evidence may seem quite isolated, we may view our experiments as mere isolated facts, but this is not to say that they are, in fact, isolated. The question is: how can we find the connection between these phenomena, these events?

The phenomenon of flower colour and shape, for example, must be connected to other elements of the plant and the environment in which it is growing. A flower, ultimately, is incomprehensible except in relation to the plant as a whole and to its environmental context. But again, Goethe cautions against the drawing of hasty conclusions and counsels patience and care (Goethe, 1988:14):

Two phenomena may be related, but not nearly so closely as we think. Although one experiment seems to follow from another, an extensive series of experiments might be required to put the two into an order actually conforming to nature.

These relationships are taken up into and reproduced through the process of ‘exact sensorial imagination’ (thinking with the quality of perceiving); in this way their ‘inner organisation’ comes to light (for example, the ‘inner’, dynamic connection between the colours blue and yellow). Goethe, however, was quite definite that these ‘inner connections’ belong to phenomena themselves (Heinemann, 1934:67).

In the third stage the phenomenon is further distilled in consciousness — a higher ‘spiritual’ standpoint is attained in which the formative principle (theory) expresses itself. This is the pure phenomenon. Goethe regards this as empirical, although ‘seen’ with the ‘spiritual eye’ or intuitive perception. This is nothing bounded or limited. Goethe writes (Goethe, 1988:17):

I will . . . attempt to establish the axioms in which the empirical evidence of a higher nature can be expressed, and see if these can be subsumed under still higher principles.
The results at this stage are expressed in statements, which, like geometric axioms, are reducible to nothing else; Goethe called these Urphänomene or 'primal phenomena'. He explains:

These [primal phenomena] can be formulated in short, pregnant sentences, compared and — as they are developed — arranged and brought into such a relationship with one another that they, just like mathematical relationships, regarded individually or in their interrelationships, remain firm. (quoted in Hegge, 1987:202)

(c) A Qualitative Science

Goethe's concern with reaching toward the 'theory' as the living essence of the phenomenon brought him into direct conflict with the standard scientific practices of his time. He believed that experimentation should be an intimate, human experience, and thus avers:

Man himself, to the extent that he makes use of his healthy senses, is the greatest and most precise physical apparatus that can exist. And this is precisely the trouble with modern physics; that the experiment has as it were been sundered from the human being, and knowledge of nature is sought merely in that which artificial instruments display. (quoted in Altner, 1987:342).

What he was questioning was the use of instruments to bring about a quantification of reality, a reduction of living phenomena to numbers. Goethe considered that:

Numbers are . . . only symbolic and approximate representations, but they soon substitute themselves for the phenomenon itself and overpower and immobilise nature. (quoted in Nisbet, 1972:49).

The philosopher Leibniz had sought to explain the whole of Being in mathematical terms, for he considered that it is only mathematical relationships which can be seen to be necessary and true. Hegel had no argument with the claim that, in mathematics, the necessary character of relationships is evident. However, against the idea that mathematics expresses the highest (because most evident) truth, he argues that it merely proceeds on the surface, does not touch the thing itself, its essence or Notion, and therefore fails to comprehend it [i.e. in terms of its Notion]. (Hegel, 1977:26)
It is with Hegel that we find sentiments close to those of Goethe who spoke of numbers as mere approximations, yet having the tendency to substitute themselves for things and thus prevent a deeper, more direct participatory understanding.

What both Hegel and Goethe objected to about a mathematically based science of nature was that it transforms phenomena into something other than themselves and thus degrades and even destroys them. Goethe’s fight against the Newtonian colour theory has been mentioned above. Goethe objected to colours being reduced to numbers because he saw no necessary connection between the numerical system and the colour qualities themselves. To employ Hegel’s way of expressing it — the numbers (wavelengths) are externally related; they proceed ‘along the surface and do not touch the thing itself’; that is, the colour as a qualitative phenomenon. In his plant morphological studies, Goethe took the quality of colour to be part of the plant’s form (that is, not as something merely descriptive but as having a meaning and necessity in terms of the plant’s being or theory). In terms of modern taxonomic procedure colour quality is always quantifiable — the presence or absence of a colour is noted and encoded numerically (i.e. as 1 or 0). Goethe, however, was interested in the experience of the colour quality (that is, as an activity of ‘objective thought’ or intuitive perception). He did not want the colour of the plant to lose its sensuous, empirical reality, and yet, in terms of the relationship of that colour to the plant as a whole, its presence could be ‘seen’ (experienced and understood) to be necessary. Even a numerical aspect — for example, a five petalled flower — is not merely an abstract ‘fact’. The five-foldness of the petals can be ‘seen’ to have a qualitative necessity in terms of the ‘theory’, the plant as a ‘whole’.6 The same thing applied to Goethe’s approach to the study of animal form. Henri Bortoft (1986:63) notes:

We have learned from Goethe’s approach to animal form . . . that there are many facts about the mammals which superficially appear to be contingent and yet turn out to be necessary when perceived with the intuitive mind. Aristotle would have understood exactly what Goethe meant when, in his remark to Eckermann, he asserted that the fact that the lion has no horns cannot be otherwise.

6 The fact that numbers have a qualitative dimension is totally in keeping with traditional metaphysics which in the case of mathematical theory is usually traced back to Pythagoras. In this tradition, numerical relationships are understood to be ‘heard’ as music; music is, in other words, the way of directly experiencing numerical laws (see Hans Kayser,1970).
The question of the apodeicticity (necessity) of qualitative relationships, relating to Goethe’s method, needs special attention here because of its contentious nature. Hjalmar Hegge (1987:204) suggests that, while conventional science would reject the idea of empirical statements about the relationships between colour qualities (for example) having an apodeictic character, there is no reason, in principle, why this should not be so. Goethe used the word ‘Schauen’ to denote the ‘direct apprehension’ of qualitative relationships; as Hegge notes, this word is normally used in the German language to mean ‘the capacity to grasp mathematical connections’. Hegge goes on to say that the apodeictic element is accepted in mathematically orientated science as a priori, whereas the elements which come through experience — namely, the qualities of a phenomenon — are normally regarded as contingent, not necessary in their relationship. Kant had determined that it is only when sense experiences are submitted to intellectual judgement that anything could be said to have the character of necessity. Goethe, however, was talking about necessary connections which are discovered ‘in the things themselves’; in other words, empirically, sensuously. He wrote: “The senses do not deceive; it is judgement that deceives” (quoted in Heinemann, 1934:70).

A crucial point to be made here is that Goethe did not limit ‘senses’ to the physical senses. Sensory experiences of a concrete nature may open up new organs of a ‘spiritual’ kind which are able to apprehend material nature from a ‘higher’ perspective. Hegge (1987:213) explains:

One can develop an organ for the cognition of the objective connections in [qualitative areas], a quality sense corresponding to the sense for quantitative relations upon which mathematical science is built.

In the scientific experiment, the method of cognising the qualities of phenomena which Goethe called ‘exact sensorial imagination’ corresponds to mathematical intuition in, for example, the domain of geometry. Hegge asserts that, in principle, the intuition of qualitative relationships is just as exacting as that of numerical relationships. Intuition here does not mean a bolt out of the blue (which is something arbitrary, in scientific terms); it means the essential activity of scientific judgement. Goethe himself made no claim that his qualitative intuitions came easily to him; on the contrary, he developed them only through years of painstaking
experimentation. Indeed he considered the coming into being of an authentic, qualitative science a thing of the future. This he makes clear in the following maxim (Goethe, 1988:307):

There is a delicate empiricism which makes itself utterly identical with the object, thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age.

Hegge points out that the capacity to grasp the necessity of mathematical connections is already well developed in the human mind and that it is generally easier to attain insight in the quantitative area than in the qualitative. The capacity for mathematical intuition is considered to be a priori; the capacity for qualitative intuition, as Goethe said, needs to be specifically developed.

Fichte wrote in one place (1956:116): “This mist of delusion clears away from before my sight! I receive a new organ, and a new world opens before me”. The idea that the human being has the capacity to develop new ‘cognitive’ organs was not unique to Goethe. Hegel (1977a:199) spoke of something similar as the highest possibility of the science of nature. He referred to it as

the primal state of innocence, in which spirit is identical with nature, and the spiritual eye stands immediately in the centre of nature.

This sounds very much like Goethe’s notion of a ‘delicate empiricism’. Goethe asserts (1988:39):

Each new object, well contemplated, opens up a new organ within us.

For Goethe, the growth of new cognitive ‘organs’ represents the realisation of a human potential. He saw a reciprocative process in the act of cognition — through ‘being known’ the phenomena of nature evolve to a higher stage and through one and the same process a new human faculty or ‘spiritual’ organ is able to come into being. The ‘theory’ comes to realisation at the very ‘centre of nature’.
B. CONTEMPORARY PHILOSOPHY OF SCIENCE

In the following overview of the contemporary philosophy of science I have used the same structure as in Part A: 1. World-view; 2. The phenomenon; 3. Knowledge; 4. The theory. I have done so in order to make as clear as possible the connection between Goethe’s ideas and present day thought. Again, the aim here is to begin with a wide perspective and then progressively focus on the subject which is the central concern of this thesis — the nature of ‘theory’. Each of these four sub-sections will be divided again into three parts, representing the points of view of three major streams of contemporary philosophy — (a) Realism; (b) Relativism and (c) Phenomenology.

The intention here is not to resolve any of the complex and ongoing debates between these different schools of thought but rather to see whether and how the scientific notions of Goethe can be placed within the context of twentieth century philosophy of science.

1. World-view

It is somewhat easier to discuss Goethe’s world-view, because he is a single person with a definite (if complex) perspective on life and culture. It is really not possible to speak of the world-view of contemporary science as a unitary thing for it is made up of an enormous number of individuals with diverse points of view. The three world-views I have selected are admittedly generalisations, and represent a significant simplification as such.

(a) Realism

The realist ontology has been defined by Cuba & Lincoln (1990:134) as

the belief that there exists a reality out there, driven by natural and immutable laws, irrespective of the notice any human being may take. The business of science, then, is to discover the ‘true’ nature of reality and how it ‘truly’ works.
They go on to say:

Once committed to a realist ontology, the conventional scientist is constrained to an objectivist epistemology. The relationship between knower and known must be circumspect; lest, on the one hand, Nature's operations are adversely influenced by the inquirer's efforts to pry loose her secrets, or, on the other hand, the inquirer's observations and subsequent interpretations are unduly influenced by either Nature's confounding ways or by rampant subjectivity.

The realist view represents (at least, as thus defined) the 'conventional' view and is the foundation for the greater part of contemporary experimental science. The idea that there actually is an 'objective world' to which our ideas refer may also be said to be the commonsense view. It is a view, however, which during this century has had to defend itself against ways of thinking which have attempted to excise it at its very roots. In what follows I will mainly be referring to a prominent defender of realism, Roger Trigg, and his work Reality at Risk where he presents an overview of the situation regarding realism and its opponents. With reference to the overarching significance of the realist view, Trigg (1989:219) writes:

Everything collapses when there is no concept of an objective reality, corresponding to each level of science, as a target or goal. Everything is then arbitrary, since there is no point in holding to one theory rather than another. A science that can never be wrong, because it does not refer to anything, is no science at all.

(b) Relativism

Relativism may be said to be the principle opponent of realism. It is a reactionary way of thinking, but it makes a strong claim for having a 'true' explanation of reality; namely, that 'truth' and 'reality' in the conventional sense do not exist. Guba & Lincoln whom I have chosen as representatives of relativism\(^7\), summarise their position in the following way (1990:148):

Realities (not reality) exist in the form of multiple mental constructions, socially and experientially based, local and specific, and dependent for their form and content on the persons who hold them.

---

\(^7\) I recognise the limitation of only referring to a small number of authors in my discussion of the three streams of philosophical thought. It, however, serves my purpose here to only highlight salient points and to indicate the ideas of prominent thinkers. In fact there is a spectrum of philosophical positions within realism, relativism and phenomenology. This is just an overview of the subject and a fuller exploration is beyond the limits of this Masters thesis.
They explain (Guba & Lincoln, 1990:145) that the epistemology associated with such a point of view is subjectivist:

The outcomes or findings of an inquiry [are] not a report of what is ‘out there’, but the residue of a process that literally creates them as it proceeds, depending on the particular time, place, circumstances, and persons involved (the creators). . . it depicts knowledge as the outcome, residue, or consequence of human activity; knowledge is a human construction, never certifiable as absolutely or ultimately true, but problematic and ever-changing.

According to this epistemological understanding:

Inquirer and inquired-into are fused into a single (monistic) entity. Findings are literally the creation of the process of interaction between the two (p.148).

The proponents of relativism number amongst some of the most eminent and influential of twentieth century philosophers of science. The relativism of these ranges from mild to extreme; that is to say, there are degrees to which they hold reality to be a construction of human consciousness. In the category of ‘mild relativism’ can be placed Thomas Kuhn, while a notable example of extreme relativism is Paul Feyerabend.

(c) Phenomenology

The third way of thinking which I have isolated is phenomenology which has been defined by Martin Heidegger (whom I am taking as representative of this school of thought) in the following way (1992:50):

The term ‘phenomenology’ expresses a maxim which can be formulated as ‘To the things themselves!’ It is opposed to all free-floating constructions and accidental findings; it is opposed to taking over any conceptions which only seem to have been demonstrated; it is opposed to those pseudo-questions which parade themselves as ‘problems’, often for generations at a time.

When Heidegger mentions ‘free-floating’ entities he is referring to the Kantian ‘thing-in-itself’, the Absolute Subject of Romantic philosophy. Defined in this way, phenomenology announces itself as an exact science, and one in which the notion of ‘truth’ is of utmost importance. The phenomenologist (at least as Heidegger presents
it) is concerned with ‘things themselves’, for only with regard to phenomena, to actual existing entities (material or otherwise), can reality be said to be anything at all. Phenomenology is a science which stands between realism and relativism (or could perhaps be said to embrace them both). It does not concur with the relativist notion that human concepts are merely mental constructions. On the other hand it does not suggest, as does realism, that there is a gap between human knowing and reality itself. Knowing and being are organically connected, are whole; to know something is actually to be involved in reality, according to the phenomenological world conception. Heidegger traces back such thinking to the pre-Socratic Parmenides who stated “thought and Being are the same thing”, a thesis which was taken up by Aristotle who said: “Man’s soul is, in a certain way, entities” (quoted in Heidegger,1992:34).

2. The phenomenon

(a) Realism

The term ‘phenomenon’, according to the Collins Concise Dictionary, means ‘anything that can be perceived as an occurrence or fact by the senses’. This, one could say, is a working definition for the positivistic scientist who confines ‘reality’ to that which can be seen, heard, touched or felt. This view considers the notion of spiritual or metaphysical entities to be meaningless and not worthy of consideration.

However, when Trigg says that “realism is a theory about ‘strong objectivity’”, he is not suggesting that what is ‘objective’ is necessarily a physically sensuous object. All he is concerned to emphasise is that ‘reality’ is something which exists, independent of human knowledge of it. He writes (1989:28):

Although realists may be materialists, they do not have to be. The nature of the ultimate constituents of the world is a totally different problem from the relation of reality to our true judgements about it. Indeed realists leave open what is to be meant by ‘the world’. We have used the term rather broadly to mean ‘what there is’. The realist can accept that mind, matter and even other kinds of entities might exist.

And further:
Realism leaves open the possibility that the entities described in quantum mechanics possess unmeasurable quantities. They would not be logically inaccessible in some metaphysical realm.

What, as a realist, Trigg is opposed to, is anything which may be described as ‘phenomenalism’. The latter, for him, limits reality to a ‘reality-for-us’. As he puts it (1989:53):

> It has often been the ambition of philosophers to reduce talk of physical objects to talk about phenomena. True statements would be about physical objects, but since the latter were equivalent to phenomena, truth would in fact correspond to things as they appeared to us.

Immanuel Kant had distinguished a *phenomenon* — the thing as visible to the senses — from the *noumenon* — the unknowable thing-in-itself. This, as Trigg writes, has encouraged philosophers to draw a dichotomy between concepts and reality, and then to conclude that it is the concepts which must be given priority and ‘reality’ dismissed as inaccessible and mysterious. For Trigg, realism proper is the understanding that “reality exists independently of our conceptions of it, though it may coincide with them” (1989:3).

(b) Relativism

Although Trigg is not a realist in a limited, materialist sense, his notion of reality would nevertheless be deemed ‘conventional’ and outmoded by the present-day relativist. In terms of Guba & Lincoln’s presentation of the relativist position, a phenomenon could not be said to be ‘real’ in any sense which is independent from human consciousness. As they suggest, we literally *create* our knowledge, meaning that knowledge is relative to us, not to ‘reality’. Even if a thing is believed to exist prior to our knowing it, we, for our part, can know nothing about how it ‘really is’. This logic can be taken to the point where it comes to appear as if we literally manufacture the world in consciousness. Guba & Lincoln (1990:153) are hinting at this when they write:

> The answer we give to [the] question . . . “May the universe in some strange way be ‘brought into being’ by the participation of those who participate?” is a resounding “Yes”.

(c) Phenomenology

Phenomenology, obviously from the name itself, is concerned fundamentally with the nature or meaning of the phenomenon. As Heidegger says, it takes its start from 'the things themselves' rather than with abstract productions of the human mind. Heidegger has discussed the complex network of meanings associated with the words 'phenomenon', 'appearance' and 'semblance'; within all of these he finds a primary signification related to the original Greek meaning of the word \textit{phainomenon}, which means "that which shows itself in itself", "that which is manifest" (Heidegger,1992:51). The essential problem is as follows. Does 'phenomenon' mean \textit{appearance}, which, in the Platonic tradition, stands for something false, unreal. Here the true reality is considered to stand behind a veil of 'mere appearances'. Traditionally reality was called Being, or the divine; science came to call it 'the laws of nature'. Or can 'phenomenon' be understood as the actual manifestation of Being — "that which is manifest"? It is the latter which, as Heidegger says, is the primordial and essential meaning as regards the science of phenomenology. We never encounter Being as such but only Being as it shows itself as our world of manifest beings. According to Heidegger, what a phenomenon \textit{is} does not merely rest upon abstract definitions but upon the nature of the \textit{experience} whereby a phenomenon is actually encountered. He writes, "Only as \textit{phenomenology is ontology possible}" (Heidegger,1992:60)

3. Knowledge

(a) Realism

Trigg hinges his conception of scientific realism upon a defence of the 'correspondence' theory of truth. He contends (1989:3) that "reality exists independently of our conceptions of it, though it may coincide with them". The 'correspondence' theory was traditionally formulated as \textit{adequatio intellectus et rei}, the 'adequation of intellect and the thing'. Truth thus defined has to do with the correctness or incorrectness of a representation of reality. Trigg (1989:52) writes that, from the realist point of view: "Truth can be defined as the agreement, or
correspondence, of judgements with how things are.” He adds that this assumes reality is not dependent upon anything else for its existence, that ‘how things are’ does not mean ‘how they are for us’ but how they are in reality. He suggests that the idea of ‘inaccessible truth’ is not a contradiction in terms, for we cannot verify our statements of truth by somehow stepping outside our statements and comparing them with reality. The central problem, he finds, for those who cannot accept the realist idea of truth and reality, is their reluctance to accept that knowledge is actually determined by reality itself rather than our own conceptual scheme. He asks (1989:10):

Why ... should reality always be blocked off by a conceptual scheme? Why may it not actually be as it is said to be? Concepts could be a window on reality, rather than a barrier to it.

Any other way of thinking about reality and knowledge, Trigg finds, runs the risk of anthropocentrism; that is, reality comes to be understood as merely a construction of the human consciousness.

(b) Relativism

The opposing relativist view is that ‘reality’ is only what we see through the ‘lens’ of conceptual schemes. ‘Reality’ is thus always relative to ourselves and we can never rightfully speak of ‘reality as such’. The realist notion of truth has been the subject of attack by the relativists who say that we cannot verify our statements by standing objectively outside our conceptual system and consequently cannot know for certain if our statements are correct correspondences, or even know what they correspond to ‘in reality’. In recent relativist thinking there has been a shift from ‘truth’ to ‘what is held to be true’. Such an orientation can be referred to the philosophy of Immanuel Kant who said (1952:108):

For truth or illusory appearance does not reside in the object, in so far as it is intuited, but in the judgement upon the object, in so far as it is thought.

Kant himself believed there are a priori rational categories in the human mind, but present-day relativist philosophy has come more and more to emphasise the
subjective nature of thinking, the way individual consciousness conditions thought and knowledge, through personal experience, social values, and so forth.

It is for this reason that Guba & Lincoln speak of knowledge as ‘a consequence of human activity’, as a ‘social construction’. They contend that to speak of ‘truth’ is to say nothing about the ‘real’ world but is simply to describe an agreement between people in a particular context of enquiry. Agreements, according to this way of thinking, are only temporary and relative; one cannot say that new ‘constructions’ are ‘more true’ than the ones they replace, only that they are “more informed or sophisticated” (1990:147).

Those who espouse this present day relativist view have travelled a long way beyond Kant’s notion of judgement; they have dispensed with the need for such judgements at all in order to intelligently conduct themselves in the world. For them, the world is simply composed of the stories of individuals, which are sometimes of sufficient forcefulness to convince others and bring about certain desired results. People are thus seen to be free to imagine and create the world in whichever way suits them. For the relativist this situation is liberating. Science, as traditionally understood, becomes a thing of a past age in which people are bound to an imagined ‘reality’. Individuals in the post-contemporary world are released into creative freedom. The post-modern catchcry is: “The rationalist have only interpreted the world, the point is to invent it!” (Second of January Group, 1986:31)

And as Guba & Lincoln say (1990:147):

Constructivism . . . aims neither to predict and control the ‘real’ world nor to transform it, but rather to reconstruct the ‘world’ at the only point at which it exists: in the minds of constructors, human beings. It is the mind that is to be transformed, not the ‘real world’.

(c) Phenomenology

Turning now to phenomenology we find quite a different notion of knowledge and thinking being presented by Martin Heidegger. He, as does the relativist, develops a critique of the correspondence theory of truth, but does not end up with relativism. He does not say that this theory of truth is without meaning, only that it is derived
from a more primordial meaning which it is necessary to reinstate if we are to
discover the highest tasks of knowing. He finds this primordial meaning in what the
Greeks designated by the term \textit{aletheia}, which is generally translated by the word
‘truth’. \textit{Aletheia}, however, does not mean ‘the accurate correspondence of a concept
to reality’ but the act of ‘uncovering’ or ‘unconcealing’ which allows an entity to
come forth and stand in the light of its truth, to "show itself from itself" (Heidegger,1971:50) which is the deeper meaning of ‘phenomenon’. This is more a
gesture of \textit{allowing} or \textit{letting} than asserting or judging. According to Heidegger,
thought is (or at least, potentially can be) the \textit{happening of truth} rather than a
conceptual image of or correspondence to reality. This ‘coming forth into the light of
its truth’ is a kind of ‘producing’, in the sense that a plant ‘produces’ a flower. Just as
the flower comes forth into presence from the living organism of the plant, so the

The apparent ambiguity between the human activity of ‘letting come forth’ and
the emergence of the thing ‘out of itself’ is resolved when we realise that Heidegger
did not consider the meaning of truth \textit{primordially} or \textit{essentially} in terms of an
interaction of subject and object. “Truth happens” he would say, just as a flower
comes forth from the plant. But then, reflecting on this happening, he derives the
image of the human being as the ‘clearing’ in which the ‘self emergence’ of the
phenomenon may take place. The opposite of truth is a ‘covering up’, an ‘allowing
to remain hidden’. He contends that the ‘correspondence’ theory of truth, the idea of
correctness and falsity, is more derivative still, having lost a conscious connection to
the existential and experienceable ‘event’ of truth.

Heidegger makes it clear that an entity exists prior to being thought, that it is not
somehow ‘created’ in thought. What he is trying to show is how an entity achieves a
new condition \textit{of itself} in ‘being known’; that is, when it is revealed or ‘unconcealed’

> Being (not entities) is something which ‘there is’ only in so far as truth is.
> And truth \textit{is} only in so far as and as long as Dasein (the human being) is.
> Being and truth ‘are’ equiprimordially.
Thus, for Heidegger, human beings and entities are connected in a truly organic conception of knowledge.

4. The Theory

These considerations of ‘phenomenon’ and ‘knowledge’ provide a basis of understanding the present-day perspective on ‘theory’. Again, the meaning of ‘theory’ in the contemporary philosophy of science is by no means unitary; there is a wide spectrum of viewpoints. What is apparent from the three positions I have isolated is that the meaning of ‘theory’ is of central concern to the contemporary philosophy of science.

(a) Realism

The realist position, as presented by Trigg, is a defence of the conventional view of the theory as the foundation of science. Trigg writes (1989:60):

Realism has to provide an interpretation of truth whereby if a theory is true, then there are in the world the entities which the theory says are true.

Trigg’s understanding of truth as ‘correspondence’ has been outlined above. What he is saying here regarding theories is that a theory does not in some way ‘create’ the thing to which it refers. We cannot step outside our theories to verify them. As he says, the truth value of a theory does not depend on us to determine it — it depends for this upon the actual entities in the world.

Trigg’s realist interpretation of ‘theory’ is not narrowly empiricist or positivist. According to the latter, it is only observations of actual material entities which can provide the data for the building of theories. This, in the time of Francis Bacon and for the historical development of positivist science, was regarded as the only firm foundation for scientific knowledge. Trigg’s realist view departs from this only in that he suggests theories are not necessarily built upon sense observations of material phenomena. According to Trigg, different sense organs may provide experiences of different levels of reality, and different instruments may provide
information not available to the human senses (1989:83). Moreover, he writes, the realist does not value experience for its own sake, and regard any thing beyond the possibility of experience as meaningless. The realist, he says, is more interested in what our experiences are of (that is, the greater reality) than in the fact of the experiences themselves. This is why he contends that theories do and should posit unobservable entities. Trigg believes that, in whatever way an entity is posited, from whatever perspective it is approached, theories about an entity put forward by different individuals at different times will converge because that entity actually exists 'in reality'.

According to conventional science method (which is realist in orientation) theories are associated with two fundamental principles — induction and deduction. Induction is the process whereby, on the basis of a large number of observations, and provided that not one observation contradicts the others, a theory can be produced and can be said to be true. From this theory, and on the basis of its truth, other events and entities can be predicted and explained, by a process of deduction (Chalmers, 1976:5). The scientific method, involving both principles, has been understood to be an expression of the human rational process, structured according to the principles by which the mind actually works. Thus, a theory is thought to be true because it pertains to the rational foundation of the world. Kosso speaks of different grades of theories. He says that hypotheses are theories with a minimal degree of credibility, but this may be strengthened over time to reach a stage when we would call them a law. He writes (Kosso, 1992:21):

[Those] theories, which generalise and describe kinds of things, are laws. We speak of the law of free fall, itself a chapter in the law of gravity . . . Unlike the feature of being hypothetical, we should be able to tell by looking at the presentation of a theory whether or not it is lawlike. It must be in the form (perhaps implicitly) of a generalisation. All A's are B.

Trigg makes a departure from the conventional notion of scientific method when he suggests that a theory is not necessarily false simply because one instance appears to contradict the rest. He suggests that circumstances may later be found which specifically explain that contradiction. Furthermore, while he has no argument against the traditional scientific method, in his claim that there are
different ways to ‘truth’ he is making a radical departure from common assumptions about science. Trigg sees the goal of realism as finding out about reality, based on the presupposition that reality actually exists; but, as he says, different aspects of reality may need different methods of investigation. He writes:

It has too easily been thought that if we cannot discover, say, God or moral truth by scientific means, we cannot talk of truth in religion or morality. Indeed, it has too easily been assumed that we know the right methodology even for science. (p.198)

(b) Relativism

Whatever departures he might be making from conventional scientific thought, the whole realist basis of Trigg’s thought is opposed by relativism. Relativists have attacked the conventional notions of scientific method on every level, casting doubt on ‘observation statements’ as providing a sure foundation upon which to build knowledge, and questioning the processes of induction and deduction by which theories are built and put to use. In general, the relativist view is that, rather than theories being built from experiences, it is actually our theories which determine experiences. Our theoretical systems are seen as the ‘lenses’ through which we view the world; they are there before any experience. According to the relativist, even what we observe is not ‘pure reality’ but determined by pre-conceptions, by what we are looking for. Thus it is said that all experience is ‘theory laden’ and is relative to ourselves.

The programme of scientific research put forward by Karl Popper is known as ‘falsificationism’ and with this the aim of science becomes a matter of falsifying theories rather than proving them according to simple inductivist techniques. According to the falsificationist method, any way possible is used to attack an existing theory, which must give way if observations and new conjectural theories prove to be stronger and better fitted to the available observations. Chalmers (1976:57) writes that in the view of falsificationists:

Theories can be conclusively falsified in the light of suitable evidence, whereas they can never be established as truth or even probably true whatever the evidence. Theory acceptance is always tentative.
Popper claims that the aim of science is to progress towards a true explanation of the world, and that knowledge is 'objective' in that it moves towards that aim. Knowledge, according to his view, is thus not relative to beliefs or subjective findings of individuals, or even communities of individuals. For Popper there is truly an 'objective' world which science is finding out about. This makes his philosophy fundamentally realist.

However, Popper's notion of the tentative nature of truth, for others, provides the basis for thinking that truth does not exist at all and that at no time will a theory refer to one world or one common reality. Thomas Kuhn has proposed that science proceeds by revolutions in which the theories or paradigms of one culture are overturned by another. Kuhn maintains that progress does not occur by coming closer to 'truth' or 'reality', for he says (1970:94) that 'there is no standard higher than the assent of the relevant community'. Theories or paradigms are thus, for him, what guides all observation and scientific methodology. Kuhn has insisted, however, that he is not a relativist in that he believes later theories are generally better than earlier in solving particular problems and puzzles (Chalmers, 1978:94). However Kuhn does not suggest that a theory is true in the sense that it provides a better explanation of something which exists 'in reality', the basic requirement for realism according to Trigg. Trigg (1989:62) writes that, according to Kuhn:

Proponents of different theories (or different paradigms, in the broader sense of the term) speak different languages — languages expressing different cognitive commitments, suitable for different worlds.

Kuhn would certainly seem to be, to some degree, a relativist in that he would deny that successive theories or paradigms come closer to what is 'really there'. Reality, for Kuhn, is a 'world' built out of the beliefs and theories of a particular culture, and another culture will have another 'world'.

Whatever tendency one discovers in the ideas of Kuhn to see reality in a relative way, one finds these taken much further and stated explicitly in the philosophy of Paul Feyerabend. In the first place, Feyerabend denies that science should be seen as having a privileged status as regards 'truth'. Indeed, he likens science to an ideology
and its dominant position in present-day culture to the hold religion once had in Western society. He writes (Feyerabend, 1983:46):

To choose a style, a reality, a form of truth — together with criteria for reality and rationality — is to choose something man-made. It is a social act and depends on an historical situation . . . One decides for or against the sciences, then, in exactly the same way as one decides for or against punk rock — admittedly with the difference that the sciences are now so embedded in society as to ensure that the former choice is attended with a good deal more talk and noise.

Actually it is not Feyerabend’s contention that science does not have a monopoly over truth that makes him anti-realist, for, as noted above, Trigg, as a realist, makes exactly the same claim. What makes Feyerabend’s view completely opposed to Trigg’s is that Feyerabend is denying that any form of culture, any form of knowledge, has access to reality. He is claiming that reality is simply defined according to different ideologies.

Feyerabend also makes the claim that the scientific method is relative and always has been, that there are a plurality of methods in science with none being the most rational or objective. This, however, should not be confused with Trigg’s statement, quoted above, that “it has too easily been assumed that we know the right methodology even for science”. Trigg is saying that different methods may be better approaches to reality under certain circumstances; Feyerabend is saying that no method has access to reality, or will produce a theory of any greater truth than the previous one. The development of theories, for Feyerabend, does not represent a gradual approach to truth. Rather, he views theories as being incommensurable and as numerous as the individuals holding them. According to this way of thinking, no advantages are to be gained from comparing theories to the results of sense experiences, for the latter are totally ‘theory dependent’. However Feyerabend does say that a mutual comparison of rival theories can force hidden assumptions into the open and in that way theories may be viewed as undergoing development (Chalmers, 1976:146).
(c) Phenomenology

Martin Heidegger presents a radically different perspective on the nature of theory from the two views given above. Heidegger has attempted to penetrate to the essential meaning of theory (and thus to the essence of science). As with the case of the words ‘phenomenon’ and ‘truth’, he reaches back to the origins of our word ‘theory’ to find the primordial meaning which, however, he does not believe simply belongs to the past, but belongs to our current usage as its essence, albeit obscured. Heidegger finds the origin of theory in the Greek noun ‘theoria’ which has two root meanings: Thea is the outwards look of something, the aspect in which something shows itself; and horae, meaning to look at something attentively. He writes (1977:164):

That particular way of life (bios) that receives its determination from theorin and devotes itself to it the Greeks call bios theorikos, the way of life of the beholder, the one who looks upon the pure shining-forth of that which presences... for the Greeks, bios theorikos, the life of beholding, is, especially in its purest form as thinking, the highest doing. Theoria, in itself, and not only through the utility attached to it, is the consummate form of human existence.

Heidegger goes on to point out that the Roman translation of theoria by contemplatio actually made the original meaning vanish, and in doing so determined the meaning of ‘theory’ for the development of Western science. For contemplarī means to partition something off and enclose it in a separate sector. Heidegger writes (1977:166):

In theoria transformed into contemplatio there comes to the fore the impulse, already prepared in Greek thinking, of a looking-at that sunders and compartmentalises. A type of encroaching advance by successive interrelated steps towards that which is to be grasped by the eye makes itself normative in knowing.

This is precisely what Heidegger finds the essence of modern science to be; the systematic process of ‘compartmentalising’ the world, of “entrapping it in order to secure it as object”; that is, of objectifying it. And in that objectification the world becomes able to be appropriated as measurement:

Man founds and confirms himself as the authoritative measure for all standards of measure with which whatever can be accounted as certain —
i.e. as true, i.e. as in being — is measured off and measured out (reckoned up). (Heidegger, 1977:151)

Heidegger says: “Science is the theory of the real” (1977:159), and this relates to the essential meaning of theory as theoría. Heidegger believes that it is still the task of present-day science to realise theory on that level. He connects the ‘real’ in this statement to the meaning of ‘to work’ (i.e. the reality which works in things); nature (Physis) ‘works’ in that it grows, it comes forth out of itself as does a plant. Physis is Thesis; thesis also essentially means a doing that, “from out of itself to lay something before, to place it here, to bring it hither and forth . . . that is, into presencing” (Heidegger, 1977:159). Heidegger reveals how, for contemporary scientific theory, the real now shows itself merely as object, that which stands over against the subject and which may thus be appropriated by the subject. Scientific method is thus seen to be the process of creating theories which refine nature by bringing it to a presence which is objective and accessible. But Heidegger is asking: have we lost sight of the essential scientific work which is the ‘highest doing’? This is what he seeks to bring to light as the science of phenomenology. He sees the task of phenomenology as not the ‘entrapping’ of the real, the sectioning off of it into objectivity, but as aiming to fulfil this greatest of human possibility; to be the ‘clearing’ in which the real may come to presence in its truth. The ‘theory’, essentially and in the highest sense, is a ‘beholding’ which is also a doing of the mind. But, Heidegger explains, what we call science today is only one way which allows such an ‘unconcealing’; art may equally be a ‘doing’ in that highest sense.

C. GOETHE IN RELATION TO THE CONTEMPORARY PHILOSOPHY OF SCIENCE

My task now is to position Goethe in relationship to the three streams of contemporary thinking I have identified above. From the foregoing discussion of ideas regarding the phenomenon, knowledge and the theory, as relating to both Goethe’s world-view and world-views inherent in the contemporary philosophy of science, certain connections or correspondences become apparent.
Firstly, it is clear that Goethe could not be termed a relativist in the terms defined above. He certainly acknowledged that there is a reality (he called it Nature) which is not merely a construction of the human mind and relative to each individual consciousness. His whole scientific endeavour was directed towards discovering a 'higher nature' within nature, of realising the 'pure phenomenon' which he saw as the revelation of the way an entity 'partakes of infinity'. Goethe spoke of 'objective thinking' meaning a thinking which intimately concerns itself with real entities. He experimented with entities in order to discover 'laws' that lie hidden within them. But then, he was vehemently opposed to this process becoming too 'theoretical' (in his pejorative sense), as if these laws could only be apprehended as mental abstractions. He was drawn to the actual qualities of things and did not wish to reduce these qualities to numbers or abstract categories. When he speaks of the experiment as "mediator between object and subject", he plainly falls short of true realism in the way Trigg defines it. To the end of discovering the highest truth of an entity, Goethe saw that the human being is intimately involved with it and he talked of 'participating spiritually' in Nature's creative processes through intuitive perception. It would appear that Goethe is closest to twentieth century phenomenology in his fundamental concern with 'things themselves'. Goethe considered that "everything exists out of its own nature"; there is no other reality behind it which is more 'real' (and accessible only through ratiocination). Goethe believed that, to an awakened sense (a "delicate empiricism" in his terms) the phenomenon itself (that is, just as it appears) is a manifestation of Divine nature, that which Heidegger calls Being.

Accordingly, Goethe's way of thinking about knowledge and truth corresponds most closely with Heidegger's conception of phenomenology. This is not altogether surprising considering that Heidegger's thought emerged from the same organic tradition as did Goethe's. Heidegger could be said to have developed insights attained by Romantic philosophers such as Hegel and earlier 'organic' philosophers going back to Parmenides (although there is no evidence he drew any direct inspiration from Goethe). The 'nature philosophers' with whom Goethe was connected were reaching towards a holistic or participatory mode of thought, an intellectus archetypus to use Kant's expression, a 'living thinking'
which thinks from the whole into the parts. Such a thinking cannot be defined merely as the activity of a subject upon an object. For Goethe, as for Heidegger, a phenomenon emerges into a new possibility of itself in the condition of ‘being known’. For both these thinkers there is no irrevocable division between humanity and ‘nature’, knowledge and reality, because humanity and ‘nature’ are both creations of Nature (or Being as Heidegger termed it). Goethe wrote: “[Nature] has neither language nor speech, but she makes tongues and hearts with which to feel and speak” and “[Nature] has brought me here and she will lead me away... It is not I who has spoken of her. No, what is true and what is false, all this she has spoken” (Goethe, 1988:5). Similarly, Heidegger considered that Being creates human beings so that ‘knowing’ can come about. “Physis (Being or Nature) brings forth the humans necessary to disclose what physis brings forth” writes Zimmerman (1990:234) on the subject of Heidegger’s understanding of knowledge.

We are now in a position to place Goethe’s statement — “Let us not seek for something behind the phenomena — they themselves are the theory” — in the context of contemporary thought. It is immediately apparent that this understanding of theory in no way accords with the relativist position as defined above. Goethe is not suggesting that a theory has meaning only in relation to the experimenter, that theories are what determine our experiences of reality. Yet it is also apparent that Goethe does not have the realist notion of ‘truth as correspondence’ in mind; for a theory to be true couldn’t mean for Goethe that it merely corresponds with reality, for he is saying that, in a certain sense, a theory is reality, is the phenomenon.

In this statement Goethe is meaning theory in the authentic sense (as opposed to the pejorative sense of being ‘merely theoretical’). Both his pejorative and authentic senses of theory have a connection to the phenomenological thought of Martin

---

8 Goethe, like Hegel, saw the human mind as the highest point of nature’s evolution. However, plainly, this did not make Goethe’s notion of knowledge anthropomorphic, for he always saw nature as the ‘inner artist’, creating human beings and their capacity for knowledge, as everything else. Hegel understood the world as the evolution of Spirit. Donald Worster (1977:89) writes: “For the Goethean naturalist the label [anthropomorphic] literally had no meaning; that man saw the world as a reflection of his own image could not conceivably be a distortion of nature, for man on the other hand also reflects nature’s order — the two are inseparably one. Real knowledge of nature, therefore, is necessarily an introspective process. To look inward is to see the cosmos, to be ‘nature looking into nature’.”
Heidegger. As shown above, Heidegger considered the danger of ‘theoretical’ science to lie in the power it gives humanity to compartmentalise the world, to ‘secure it as object’, to render it quantifiable and thus controllable. Goethe, too, felt that ‘theoretical’ science has the capacity to “overpower and immobilise nature”. Heidegger, like Goethe, recognised an alternative pathway in science, a journey of self-overcoming whereby phenomena are allowed to ‘speak’ on their own terms. They saw this as the pathway which leads towards the highest possibility of theory (even if they conceived this pathway in very different terms). This authentic theory is the ‘wholeness’ of the phenomenon, its dimension of unity. For Goethe, this is the ‘pure phenomenon’, the ‘idea’ out of which the thing arises or comes to presence. What makes Goethe’s approach phenomenological in the modern sense is that he did not think of the ‘idea’ or theory as something behind the phenomenon, an unknowable ‘thing-in-itself’. He considered that the theory may be ‘seen’ in the visible aspect of the phenomenon if one attains to a heightened faculty of perception.
CHAPTER III. GOETHE AND CONTEMPORARY ECOLOGY

In the last chapter I searched for the philosophical location of Goethe's world-view and conception of 'theory' in relation to present day philosophies of science. I have shown that, indeed, Goethe has a relevance to contemporary thinking in that his ideas can be closely related to modern phenomenology. However, this still does not indicate unique features of his approach that may have decisive value in terms of contemporary needs. In my introductory chapter I asked the question: does Goethe's notion of the 'theory' have particular relevance to today's environmental issues? The next step, then, is to relate Goethe's approach more directly to present day philosophies which are focussed on questions of the environment and ecology.

My first task here will be to provide an outline of the roots of the contemporary understanding of 'ecology'. I will then proceed to discuss two variants of 'eco-philosophy' before indicating whether, and in what sense, Goethe's form of 'nature study' could be called 'ecological'. The sections in this chapter will be: A. Ecology; B. Deep Ecology; C. Social Ecology; D. Goethe as Forerunner of a New Ecological Discipline.

A. ECOLOGY

As Donald Worster points out in his Nature's Economy (1977), the word 'ecology' today has an enormous burden of meaning. It means many different things to many different people; it is a form of biological science, a way of thinking or world-view, even to some a form of spiritual practice. In the most general terms, it has to do with the understanding of the whole web of life in which humanity is included. As such it evokes questions both scientific and ethical: how best can this 'web' of life be studied? What are the human responsibilities within this web? My discussion of Goethe's scientific approach in the context of contemporary culture has led naturally to this consideration of ecology. It was not a word Goethe used himself; nevertheless, at least on the face of it, Goethe's way of thinking had a lot to do with what we would now call ecology; Goethe did not merely study nature, he was also
deeply involved in what we would now call ‘environmental ethics’. As I will show below, Goethe features prominently in the history of ecological ideas and today his scientific contribution is best assessed in this light.

The origins of contemporary ecology can be found in the traditions of ‘organic’ thinking which stretch back at least to Plato and to which I have referred in the previous chapter. Here the universe is understood to be a whole, in which every part, every being, is organically interrelated with every other. We find the roots of the word ‘ecology’ in the way Christian philosophy took hold of these ancient organismic conceptions and gave them a particular religious orientation. The Swedish botanist Carl von Linné, in the eighteenth century, wrote an essay entitled “The Oeconomy of Nature”, where the word ‘oeconomy’ is related to its Greek root — oikos, or house. “The Oeconomy of Nature” thus referred to the management of the household of living things on earth, and related to a conception of the general aims God had when He allotted all things a ‘place’ in nature. (Worster,1977:31-55). Thinkers at this time began to develop a more and more mechanical world-picture (finally articulated by Newton) where life is conceived as a machine set in motion by the Creator, with all its parts designed to work in perfect interrelationship. The aim of life was considered to be to serve human needs, humanity being the highest of God’s creations.

There were those who rebelled against this mechanised world-picture and against the notion that life was created simply for the human being; Goethe was one of these. Worster (1977) places him alongside Henry Thoreau as important representatives of Romantic ecological thinking. Both of these had inherited the organic world-view but did not find a reason in this way of thinking for placing humanity in a commanding position over the rest of creation. They both conceived nature, not as a machine working to a fixed and preconceived order, but as a living, dynamic whole with which humanity existed in intimate intercourse. Worster (1977:82) writes:

The previous age of mechanical deists and physico-theologists, it is true, had also posited a nature joined together in a kind of unity. But their notion of integration was too cold and contrived, too lacking in essential coherence, to satisfy the Romantics. What they needed was a sense of inviolable
interdependence that no machine analogy could possibly offer . . . The Romantics saw nature as a system of necessary relationships that cannot be disturbed in even the most inconspicuous way without changing, perhaps destroying, the equilibrium of the whole.

Both Goethe and Thoreau tried to find their way towards a science which would involve a deep participation in life rather than one which, through abstract knowledge, seeks to understand and manage a world considered to have been made solely for human purposes. Thus they had no problem applying words such as 'love', 'sympathy' and 'soul' to their science:

Love is the recognition of interdependence and the 'perfect correspondence' between spirit and matter; sympathy is the capacity to feel intensely the bond of identity or kinship that unites all beings with a single organism. (Worster, 1977:89)

This organic world-conception of the Romantic naturalist took a particular direction through the work of Charles Darwin who further undermined the theistic notion that there is an allotted, fixed 'place' for every living being. Darwin saw that life evolved through constant competition for 'places' in the environment. He did not preserve the Romantics concern with spiritual intimacy with nature but helped develop the strictly epistemological approach which we see in biological ecology today. It was the German Darwinian, Ernst Haeckel, who in 1866 coined the term 'Oecologie' for the science which studied the relationship of living organisms, and this word in later times converted to 'ecology'.

Another significant impulse towards present-day ecological biology came, in the first part of the nineteenth century, from another German, Alexander von Humboldt. Humboldt had a holistic view of nature which, as Worster points out (1977:133), took much of its impetus from contact with Goethe. Goethe writes in his essay Towards a General Comparative Theory (1988:55),

How does a surrounding element, with its various specific characteristics, affect the general form we have been studying? How does the form, both determined and a determinant, assert itself against these elements? What matter of hard parts, soft parts, interior parts, and exterior parts are created in the form by this effect? And...what is wrought by the elements through all their diversity of height and depth, region and climate? . . .we will raise our observation to a higher level to consider the structured world itself as an interrelationship of many elements. We will see the entire plant world, for example, as a vast sea which is as necessary to the existence of individual
insects as the oceans and rivers are to the existence of individual fish, and we will observe that an enormous number of living creatures are born and nourished in this ocean of plants.

And at much the same time, Humboldt explains his task of research:

I shall endeavour to find out how nature’s forces act upon one another, and in what manner the geographic environment exerts its influences on animals and plants. *In short, I must find out about the harmony of nature.* (quoted in Worster, 1977:133)

Humboldt set about studying plants, not as individuals but as parts of whole biological systems influenced in composition by such environmental factors as climate. He not only considered organisms according to their taxonomic relationships but according to overall patterns in which they exist in communities. Humboldt had a vision of universal ‘unity in diversity’ which, in spirit, was related to Goethe and the Romantic philosophers, but in practice served the development of a more empiricist, rationalist ecological biology. It was this way of studying organic communities in terms of their overall patterns and the environmental factors which evolved, in the twentieth century, into the scientific discipline of ecology.

Biological ecology now takes its place alongside botany and zoology as a fully fledged member of the family of sciences. In general form and method it is identical with the other sciences; it proceeds by description and analysis in order to form theories and make predictions regarding ecosystems. In the words of one plant ecologist, the initial description of vegetation takes place

> to enable people other than the observer to build a mental picture of an area and its vegetation and to allow the comparison and ultimate classification of different units of vegetation”. (Kershaw, 1973:1)

One of the things ecologists are interested in is pattern in the existence of organisms in certain environments.

> Environmental pattern is developed in vegetation in response to a general and overall variation of one of the major environmental factors and produces a pattern of density distribution. (Kershaw, 1973:152)
Ecologists use often complex mathematic procedures to analyse the groupings of organisms and upon this information develop hypotheses regarding the causes of these patterns (which could be soil type, pollinating vectors, weather conditions and so forth). In other words, ecology, as generally understood as a biological science, is a hypothetico-deductive science founded upon quantitative analytical techniques.

The ethical dimension of ecological thinking, recognised by the Romantic naturalists, has continued to evolve along other pathways. Notions of ethical environmentalism took hold in the early twentieth century through the influence of Alfred North Whitehead and Albert Schweitzer (Nash, 1989: 59-60). Their views about the total interwovenness of life and the need for a reverence towards things developed into philosophical and legal questions concerning the 'rights' of non-human beings, and also motivated the formation of conservation movements in various parts of the world. In recent decades, particularly in response to rapidly growing awareness of the critical nature of our environmental problems, ethical environmentalism has flowered into numerous different forms and movements of thought. Prominent among the latter are so-called Deep Ecology and Social Ecology and I shall look more closely at these.

B. DEEP ECOLOGY

Deep Ecology, itself, is already a wide ranging intellectual movement embracing a spectrum of positions and interpretations. It does, however, have various central concerns and these have been adumbrated by several prominent authors to whom I will refer. Like its conventional scientific namesake, it uses the word ecology because of its fundamental concern with the relationships between organisms and their environment. However, Deep Ecology refers to the attempts to question more deeply the whole context of these relationships in which the human being is included; this was the idea behind the philosopher Arne Naess's original formulation of the term (Naess, 1973). Thus, while biological ecology limits itself to description and analysis of patterns and mechanisms in the environment, Deep Ecology includes within its scope of considerations social, religious and philosophical issues which extend to a questioning of the very nature and purposes of existence itself.
Deep Ecology recognises that human beings are but one aspect of nature which is characterised by its incredible richness and ‘unity in diversity’ whereby every being, small or large, has intrinsic value and is connected with everything else. Deep Ecologists identify a general tendency amongst human beings to project values onto nature, this being related to the desire to order and control nature to meet human needs and purposes. Freya Matthews writes (1988:10):

[The notion of intrinsic value] is the idea that all beings have value in their own right, irrespective of whether they have any ‘use value’ for us. And along with this idea of intrinsic value, we find the further idea that all beings are equal in value — that there are no ‘higher’ and ‘lower’ life forms in Nature, but that the very concept of rank is political in origin, and inappropriate when projected onto Nature.

This relates to a central concern of Deep Ecology with *ecocentric* rather than *anthropocentric* ways of thinking.

As Matthews points out, the ideas behind Deep Ecology are not new; she writes (1988:9) that the sense of the unity of nature

has been the perennial refrain, not only of artist and poets within our own culture, and of Aboriginal people, but of ancient and primal peoples all over the earth.

Bill Devall (1980) has described some of those traditional perspectives in detail. He relates how Deep Ecology has been influenced by a number of different streams of thought. One of these has been the influx of ideas from Eastern philosophies where the notion of the unity of life is elaborated in great depth. Another influence has been the re-evaluation of the religious beliefs and customs of Native Americans and other preliterate peoples. A third source, Devall shows, is the growing interest in the ‘minority traditions’ of Western religions and philosophical traditions. Here Bruno and Spinoza are mentioned in particular. Devall writes (1980:306):

Spinoza’s ethics is most naturally interpreted as implying biospheric egalitarianism, and science is endorsed by Spinoza as valuable primarily for contemplation of a pantheistic, sacred universe and for spiritual development.
As a recent representative of the Western tradition, Heidegger is also mentioned by Devall. Heidegger’s contribution to Deep Ecology has been discussed in detail by Michael Zimmerman (1983,1993). He writes (1993:200):

Heidegger can be viewed as a forerunner of deep ecology because he called for a ‘higher humanism’ that would lead beyond the anthropocentric, dualistic humanism associated with dominating nature and make possible authentic ways of ‘dwelling’ [human living] compatible with ‘letting things be’.

Devall notes that the conventional science of ecology can contribute to the cause of Deep Ecology when it places special emphasis on the idea of the biosphere as ‘home’ for the whole diversity of species including human beings. However he also warns (1980:307) that ecology as an analytical science

is open for co-optation by the engineers, the ‘technological fixers’, who want to ‘enhance’, ‘manage’, or ‘humanise’ the biosphere.

In a general sense, Deep Ecology is not concerned with the description and analysis of ecological patterns and relationships but with promoting the value of an increased human awareness of the total interconnectedness of things.

The expression Arne Naess gave to this ‘increased human awareness’ was ‘Self-realisation’. Fox (1990:106) writes that:

self-realisation . . . leads us to seek, among other things, and under suitable conditions, to understand the world and our place in it, and understanding the world and our place in it, (i.e., understanding that reality is a unity, that all entities are modes of a single substance) leads us to identify more widely with the world of which we are a part; it leads, in other words, to the realisation of a more and more expansive sense of self (i.e., Self-realisation).

As Freya Matthews puts it (1988:11):

The idea is that when people are internally charged in this way, when they experience the power that may be drawn from their interconnectedness with all of life, they will withdraw their support from destructive and exploitative social structures . . . the role of Deep Ecology in the environmental movement then is perhaps that of a consciousness raising tool.

Such a view accords with the general view of Deep Ecology that humans should not interfere with other beings, and this includes investigating them in the conventional ecological sense. Deep Ecologists tend to promote a hands-off
approach, rejecting scientific research into organisms and ecosystems as anthropocentric and manipulative. They maintain that natural entities have the right to be and to unfold their destinies without interference from human beings.

Deep Ecology, then, looks to techniques of raising consciousness or Self-realisation rather than to techniques of increasing our store of factual knowledge about living things. Consequently there is a looking back to the ‘old ways’, the ‘earth rituals’ and methods of spiritual development from traditional cultures of all kinds. For example, Freya Matthews (1988:11) draws quotations from the texts of Taoism; Michael Zimmerman points to affinities between Deep Ecology and Buddhism (1993:217); Dolores LaChapelle (1988:268-300) refers to ways of heightening ecological consciousness through traditional ritual such as dance, chanting and drumming. Matthew Fox suggests that the greatest degree of Self-realisation (the realisation of the unity with — and thus respect for — all of nature) is not a matter of logical analysis, but spiritual training. He writes (1990:251):

If one seriously wishes to pursue the question of ontologically based identification [Self-realisation] then one must be prepared to undertake arduous practice of the kind that is associated with certain kinds of experientially based spiritual disciplines [such as Zen Buddhism].

He adds that most of us are not prepared to do this.

No special mention (as far as I can ascertain) is made of Goethe in Deep Ecological writings, but it is not hard to see certain correspondences between his world-view and the world-view of Deep Ecology (at least in its general form). Goethe conceived nature as an organic unity in which all beings are interconnected; he considered all beings as valuable and worthy of respect because they are all parts of the one divine creation. This can be compared to the Deep Ecological view of nature as a ‘unity in diversity’ and desire to promote respect for the intrinsic value of all beings. Goethe writes how, in his science, he “defended the rights of nature” (Goethe, 1988:30) which sounds very similar to a Deep Ecological way of speaking. Spinoza is cited as a forerunner of Deep Ecology. I suggest that Goethe, greatly influenced by Spinoza, could in his own way be considered a forerunner, as could Schelling, Hegel and other participants in the German Naturphilosophie movement.
However, there are significant ways in which Goethe’s approach does not accord with Deep Ecology. Firstly, when we consider the manner in which Goethe went about studying nature we run into problems. Goethe collected bones, rocks and plants; he looked at crystals and flowers with a magnifying glass; to all appearances he was a scientific researcher in the conventional sense. He may have made philosophical statements regarding the unity of life and have voiced his opposition to the Baconian doctrine of ‘torturing’ nature to yield her secrets, but in practice he was completely unrevolutionary; such might be the view of a Deep Ecologist examining Goethe’s work today. Goethe wished to understand more about the phenomena of nature and Deep Ecologists may find his approach anthropocentric, that is, governed by his needs and determinations rather than the needs and potentialities of the beings themselves. It may be said that in theory, but not in practice, Goethe is a forerunner of Deep Ecology.

We uncover more (apparent) discontinuities when we compare Goethe’s aims with a fundamental aim of Deep Ecology, namely, Self-realisation. As described above, the methods of Deep Ecology are intended to ‘raise the consciousness’ of individuals, to help them to understand themselves and their relatedness to the whole of nature, this supposedly leading to more aware and responsible forms of social action. These methods have nothing to do with studying nature as such. Whether it be ‘arduous practices’ such as Zen Buddhist meditation, chanting, drumming or simply ruminating philosophically, all of these are ‘inner’ methods and cannot be compared to the way Goethe went about actually physically examining entities in order to gain his insights. Now, Goethe was not unaware of the Western tradition of Self realisation. He wrote (1988:39):

I must admit that I have long been suspicious of the great and important-sounding task: “know thyself.” The words inscribed above the entrance to the temple of Delphi. I am taking ‘Self-realisation’ and 'know thyself' to be the same idea because, in all religious traditions, ‘self knowledge’ does not merely refer to knowledge of the limited egoic self but to knowledge of the higher Self or Divine Ego.
We can, incidentally, note a similarity between Goethe's and Fox's perception of the virtual impossibility of humanity in general meeting the demands of spiritual disciplines; beyond that Goethe and Fox\(^\text{10}\) appear to move in opposite directions. Goethe moves towards the world of actual things rather than to the 'inner' space of consciousness, of spiritual discipline and Self-realisation. To use the modern phenomenological expression, he wished to look to 'the things themselves' and if we can speak of 'spiritual insight' in relation to nature, he wished to attain this in relation to what he could actually 'see' and experience in the world, albeit with heightened 'organs' of perception.

Therefore we would appear to have come to an end of the usefulness of comparing Goethe's approach with Deep Ecology. The decisive difference has to do with what is understood by 'activity in the outer world', to use Goethe's own phrase. Goethe could not have espoused the 'hands off' approach of Deep Ecology because he considered it the task of the human being to engage actively and creatively with the things of nature. In this respect we find closer correspondences between Goethe and another form of contemporary ecological thought — Social Ecology.

C. SOCIAL ECOLOGY

Here I will focus on the meaning of Social Ecology as developed by Murray Bookchin.\(^\text{11}\) Bookchin has stated (1991) that the task of ecology is not so much Self-realisation as such, the attaining of an awareness of or an identification with the Oneness of existence, but with the practical responsibilities entailed by the fact that human consciousness and society (what he calls 'second nature') has evolved out of non-human terrestrial nature ('first nature'). In this he is greatly influenced by the 'dialectical tradition' and particularly Hegel's organicism out of which he derives an ecological discipline he calls 'dialectical naturalism'. Hegel used the image of plant

\(^{10}\) While it is true that Fox eschews the term 'deep ecology' in favour of 'transpersonal ecology', he makes it clear his thinking is grounded in the fundamental philosophical considerations which characterise 'deep ecology'.

\(^{11}\) There are now a number of schools of thought which have assumed the name 'Social Ecology'. This thesis is being prepared under the auspices of a School of Social Ecology which acknowledges this spectrum of interpretations. I am focussing on the interpretation of Murray Bookchin here, partly because of his longstanding use of the term (going back to the fifties), and partly because it comes closest to Goethe's own thinking. A number of other interpretations are of a more relativist orientation.
growth, with its complex differentiation into leaves and flowers regulated by the plant as a 'whole', to describe the process of evolutionary unfolding, of a potential in nature becoming actual. For Hegel (and Bookchin) the appearance of human beings and the possibility of human freedom bespeaks just such an unfolding of a potentiality of nature as a 'whole'. (Bookchin, however, rejects the 'idealism' of Hegel and his speculations regarding the workings of a universal Spirit).

'Dialectical naturalism', for Bookchin, is the means of discovering the responsibilities which accrue from our being purposeful products of nature's evolutionary process. He contends that there is a directionality in nature which points to certain possibilities for human development, not a preordained end but the possible "actualisation of what is implicit in the potential" (1990:267). Thus he sees the task of fulfilling our human potentialities in our future becoming as related to the understanding of the original coming-into-being of humanity out of nature. He writes (1990:274):

The most crucial dialectic we now face — theoretically and practically — is the way human social evolution (second nature) has phased out of biological evolution (first nature), the continuities that relate them, the discontinuities that distinguish them from each other, and, above all, the problems their interactions have produced within the larger continuum of development we call 'nature'.

Bookchin believes that we human beings have a responsibility within nature to evolve our unique mental and technological capacities to further nature's evolution through a symbiotic process which can give rise to an 'ecological society' in the future. He takes this to be the evolutionary function and potentiality of the human being as "the self-reflexive voice of nature" (Bookchin, 1991:365).12 He also speaks in

---

12 This is a point of division between the Bookchin's vision of Social Ecology and Deep Ecology, and is discussed by Zimmerman (1993). Deep Ecologists, as Zimmerman points out, see Bookchin's view as anthropocentric, as wishing humanity to intervene in nature, whereas the deep ecological 'biocentric' view is that natural phenomena do not need human beings to 'be' what they are. Bookchin claims he is talking about the possibility of entering into a symbiotic relationship with nature in order to foster a more diverse, complex and fecund biosphere, and that this is humanity's task and responsibility. Zimmerman notes that Deep Ecologists have looked to Heidegger to support their idea that non-human nature does not need any form of human intervention in order to realise its potential. He writes (1993:223): "Deep Ecologists claim that humans can be the 'voice' of nature only in quite limited ways." Heidegger's conception of 'letting things be' means a way of 'knowing' which is a caring for things in that it allows them to be what they themselves are, to show themselves on their own terms. Bookchin (1990:272) believes that the mentality which divides the situation up dualistically into 'bio-centric' versus 'anthropocentric' approaches is "a convenient way of eluding the need to develop a sophisticated and nuanced ecological synthesis between non-human and human needs".
this regard of a ‘creative intervention’ of the human mind into first nature which is “prudent, nonexploitative and ecologically guided” (1990:272).

It is this last point — Bookchin’s suggestion of the need for a ‘creative intervention’ into nature — which has got him into trouble with Deep Ecologists, as he himself discusses (1990). However, it is precisely here that we find a parallel with Goethe’s form of ‘nature study’. Goethe may not have used the word ‘intervention’ but he certainly considered it the human task to interact creatively with nature. Goethe, too, understood the existence of the human being, and all that belongs to human life, as a purposeful ‘creation’ of nature and as having certain implicit potentialities. He saw the task of scientific research into nature as one such responsibility. The problem for him was not the fact of scientific investigation per se, but how it is to be carried out and what it is seeking for. At the highest level Goethe saw science as a creative activity, creative in the sense that it allows something of what is potential in nature to become actual through human thinking and expression. He considered that

through an intuitive perception of eternally creative nature we may become worthy of participating spiritually in its creative processes. (Goethe:1988:31)

In another place (Goethe, 1988:74) he writes of the work of the scientist:

The intuitively perceptive have already reached a creative stage, for as knowledge undergoes intensification it begins to demand intuitive perception; it turns into intuitive perception without our noticing. The seekers of knowledge may cross themselves and bless themselves against imagination as often as they wish — before they know it, they will have to call on imagination’s creative power for help.

Bookchin speaks in modern, theoretical terms of the need to develop ‘symbiotic’ ways of working, of ‘creatively intervening’ in nature. Goethe had actually gone about trying to develop a scientific method of investigation which was inherently ‘creative’ and what we would now call ‘symbiotic’. It is for this reason that we can consider him as the forerunner of a new ecological discipline.
D. GOETHE AS FORERUNNER OF A NEW ECOLOGICAL DISCIPLINE


Putting into practice ecological thinking in the sense of greater wholeness is not just a matter of allowing respect for life and consideration of the environment to play a larger role in the technological application and the economic assessment of scientific knowledge. Welcome as such a practice would be, it does not lead us any closer to the heart of the question, namely the conditions under which greater wholeness and integrity would become possible.

He goes on to say that the conventional conceptual mode of the sciences does not provide such conditions and provides reasons for this which sound very similar to Heidegger’s. Altner (1987:342) sees this science as a form of power, a means “of making calculable in nature everything that can be made calculable”. He finds in Goethe’s approach the potential for these ‘conditions of greater wholeness and integrity’ to be met. He describes Goethe’s methodology as one

in which one arrives by means of the human senses at a living and immediate contemplative viewing [Anschauung] of nature . . . A vital contemplation that is also active and practical — that is Goethe’s passion. In this he is a true forerunner of alternative science. (1987:342)

Henri Bortoft is making a similar point when he suggests that Goethe’s approach represents a new way of seeing Nature as a ‘whole’. He writes 1986:72):

Instead of mastery over Nature, the scientist’s knowledge would become the synergy of man and Nature. The historical value of Goethe’s work, in the wider sense, may be that he provides us with an instance of how this can be done. If this should turn out to be the historical significance of Goethe, then our present science will be only a phase in the development of science.\(^\text{13}\)

\(^{13}\) Even books which recognise the major contribution of Goethe to the development of modern ecology tend to take just the historical approach, placing Goethe prominently amongst the ‘Romantic naturalists’ of the early nineteenth century whose ideas and methods certainly influenced but were overtaken by the advances of Darwinism and modern biological ecology. For example, Donald Worster in his Nature’s Economy, describes how Goethe not only had an ecological world-view, but strove to develop a new scientific approach which was more ‘whole’. Worster writes (1977:97): “[Goethe] doggedly kept on with his experiments in the hope that science, for all its wrongheadedness, might eventually by his aid be redeemed”. Here Worster paints Goethe’s work in a rather quixotic light; his efforts appear valiant but the end fruitless. Worster does not recognise the possibility that Goethe’s approach might represent something viable and new for us, even today.
This raises a number of questions. I have sited Goethe in the context of the contemporary philosophy of science but have yet to explain exactly in which sense his approach can be called scientific. One potential problem is his use of the words 'intuitive', 'imagination' and 'creative' to describe the work of the scientist, words which are much more commonly associated with art than with science. An oft-expressed point of view is that Goethe was primarily an artist and a mere dabbler in the sciences, a dilettante. Perhaps science is not the most appropriate term for his form of nature study (even if he used this term for it himself); perhaps it is closer to art. Certainly, speaking of it as 'a new form of ecological discipline' avoids some of these problems, but then runs the risk of seeming a little vague. I am not intending to resolve these questions here but a certain exploration and clarification would appear necessary.

When I have, up to this point, spoken of 'conventional science', I have meant the form of science which is practised by the vast majority of those today who go by the title 'scientist'. This may be called the classical scientific method. The fact that there is today a wide spectrum of theories and philosophies of science is another matter altogether. I have already, in Chapter II, made it clear that contemporary philosophy of science is by no means a unitary thing. There are positions which range from extreme relativism to extreme realism (or positivism) with phenomenology falling somewhere in between. Certainly there are strong forces of change entering the sciences from these philosophical spheres but it must be said that science, at the level of practice, has a considerable inertia and relies to a large extent on the tried and tested methods. It is towards these 'classical' methods and the conditions they generate that Altner is directing his criticism in the above passage; he looks to Goethe's approach as an alternative of a practical kind. In a similar vein, Bortofoft is concerned not so much about theory but about practice when he speaks of

---

14 One biographer, J.G. Robertson, writes (1932:312): "To many of us to whom Goethe is, above all things, the great poet, there is a dark side to Goethe's scientific pursuits. Did they not place hindrances in the way of his poetic activity? It may have been that he only turned to science when poetic inspiration left him in the lurch; but it may also have been that science was at times responsible for that failing inspiration and led to his neglect of that function for which he was supremely gifted."

15 In the most general terms, this is a combination of the empirical and hypothetico-deductive methods I have already spoken about in Chapter II. Certainly classical science would be called realist in its belief in real, objective 'laws of nature'. It becomes positivistic if it rejects metaphysics and all forms of beliefs and holds that experimental investigation and observation are the only sources of substantial knowledge.
Goethe's approach as 'providing us with an instance of how the synergy of humanity and nature can be achieved'. These writers are pointing to the primary importance of Goethe's contribution as being in the actual example he sets rather than in the philosophy he espouses.

Goethe's method of investigation is alternative in that it is not analytical in the classical scientific sense and in the way it draws from diverse areas of culture. Ronald King writes (1950:247):

The life and works of Goethe are a great natural bridge between the humanities and natural science. They are a link stretching from the limited experience and narrow outlook of every specialist to a broader vision and a new perspective.

The question here is not whether a specialist in any field — say plant morphology — may or may not have an interest which extends beyond that field; for example, into other sciences or into the arts. Indeed many scientists do have such wide-ranging interests. Goethe, as reported in his conversations with Eckermann (Goethe, 1901:116), defined the difference between 'culture' and 'practical activity'; an individual is cultivated in his understanding and outlook by drawing from many sources but concentrates on a single practical activity or specialisation. Nevertheless, Goethe himself appears not to have been able to specialise in this way; he not only cultivated himself with diverse theoretical and philosophical interests in both the arts and sciences but practised both. Goethe writes (1901:163):

I have... never observed Nature with a view to poetical production: but, because my early drawing of landscapes, and my later studies in natural science, led me to a constant, close observation of natural objects, I have gradually learned nature by heart even to the minutest details, so that, when I need anything as a poet, it is at my command; and I cannot easily sin against truth.

Peter Salm (1971) has shown how the structure and content of Goethe's famous drama Faust is based upon the principles of plant development — metamorphosis, polarity, intensification and the 'archetypal plant'. For Goethe there was a two-way exchange between his art and his science. Goethe has been called a 'generalist', a

---

16 See Chapter IV for the meaning of these terms.
'Renaissance man', with Leonardo da Vinci providing an earlier example of a creative individual who was practised both in art and science. Yet this in itself brings no light upon what is unique and significant in his approach for us today. For this to happen it is necessary to penetrate further into what Goethe meant by human creativeness.

Goethe conceived art and science as being governed by the same creative principles and judged by the same 'sense of truth'. He writes (Goethe, 1988:47):

In artistic work as in scientific and mathematical work, the essential element is the underlying truth which is disclosed not so much by speculative thought as by practical application; here we find the touchstone for what is born of the spirit, what an inner sense recognises as truth.

Such a notion is explicable when we consider the influence on Goethe of Kant, especially his *Critique of Judgement*. Goethe wrote (1988:29):

The *Critique of Judgement* fell into my hands, and with this book a wonderful period arrived in my life. Here I found my most disparate interests brought together; products of art and nature were dealt with alike, aesthetic and teleological judgement illuminated one another.

Goethe writes, after his journey to visit the Italian art galleries, of his experience of the works of 'the great Masters' (Goethe, 1982:383):

These masterpieces of man were brought forth in obedience to the same laws as the masterpieces of Nature. Before them, all that is arbitrary and imaginary collapses; there is Necessity, there is God.

And in another place (quoted in Gage, 1980:78):

A true work of art will always have something of infinity in it to our minds, as well as a work of nature.

Goethe was critical of tendencies in his time to speak of both organisms and works of art as 'compositions'. He found this degrading to both nature and art (Goethe, 1901:377). For him, "the individual parts of an organic whole . . . produce themselves with life, and are pervaded by a common soul." Just so, the work of art is a spiritual creation, in which the details, as well as the whole, are pervaded by ONE spirit, and by the breath of ONE life; so that the producer did not make experiments and patch together, and follow his own caprice, but was altogether in the power of the daemonic spirit of his genius . . .
These statements can only make sense in relation to Goethe’s understanding of ‘true theory’. Through ‘intuitive perception’ one comes to apprehend how a created form, human or natural, ‘partakes of infinity’. So that, when a person studies a phenomenon of nature to the point of intuitive perception, there arises the inner recognition of ‘generative principles’ (theories, archetypes); these insights may be brought to artistic expression. In other words, natural and the human creation arises from a unitary source, according to the same ‘theory’. Goethe expresses this notion of creativity in *Faust*, where the source of creativity, the realm of Being itself, is symbolised by the Mothers (Goddesses). Gregor Sebba writes (1950:127):

> We must distinguish between creation as the making of Something, and the creativeness that constantly gives form after form to that Something . . . Even the Mothers cannot make anything new; much less can mortal man. But to give ever-new form to Being, to parallel the work of the unending creativeness that gives shape to what is, — that is the task and the function of the creative power symbolised by the Mothers.

Thus, according to Goethe (and here we can recognise his Neo-Platonic heritage), human beings do not merely replicate or imitate nature. Through human creation a phenomenon in nature reaches a new stage of actuality. This is what Goethe meant when he said that the work of the scientist, on the highest level, is *creative*.17

This is a perspective on ‘creativity’ which I do not believe is achieved by descriptions of the ‘complementariness’ of art and science. To give a few examples from recent philosophical and psychological literature: Rudolf Arnheim (1991) views the division between science and art as the division between knowledge and value, quantity and quality, and he attempts to find a way beyond this ‘double truth’. Arnheim sees art as our primary source of meaning, providing an aesthetic grasp of the wholeness of life and thus as a necessary complement to science which he says is no more than “an inventory of factual phenomena” and thus incomplete. Ervin Laszlo writes with regard to his ‘transactional’ model of the mind (1968:81):

---

17 This runs the risk of being misinterpreted as anthropocentric by the relativist tendency of modern thinking which understands a human theory as a *human creation* and as something which determines and limits human thinking. When Goethe says that the scientist inevitably turns to ‘the imagination’s creative power for help’, he doesn’t mean imagination as something subjective but as the power of ‘intuitive perception’, or ‘judgement that SEES’. In modern times Heidegger comes close to Goethe’s meaning when he writes (1971:71): “Art . . . is the becoming and happening of truth”. This relates to Heidegger’s understanding of truth as ‘unconcealing’ *entleheiser* (see Chapter II.B.3).
[This transactional model] contradicts the assumption of any categorical
dichotomy between the arts and the sciences. It regards the mind as an
instrument for the maintenance and discovery of refined invariances in the
richly patterned stream of experience. And it urges that the mind
accomplishes this intellectually as well as affectively, through the sciences
and through the arts.

Suzanne Langer has explored related ideas in her Philosophy in a New Key (1951) in
which she presents the idea that 'knowledge' cannot be equated with 'human
mentality' and that a comprehensive theory of mind must embrace art as well as
science. Deep Ecologists, similarly, have drawn on both science and art for insights
into the interconnectedness of life-forms (for example, Devall [1980] and Matthews
[1988]). These sorts of views regard the human consciousness as comprised of
different cognitive capacities which have become divided from one another and the
suggestion is that art and science should be reintegrated if we are to attain a
comprehensive picture of the human mind.

But does such an integrative approach really produce 'conditions of wholeness'?
This is like asking whether the 'whole' is the sum of the parts. There is in Goethe's
method of investigation, I suggest, the germ of something quite different and new;
an integral approach. This is pointed to by Hegge in an already given quotation 18:

One can develop ... a quality sense corresponding to the sense for
quantitative relations upon which mathematical science is built.

Here we have the key to understanding Goethe's method as a 'new ecological
discipline'. If we take the word 'ecological' to mean, in the broadest sense, the
recognition of relationship and interconnection, then in a 'deeper' ecological study
the arts and sciences cannot be compartmentalised, for that in itself would be
unecological. This implies that art and science are not merely 'patched' together, like
the 'composition' which Goethe so deplores. Goethe was striving for an approach
which would arise from and be illuminated by the one spirit of creation, a 'unity
without unification'. He was striving towards an integral approach whereby artistic
perception finds in itself the equivalent of an exact science. This is what was, and
still is, new about the form of investigation which he initiated. It is here, I suggest,

18 See my discussion of Hegge in Chapter II.A. 4.
that Goethe’s approach potentially meets Bookchin’s challenge of finding a ‘creative’ way of working with nature, a way which is responsible and symbiotic. An integral approach is ethical because it is ‘whole’; it satisfies both knowledge and artistry. This is the meaning of ‘justice’ Plato had indicated in *The Republic* (1974:221); justice in the world and in ourselves occurs when our divided ‘parts’ are harmonised by the power of the One.

I speak of human creativity meaning ‘productivity’ in the broadest sense; it includes artwork as normally understood but also the capacity of human beings to re-fashion the world, to re-work it technologically according to our needs and desires. But merely to define our activities as ‘productive’ or ‘creative’ does not mean that what is produced is healthy or good for everybody or everything. Something is altered, something new is produced which appears as a great advance; but this something could involve destructive processes as detrimental to ourselves as to our environment. For example, genetic engineering may produce new, ‘creative’ life-forms, but these could end up causing widespread disease and death. Creativity is usually defined merely as ‘showing imagination’ or ‘originality of thought’; here any notion of an ethical dimension or sense of justice is lacking. However, looking back to the ancient Greek world, an ethical sense was attached to creating (or making) and this was encompassed by the word *techné*. This meant ‘art’ in a general sense. Bookchin shows that the original meaning of *techné* included not only the ‘how’ of a technical activity but the ‘why’ of an ethical consideration. Drawing on Aristotle’s *Nichomachean Ethics*, Bookchin writes (1991:221):

In contrast to their strictly operational subordinates, ‘who act without knowledge of what they do as fire burns’, master workers act with an insight and ethical responsibility that renders their craft rational.

Martin Heidegger, too, has seen fit to look to the original Greek meaning of *techné* as part of his analysis of the function of creativity in the contemporary world. He shows that our present-day meaning of technology is a constriction of *techné* as ‘art’. *Techné*, he shows, most essentially, is a form of knowing which discloses an entity, brings it forth, lets it be seen. Heidegger suggests that a genuine *techné* preserves and guards things, cares for them, this being so through its link with the meaning of procreating and engendering (as in “raising children”, “bringing them into the

For the Greeks, techné meant both the event of bringing something into the open, and the know-how required for accomplishing that disclosure. Authentic producing, then, understood in terms of the Greek insight, involves disclosing something appropriately, letting it come forth into its own, bringing it into the arena of accessibility, letting it lie forth, as something established stably for itself. To ‘pro-duce’ something means to lead it forth (pro-ducere), to release it so that it can manifest itself and linger in presence in its own way.

Heidegger considers that, in this sense of techné, knowing is not separate from doing, theory from practice. In Bookchin’s and Heidegger’s writing, we see a need expressing itself, not so much to return to the past, but to discover a deeper, ethical meaning of creativity in the context of our contemporary environmental dilemmas. Goethe’s approach is significant in our time, I suggest, in that it provides a way of uncovering this ethical dimension of human creativity.

Returning now to the question of what to call Goethe’s form of ‘nature study’; because it is neither art nor science in the conventional sense of either term, it has led some to give it the inclusive term ‘phenomenology’ (for example, Heinmann (1934) and Bockemühl (1985a)). I have already shown a theoretical connection of Goethe to modern phenomenology. Still, confusion may arise if it were to be thought that Goethe’s approach was simply an early and perhaps now obsolete form of investigation which has been completely overtaken by modern phenomenological methods and theories. I am suggesting in this section that, on the contrary, Goethe’s phenomenology represents a new form of ecological discipline. What is unique and new about it cannot be seen in merely theoretical terms but in terms of practice. Goethe said (speaking of his Theory of Colours) (Goethe,1901:389):

It is very hard to communicate for . . . it requires not only to be read and studied, but to be DONE and this is difficult.

---

19 In the context of this discussion Heidegger makes a reference to Goethe; he writes, “What the Greek thinker already knew, Goethe grasped in the statement: ‘The highest would be to conceive that everything factual is already theory’ (Zimmerman, 1990:231), which, of course, is the very quotation I have used as the basis for this thesis.
Accordingly I will now turn my attention to a closer examination of how Goethe himself went about the practice of his 'nature study', here focussing on his plant studies. I will then proceed to do some of this form of investigation myself. The meaning of authentic 'theory' for Goethe was not something detached, abstract; it was the 'inner' journey the investigator makes with the phenomenon, a journey of participation.
CHAPTER IV. GOETHE'S THEORY OF PLANT DEVELOPMENT

The aim here will be to show how Goethe applied his phenomenological method and how he arrived at his 'theory' of plant form. Also in this chapter, I will further examine how science and art are related in Goethe's approach to nature study. By looking more concretely at his actual experimental work I will attempt to clarify the way in which Goethe considered the aesthetic sense can be cultivated as an organ of cognition.

A considerable amount of Goethe's scientific research was devoted to the study of plants, in particular the flowering plants and mosses. He was acquainted with some of the most eminent biologists of his time. Even as a child he had busied himself compiling lists of plants and animals with their Latin names and wrote that nature is beautiful because God's hand brought it all forth (Kuhn,1987:5). It would seem that this feeling for nature's sacredness never left him; it transformed into a deep respect for natural phenomena. He wrote in later life (Goethe,1988:54):

Man is in the habit of valuing things according to how well they serve his purpose. It lies in the nature of the human condition that man must think of himself as the last stage of creation. Why, then should he not also believe that he is its ultimate purpose? Why should his vanity not be allowed this small deception? . . . When a thistle springs up to increase his toil in the fields he blames it on the curse of an angry god or the malice of a spiteful demon rather than considering it a child sprung from all of nature, one as close to her heart as the wheat he tends so carefully and values so highly . . . However, the simple example of botany will show that the scientist must leave this view behind if he wishes to make progress in thinking about things in general. The brightest and fullest flower, the most delicious and attractive fruits, have no more value to the scientist of botany than a lowly weed in its natural setting or a dried and useless seed capsule, and may even be of less value in a certain sense.

This statement serves the purpose here of setting the stage for an exposition of Goethe's theory of plant development. He saw a plant as a 'child of nature', as a phenomenon worthy of the greatest reverence, and he wished to know it on its own terms and in a way which did justice to the wisdom of its creation. For Goethe, the study of a plant's form (morphology) was the means of attaining insight into its creative essence, the "mysterious architecture of the formative process" (1988:55).
This was one of his ways of alluding to what he also called the 'theory' of the plant; in other places he referred to it as the 'archetypal plant' (Ur-Pflanze) or 'typus'.

In Chapter II.A.4(b) I outlined how Goethe considered his experimental method to be a movement from the 'natural phenomenon' to the 'pure phenomenon' and that he saw this as a process of 'distillation', meaning the developed capacity to see the phenomenon intuitively, from a 'higher standpoint'. This is a process of a progressively deepening participation in the organism's formative process, in the movement of its unfolding, from potentiality into actuality. There is a striving of thought (the way Goethe understood it) to participate in a plant's living function, to experience its 'potency' and unfolding into form. Through investigating plants in this way Goethe arrived at four principles or aspects of plant development — A. Metamorphosis B. Polarity C. Intensification D. The archetypal plant.

A. METAMORPHOSIS

As Hegel (1977b:46) notes, the characteristic of plant growth is not increase in size (as with an animal) but change in form or self-augmentation. A plant develops over time though a progression of forms, each one being like a new entity, quite distinct from the former — seed, leaf, flower, fruit. Thus a plant can only be adequately understood in terms of these changes throughout its life-cycle. The developmental character of organisms had been of interest to Aristotle and was very much a subject of debate around the time of Goethe. Goethe read, for example, the work of Lyonet on the subject of the developmental stages of the caterpillar. He writes (1988:67):

After acquiring enough skill in judging most instances of organic change and transformation in the plant world, and discerning and deducing the sequence of forms, I felt further obliged to learn more about the metamorphosis of insects. No one will dispute that this metamorphosis is a fact: the life of such creatures is a continual transformation, one which is clear and obvious. I had retained my earlier knowledge of this subject, based on years of raising silkworms.

Science has different uses for the term 'metamorphosis' and so it is necessary to clarify Goethe's own usage. Metamorphosis literally means 'transformation' (from the Greek, meta, change, morphe, form) and is a fundamental concept in geological
science where we speak of the metamorphosis of one rock into another; for example, the change of shale into slate due to intense heat. The physical substance of the rock undergoes a process of transformation and there is a causal (mechanical) relationship between the former and the latter; namely, the heat causes one rock to change into another. However, the metamorphosis Goethe was examining with regard to organic growth is not causal in this way. As the plant unfolds its different forms in the process of growth, one form is not causing the other (i.e., the flower does not cause the fruit). Nevertheless, one part emerges out of the other. This dynamic relationship of plant parts is referred to by Goethe in the introduction to his *The Metamorphosis of Plants* (1988:76). In this essay Goethe depicts the process of transformation in the whole life cycle of a plant. The seed first puts out the seed leaves and the roots. In many flowering plants, as the leaves develop on the elongating stem they differentiate into highly divided shapes; these generally simplify again as they reach the point of flower emergence. The plant then forms sepals, petals and the other floral parts. If the flower is fertilised a fruit is formed containing seeds and so the cycle is completed. The latter is what Goethe called progressive metamorphosis, this being the normal condition of plant growth. He also noted deviations from that pattern which he calls retrogressive and accidental metamorphosis.

It had been known since ancient times that plants and animals are distinguished from other aspects of nature (such as water or minerals) in that they have the character of an organised system (this being why they are called organisms.) Aristotle had recognised that the growth of plants is organised in such a way that it develops towards something; in other words, the plant is purposive in nature, it has an end or telos. The question which concerned Aristotle and later thinkers related to why and to what end organisms are ordered. Kant, in his *The Critique of Judgement*, discussed the problems of mechanical and teleological explanations of organisms. He writes (1987:282):

For it is quite certain that in terms of merely mechanical principles of nature we cannot even adequately become familiar with, much less explain, organised beings and how they are internally possible.
As Kant says, we can look at the structure of a blade of grass and grasp through aesthetic judgement that it is in some way purposeful, that its form is not merely arbitrary or accidental. Yet it is impossible to understand that purposefulness mechanically; for example, by saying that the existence of grass is caused by the need for cattle to eat it, and cattle are caused by the need for people to eat them (Kant, 1987:258). We cannot conceptually judge the intentional purposes of nature in this way, Kant suggests. Goethe writes of the effect of this book of him (1988:29):

The antipathy I felt towards ultimate causes was now put in order and justified. I could make a clear distinction between purpose and effect and I saw why our human understanding so often confuses the two.

Hegel also made reference to superficial ideas of teleological causality which had arisen in the course of time; where, for example, “the wisdom of God is admired because He causes cork trees to grow that we might have bottleneckers” (Hegel, 1970a:196).

This question of teleology and organic nature was thus a central concern of the Naturphilosophie movement. Out of the deliberations of these philosophers emerged a picture of living nature as self-subsistent, self-creating, as qualitatively different from the aspects of nature which can be explained in mechanical, cause-and-effect terms. The plant creates its form out of itself; it is purposive in that it seeks to actualise the potential contained in the seed, which is inherent in the organism itself (not external, as the cattle are external to the grass). This, says Hegel, is the true teleological view (Hegel, 1970a:196).

The foregoing helps to clarify how Goethe came to his understanding of plant metamorphosis. Just as purposefulness of an organism is not something visible to the eye and is not mechanically explicable, so it is with the phenomenon of metamorphosis. As indicated above, the flower does not cause the fruit to come forth out of it; neither does the fruit cause the flower. The purposiveness of the metamorphosis of one into the other requires a different kind of apprehension to be understood. Goethe spoke of the “skill” required to judge metamorphic processes (of special significance since various parts of the plant organism may not be
simultaneously present for observation — for example, the flower and the fruit). Goethe (1988:75) relates how he proceeded in order to grasp the plant metamorphic process:

If I look at the created object, inquire into its creation, and follow this process back as far as I can, I will find a series of steps. Since these are not actually seen together before me, I must visualise them in my memory so that they form a certain ideal whole. At first I will tend to think in terms of steps, yet nature leaves no gaps, and thus, in the end, I will have to see this progression of uninterrupted activity as a whole. I can do so by dissolving the particular without destroying the impression itself.

This is the process he called ‘exact sensorial imagination’.

The process of imaginatively relating the parts of a plant, deriving from Goethe’s own experimental work, has been described and illustrated in recent times by Jochen Bockemühl (1988). Bockemühl removed the leaves of a field poppy, grouped them randomly, and enquired into the process whereby we are able to sort them into the sequence in which they grew on the plant. He writes (1988:192):

These leaves (Fig.1) show an outer, spatial connection, but in this case an arbitrary one. We can discover an inner connection, however, when we note their ‘similarities’, or to be more exact, when we perceive by our sense of relationships what lies between an ideal identity for all field poppy leaves and these external differences. It is not necessary to understand anything about plants, or about the field poppy in particular, to arrive at the sequence below (Fig.2); as anyone would after sorting them for a longer or shorter time.

Fig. 1. Random grouping of leaves of field poppy (after Bockemühl, 1986:22).

---

20 Time-lapse photography has now been able to capture aspects of plant growth not possible in Goethe’s day. But even with this modern tool, we need to imaginatively participate in the movement of growth in order, not just merely ‘see’, but to experience the metamorphic process.

21 See my discussion in Chapter II.A.3.
He goes on to further discuss this 'sense of relationships', the cognitive process required to bring about this ordering process:

Calling on an exact, artistic manner of observation, we come upon a lawfulness according to which the plant has produced these leaf forms out of itself without any influence from ourselves.

Fig. 2. Leaves of field poppy arranged according to similarity of forms (after Bockemühl, 1986:22).

Of course, in the case of this study of field poppy, all the forms are visible before us. But the process of relating them is exactly the same as if they were not; it is an inner faculty which senses their relationship as aspects of one process of growth. Goethe took the forms of plants into his memory in order to better cultivate this imaginative or artistic faculty.

The fact that judgements concerning the purposeful organisation of plants do not come about logically (in terms of concepts, through a reasoning process) but aesthetically, is the basic argument of Kant’s The Critique of Judgement (which was so influential upon Goethe). Goethe was “glad to find poetry and comparative science related so closely: both are subject to the same faculty of judgement” (1988:29). Kant had discussed the notion of aesthetic judgement in terms of beauty and taste, the subjective feelings of pleasure associated with organised forms (organisms and artworks). Yet, as is clear from Bockemühl’s description, the ‘artistic manner of observation’ has not merely to do with subjective feelings of pleasure, with the experience of beauty. Bockemühl is describing the faculty of judgment
which determines the ordering of the leaves. This is the kind of determinative aesthetic judgement which, as previously mentioned, Kant thought to be a form of knowing possible to conceive of in principle but which is unavailable to us human beings. It is this very faculty of judgement (intellectus archetypus) Goethe believed he was exercising in his work with plant metamorphosis and which Bockemühl alludes to when he speaks of an "exact, artistic manner of observation".

This sense of relationships which is able to determine the ordering of these leaves is a qualitative cognitive faculty or organ of perception. We do not measure the leaves, reduce them to numbers and submit these to some form of arithmetical operation in order to deduce their relationships. The progression of the leaves in Fig.1 is not visible as such, yet we stay with the phenomena themselves (rather than numbers) in order to find their ordering principle. What we are working with in this process is qualities such as degrees of roundedness, symmetry etc. In the process of this operation there develops the qualitative sense of a single movement (which Goethe calls the 'uninterrupted activity as a whole' in the above passage); this is experienced as the 'principle of relationship' of the leaves. This has been described by Brady (1987) in reference to the same kinds experiments with leaf growth. Brady writes (1987:276):

If we begin with the first leaf on the stalk (lower left) [Fig.1] and follow the transformation to the last (lower right), we have the sense that we are in fact watching the form on the lower left turn into the form on the lower right. Because we 'see' the series in the context of this imagined or 'intended' movement (to use the phenomenological term), an adequate criterion for accepting or rejecting a new member is near at hand . . . We intend the dynamic context because by it the lawful relation between the forms is made manifest. All this happens tacitly, as an unnoticed aspect of ordinary perception, but the fact that it is normally unnoticed does not hinder our analysis of it now . . .

Brady goes on to discuss the meaning of 'form' in this dynamic context (form would normally be considered to be the individual leaf shape or Gestalt). Brady writes (1987:278):

For the purpose of our intention, the arrested stage, or Gestalt, is an abstraction. It is held in arrest by our sensible experience, but when we attempt to detect the relation between stages, we must dissolve that
condition in the mind. We move our intentional focus from text to context, from the individual particulars to the unifying movement...Compare, for example, the Gestalts of two leaves extracted from differing zones in the series [Fig.3]. Compared in isolation from the rest of the series, they are quite unlike. But let the observer work through the series, as Goethe claimed that he did, both forward and backward, until it becomes a continuous movement, and then glance again at the extracted forms. If these can be placed within the context of the movement of the whole series they will no longer seem unlike. They will, in fact, bear a distinct resemblance to each other, and bear it so strongly when the trick is learned that the impression arises that they are somehow the same form.

Fig. 3. Two leaves from the field poppy.

What Brady arrives at out of this discussion is the idea that the form of the plant is a movement. He goes on to say (1987:279):

Since all potentials are specified by the movement, it can also generate those intermediates which we do not actually find in nature. After all, the movement is perfectly continuous, and capable of giving rise to any number of discontinuous Gestalts for that reason. The movement specifies forms, it would seem, by generating them. It might seem counter-intuitive to speak of movement, rather than an object making the movement, as generative, but between the forms and their movement there is only one possibility.

Thus we begin to approach, in practical experimental terms, what Goethe understood as the 'theory' of the plant; it is the 'unity' of the organism, the single movement which generates the forms of the plant 'out of itself'. This 'unity' is nothing visible — no leaf is physically moving. The movement is 'ideal' in the sense described above. What is actually working as a generative force in the plant comes alive in a fluid, artistic thinking. We begin with empirical leaf forms — what is visible before us — and these are 'distilled' in thinking in a way which brings to light this movement/form as the unifying principle of the metamorphic process. We cannot speak of intentions or purposes in organisms in a mechanical or logical way, yet we can learn to intend the metamorphic movement through an 'exact sensorial imaginary' which participates in the process of growth. Goethe saw in organic metamorphosis evidence of an 'inner design', expressing itself in the living physical form of the plant. He spoke of "following in the footsteps of nature", of
“accompanying the outer form of the plant through all its transformations” (Goethe, 1988:90), and here he means this artistic, participatory form of thinking which I have described.

B. POLARITY — EXPANSION AND CONTRACTION

The concept of polarity was fundamental to Goethe’s scientific outlook. For example, his *Theory of Colour* rests on the principle that colour arises out of the polarity of light and dark, that colours are not merely the components of light, as Newton had maintained. For Goethe, darkness is an active principle in colour formation, whereas, according to the Newtonian theory, darkness is merely the absence of light (Goethe, 1988). Polarity was for Goethe a ‘primal phenomenon’ (*Urphänomen*), an archetypal creative principle. He saw it as embracing, dynamically, the opposites of spirit and matter, thought and extension, body and soul (Goethe, 1988:155). In his plant studies he thought of polarity as the expansion and contraction of the plant organs in the process of growth.

The process of cognitive ‘distillation’ of the field poppy can be taken a step further in the manner of Goethe’s own research. Bockemühl has set out the leaves of the field poppy in a way which shows their actual configuration on the plant (Fig.4). Experiencing (intending) the movement from the bottom upwards (or the top downward), it evinces a certain *gesture of contraction and expansion* in the overall metamorphic movement. We move from a point of contraction (at the bottom or top) to an expansion into the middle, and thence to a contraction again (at the bottom or top depending on which way we are moving). Reproducing this expansion and contraction with the movements of both of one’s hands, as would an orchestral conductor, is a way of discovering this movement as a *gesture*. As a real and active principle in the plant we may call it a *generative gesture*, for, as Brady makes clear above, it is this which generates the plant forms. We call it a *gesture* because it is not an arbitrary movement; it is a movement with a certain configuration or shape, with a particular *meaning*.

---

22 Aristotle had called this the *entelechy*, usually translated as ‘soul’, the vital principle of the organism.
This gesture may be called the ‘dynamic principle of order’ of the metamorphic process. It is a rhythm — in ordinary parlance ‘the rhythm of life’. The character of this rhythm depends on the plant in question; no two plants are exactly the same. However it is true to say that in any living movement we do not find indefinite expansion or contraction. The leaves expand to a certain size before becoming smaller. The fruit reaches a certain threshold state of expansion; the seed a threshold stage of contraction. Metamorphosis throughout the whole life-cycle of the plant takes place through a progression of expansive and contractive movements or pulsations — this is the conclusion Goethe came to through his studies of plant morphology.

So far I have depicted the metamorphic process working in only one phase of plant development — the ‘generative gesture’ working between seed-leaves and flower. However Goethe was concerned with all phases of plant growth. In *The Metamorphosis of Plants* Goethe identified six stages of expansion and contraction. From the initial point of contraction, the seed, there appears the first expansion into the cotyledons, the preparation for the leaf forms proper. The stem leaves contract into the calyx (sepals), after which there is an expansion into the corolla (petals). The formation of the reproductive organs of the flower (the stamens, the styles and the
ovaries) represents an intense contraction of the petals (there are sometimes intermediary organs called nectaries, formed by the contraction of the petals). The last and usually the greatest expansion occurs in the formation of the fruit. The last and greatest contraction occurs in the formation of the seed and so the cycle completes itself. In Goethe’s words (1988:96):

> Whether the plant grows vegetatively, or flowers and bears fruit, the same organs fulfil nature’s laws throughout although with different functions and often under different guises. The organ which expanded on the stem as a leaf, assuming a variety of forms, is the same organ which now contracts in the calyx, expands again in the petal, contracts in the reproductive apparatus, only to expand finally as the fruit.

What Goethe means by the one ‘organ’ in this passage will be further clarified in the section on the ‘archetypal plant’. For now it is only necessary to state that Goethe saw the whole plant as a single form, as a single movement. Just as the two leaves in Fig. 3 look quite different but are realised from within the whole series to be the same form, so a leaf and flower, or a flower and fruit, look utterly different when abstracted from the plant but are actually the same form in different stages of its manifestation. The whole series, from seed to seed, is illustrated schematically in Fig. 5.

![Diagram of plant development](image)

*Fig. 5. Six expansions and contractions in plant development according to Goethe a. seed (contraction) b. leaf (expansion) c. calyx (contraction) d. flower (expansion) e. reproductive organs (contraction) f. fruit (expansion)*.

Portmann (1987:143) describes how, for Goethe, the polarity of expansion and contraction in plant metamorphosis takes on a universal significance:

> In the dicotyledonous flowering plant . . . we see expansion, unfolding and contraction; that which is unified, dividing into a richer reality; that which
is divided uniting itself into a pregnant new unity; the repetition of an
eternal diastole and systole.

The plant moves through its six contractions and expansions, from seed to seed,
from cycle to cycle. But within each cycle each rhythm is directed towards a particular
end or telos. Perceived with an artistic or qualitative faculty of cognition the
contraction of the leaves into the calyx represents a ‘pregnant unity’ prior to
expansion into a new multiplicity (the floral organs); similarly, the contraction of
the fruit into the seeds prepares for a new expansion into multiplicity (the leaves).
This inner teleology of the the organism is what Goethe termed ‘intensification’ or
‘enhancement’.

C. INTENSIFICATION OR ENHANCEMENT

Timothy Lenoir (1984:318), writing about the problem of what he calls ‘biocusalculay’
in Goethe’s botanical work, considers the latter to be “fundamentally and radically
teleological in character” and thus distinguished from the biology of Darwin. The
latter is founded upon the idea of ‘natural selection’, a biological mechanism which
causes organisms to assume certain forms under certain environmental conditions.
Lenoir goes on to say that Goethe’s teleology is not one of a designing Creator but, as
with Kant, a recognition of an inner principle of organisation which directs the
organism’s own process of development. The meaning of ‘intensification’
(Steigerung) in plant development was, for Goethe and for Kant before him, related
to the fact that plants do exhibit a purposiveness in their form even if this cannot be
logically explained by external causes. Plants simply grow, come forth out of
themselves.23 Goethe’s artistic sense recognised in this ‘coming forth’ of the
flowering plant a certain inner ‘striving’. He did not mean anything conscious on
the part of the plant; he was referring to the obvious ‘intelligence’ of plant formation
which he would never have been able to put down to ‘chance mutations’ or
‘selection mechanisms’ in the Neo-Darwinian sense. Creation, for Goethe, is
intelligent through and through.

23 A fuller account of the relationship of Goethe’s and Darwin’s notions of biocusality and evolution
shall be given in Appendix A.
Bockemühl, in the section on ‘metamorphosis’ above, spoke of the aesthetic or qualitative sense of relationships which is able to order the leaf-forms into a metamorphic sequence. Remaining with this aesthetic form of cognition and further ‘distilling’ the plant forms we come to Goethe’s insight into plant ‘intensification’. Aristotle believed that the adult state could be conceived as an end for which the earlier states of development were the means (Brady, 1987:289). Goethe, however, saw no stage of plant growth as primary. As Brady writes (1987:290):

Each stage of development was [for Goethe] equally required by the whole, not as a means to an end, but as a mode of being-in-the-world. Development in time does not proceed towards this whole, but rather expresses it.

The point is that, while Goethe experienced in the metamorphic sequence of the plant an intensification or enhancement, this was a qualitative perception. Goethe was not offering his notion of ‘intensification’ or ‘striving’ as a mechanism or explanation of plant form. He was not saying, for example, that the plant strives to reproduce itself and this is the goal and explanation for germination and flowering. According to the ‘artistic’ way we have been perceiving the metamorphic process, the whole plant is one movement which generates different organs successively. As Brady writes, each organ is the expression of the whole. Just so, the ‘intensification’ of the forms in the course of that growth is not the explanation of that movement but its expression.

With this in mind we can turn to how Goethe expressed his vision of ‘intensification’ in plant development. The seed, as the organ of the plant form in maximum state of contraction, is also the point of greatest (and most hidden) potential. This single, potent point unfolds and bifurcates as the cotyledon or seed-leaves. Goethe saw that these are much less developed than the later stem leaves; the seed-leaves are without serrations or hairs, usually a simple, rounded form. This initial gesture of expansion into the two dicotyledons then continues in the differentiation of the leaf forms up the stem. What begins as a simple bifurcation is enhanced through stage after stage of differentiation of leaf shape, often becoming serrated and more finely divided (Fig. 4). As Portmann (1987:140) puts it:

We attend to the gradual intensification of these foliage forms, which culminate at the zenith of the vegetative phase by creating a form which
places before our eyes an optimum of its possibilities, the ‘climax leaf’ of contemporary botany. This form is a realisation of hidden, secret potentials for the two-dimensional shoot-formation that is specific to the leaf — something we see especially clearly in palmate or pinnate leaves.

Goethe saw the subsequent contraction into the calyx as an intensification and re-potentialising of what had unfolded in the forms of the leaves. Here the leaves (sepals) are gathered closely around in a ring, unlike the previous leaves spread out along the stem. This is the site of a preparation for a completely new emergence — the flower. The appearance of the corolla (flower) is often extraordinarily abrupt. As Goethe notes (1988:82), the fine structure of the petals, the colour and fragrance, the highly differentiated character of the nectaries, stamens and the other sexual organs, scarcely betray that they are leaves in a condition of intensification.24

For Goethe, the flower, and especially the contraction into the stamens and the pollen, represent the most intensified stage of plant growth:

The fine matter developed in the anther looks like a powder, but these tiny grains of pollen are just vessels containing a highly refined juice. (Goethe, 1988:86)

The ‘highest moment’ is the union of the sexes at the summit of the plant axis. Thus, the first bifurcation of the cotyledons (the initial gesture of expansion) is progressively enhanced through the leaf and floral organs to the point of the binary division of the sexual organs. Through the sexual process, what has been thus divided becomes one again in the fertilised egg. The stages of fructification return the plant to the seed condition; hence the plant, which has unfolded through a process of differentiation and enhancement, is returned to the condition of maximum simplicity and potency.

So, through a qualitative ‘reading’ of the phenomenon of plant development, Goethe arrives at a statement which he considers to be the ‘theory’ or formative ‘law’

24 Through his study of what he calls ‘abnormal cases’ he finds evidence of how the flower parts actually arise as modifications of what has come before them in the growth of the plants. He writes: “Sometimes nature skips completely over the organ of the calyx, as it were, and goes directly to the corolla. We then have the opportunity to observe how stem leaves turn into petals. Thus, for example, an almost fully formed and coloured petal often appears on tulip stems. It is even more remarkable when half of this leaf is green and attached as part of the stem, while its other, more colourful half rises up as part of the corolla, thereby dividing the leaf in two” (Goethe, 1988:83).
of the plant. While expressing itself in the physical manifestation of the plant organs, the ‘theory’ is ideal or spiritual in nature and has universal significance. It is the intelligent principle of plant generation. Goethe (1988:6) speaks of the relationship between the processes of ‘polarity’ and ‘intensification’ thus:

The concepts of polarity and intensification; the former a property of matter in so far as we think of it as material, the latter in so far as we think of it as spiritual. Polarity is a state of constant attraction and repulsion, while intensification is a state of ever-striving ascent. Since, however, matter can never exist and act without spirit, nor spirit without matter, matter is also capable of undergoing intensification, and spirit cannot be denied its attraction and repulsion.

And in another essay (Goethe, 1988:156):

Whatever appears in the world must divide if, is to appear at all. What has been divided seeks itself again, can return to itself and reunite. This happens in a lower sense when it merely intermingles with its opposite, combines with it; here the phenomenon is nullified or at least neutralised. However, the union may occur in a higher sense if what had been divided is first intensified; then in the union of the intensified halves it will produce a third thing, something new, higher, unexpected.

The deepest realisation of the being of the plant is, for Goethe, this ‘drama’ of universal principles. His was a ‘spiritual’ participation in what he considered to be actual forces which are active in plant formation. As I have shown he was not alone in considering such forces or principles to be realities which can be intuitively experienced, something as real as the material aspect of a phenomenon which is experienced sensuously. Such a view was characteristic of the Naturphilosophie movement and indeed the whole ‘organic’ tradition of knowledge. In this tradition it is understood that a human being can potentially be united in essence with the whole of creation. As L.L. White (1949:289) has put it:

[Goethe’s] view of nature and man was single. The clue to external nature can be found equally in the human subject; one principle unites the whole and nature, non-human and human. “Ist nicht der Kern der Natur Menschen im Herzen?” If this is a poetic truth, it must also be a scientific truth: the formative laws of nature shape the human heart.
D. THE ARCHETYPAL PLANT

Goethe described the moment when he ‘discovered’ the archetypal or Primal Plant; it was after a long and difficult period of searching. In his Italian Journey (1982:163) he writes that, in Rome, he was on his way to establishing important new relations and discovering the manner in which Nature, with incomparable power, develops the greatest complexity from the simple.

Later, after being in the botanical gardens in Padua, he writes (1982:251):

There certainly must be [a Primal Plant]. Otherwise, how could I recognise that this or that form was a plant if all were not built upon the same basic model?

On his return from Italy there took place the famous conversation between Goethe and Schiller\(^25\) when Goethe tried to describe to Schiller his notion of the ‘archetypal plant’. Schiller considered this to be ‘just an idea’; in other words, having no real existence, not factual. To this Goethe objected that he could ‘see’ it with his own eyes.

Goethe’s notion of the ‘archetypal plant’ has been one of the more contentious and confusing aspects of his scientific thinking. Commentators have come to the conclusion that it is completely illusory, a subjective fantasy. For example, one writer calls it “that will-o’-the wisp of Goethe’s” (Harris, 1972:361). C.S. Sherrington writes (1981:216):

Time has confirmed Schiller’s remarks. Goethe’s view has gone the way of unsupported theories.

Ludwig von Bertalanffy summarises standard scientific opinion when he writes that Goethe’s conception of the ‘archetypal plant’ is “diametrically opposed to the principles of modern empirical science” (Bertalanffy, 1951:79). Typically, it has been equated with Plato’s notion of an Archetype or Form, a perfect and eternal metaphysical model upon which the physical world is formed. Bertalanffy writes (1951:79), taking the point of view of empirical science:

\(^{25}\) See Chapter II.A.4.
If the 'ideas' are not only hovering in a super-physical world but determine physical nature, then they must be factors or entelechies active in real things, and the living organism in particular. Then the system of modern science, which has given us not only theoretical knowledge of nature but has led to the triumph of modern technology, is basically wrong. For the system of physical forces and laws is superseded by other agents, hobgoblins, as it were, who direct the events towards a secret goal, organisation and wholeness. This is the conception called 'vitalism' and rightly discarded in biology, because it contradicts empirical evidence, and even threatens its very foundations.

Bertalanffy goes on, however, to deny that this is an accurate representation of what Goethe had in mind when he referred to the 'archetypal plant.' He points out that, for Goethe, the ideal plant was not a perfect, unchanging model but

an eternally changing proteus. Being himself a paragon of Faustic Man, Goethe could not be a Platonist, and could not conceive the core of reality in stable forms, throning beyond time like the marble statues of the gods. Behind Goethe's apparent Platonism lies the Heraclitean view; behind the manifest form, a never ending stream of becoming; behind the morphological intuition, its resolution into dynamics. (Bertalanffy, 1951:80)

The 'theory' of 'law' of the plant, as I have demonstrated in the above section on 'metamorphosis', is single formative movement.

One other line of interpretation is that the 'archetypal plant' is an ancestral form of plant from which all contemporary forms are derived through evolution. In other words, in this case 'archetypal' is thought to mean original in time. This effectively does away with all of Goethe's associated ideas of intuitive perception, 'natural laws', 'entelechies' and so forth. As Weizsäcker writes (1987:120):

Goethe had to admit: the primal plant was not an object of scientific empiricism. A primal plant does not exist among the plants available to the botanist.

This, indeed, was how Darwin himself understood Goethe's 'archetypal plant' — as a physical progenitor or ancestor (Brady, 1987:270). This becomes a means of explaining the homologies (similarities of form) in various present-day species; they are all related to the same hypothesised ancestor or 'archetype'. Contemporary evolutionary biologists talk about 'primitive' and 'derived' plant individuals. The problem is that Goethe's own statements contradict such a view. He wrote (Goethe, 1982:363):
While walking in the Public Gardens of Palermo, it came to me in a flash that in the organ of the plant which we are accustomed to call the leaf lies the true Proteus who can hide or reveal himself in all vegetal forms. From first to last, the plant is nothing but leaf... Whatever exactly this Proteus or ‘archetypal plant’ is, plainly Goethe did not conceive it as something belonging to the distant past but as an aspect of the phenomenon of a plant in the here and now. And if it can ‘hide or reveal itself’ then obviously it is not an objectively existing plant.

Confusion has arisen because Goethe himself made statements which have seemed at variance with each other. When he wrote that the plant is “nothing but leaf” it is certainly clear that he connected the ‘archetype’ with an aspect of the physical nature of the plant. But then, he talks about the true Proteus who “can hide or reveal himself in vegetal forms” and it is plain also that he could not have been thinking of the physical leaf which is evident to normal vision. We must allow here for a certain poetic expressiveness; the statements of Goethe in general are not characterised by a systematic working out in the manner of a philosopher like Kant. It is helpful here to look at the actual way he came to the realisation of his ‘archetypal plant’ rather than taking these statements as ‘theoretical’ (in Goethe’s pejorative sense of the word).

By means of ‘exact sensorial imagination’ Goethe had worked backwards and forwards through the metamorphic sequences of flowering plants, from seed to flower and fruit. This research led him to the realisation that all the plant’s organs are actually modifications of the one form. In *The Metamorphosis of Plants* he discusses how a leaf transforms into a sepal, a petal, and stamen, especially clear to him from irregular cases such as the ‘proliferous rose’ and the ‘proliferous carnation’. He had also noted a plant’s ability to develop a new individual from a cutting taken from any part of the plant. His question was: is any one organ of the plant primary? Brady (1987) points out that Goethe’s thinking on the nature of the ‘archetypal plant’ itself went through stages of development but that he seems all along to have been thinking about an ‘organ’ not visible to sensory vision but to intuitive perception. So that, when Goethe described the ‘archetypal plant’, he was thinking of a ‘pure phenomenon’, a ‘theory’ in his authentic sense.
In line with the above discussion we may conceive of the 'archetypal plant', not in the sense of static platonic 'form', but as a dynamic, formative 'gesture' or 'potency', realised through intuitive perception, through a fluid, 'living' thinking. The 'law' or true theory of the plant is a 'movement', not a physical movement, but an 'ideal', formative gesture. All plants are particularisations of the same essential 'gesture' or 'idea. Goethe writes (1982:306):

With this model and the key to [the Primal Plant], it will be possible to go on forever inventing plants and know that their existence is logical; that is to say, if they do not actually exist, they could, for they are not the shadowy phantoms of a vain imagination, but possess an inner necessity and truth.

Goethe is talking about the form of cognition which understands how the parts arise out of the 'whole', which Kant called intellectus archetypus (and denied as a human possibility). The 'archetypal plant' is the 'whole' which generates all particular plants. As Brady (1987:284) writes:

In organic metamorphosis . . . we have presumably a law by which the plant produces its multiplicity of forms, a whole which designs its own parts. The comprehension of such a whole would oblige thinking to move from the whole to the parts, rather than the other way round . . . We cannot picture nor even think — in our usual analytic mode — the unity that generates multiple potentials. Yet we intend such a unity when we perceive the movement of a metamorphic series. If we are not satisfied to remain content with the Kantian paradox that we may intend what we cannot understand, we can follow Goethe in attempting to work through the structure of our intention, or if we use the Kantian term, representation . . . the single image now becomes transparent to the whole 'gesture' — which it now seems to express — and that gesture moves toward perceptibility as the individual forms move toward continuity.

In this chapter we have delved somewhat into the morphology of the field poppy by means of an aesthetic or qualitative mode of cognition, and in doing so approached an understanding of the 'archetypal plant'. The question remains: if indeed this 'whole' (theory or archetype) cannot be pictured nor even thought in our usual analytical mode, then how is it to be represented? Goethe perhaps best answered this question when he declared (Goethe,1893:171):

When Nature begins to reveal her open secret to a man, he feels an irresistible longing for her worthiest interpreter, Art.
Art is the form of doing which Goethe considered is most worthy to give expression to the 'archetypal plant'.
CHAPTER V. A GOETHEAN METHODOLOGY FOR PLANT STUDY

There are many commentaries and general discussions of the philosophical issues surrounding Goethe’s scientific work just as there have been numerous descriptions of his experiments. Not many authors have focussed on the question of his methodology. Fritz Heinemann (1934) is one who has, earlier this century, written specifically on that subject. He explains (p.73):

[Goethe’s] method is genuinely phenomenological. It begins with phenomena, proceeds through them, and ends with them, returning at the last from the Ur-phenomenon (archetypal phenomenon) to the particulars whose claims have not at any point been abrogated.

Heinemann is drawing in this article directly from Goethe’s own descriptions of his method which are hardly systematic and detailed.26 Goethe really only provided indications in his writings which Heinmann has summarised but not greatly elaborated upon. Goethe’s germinal approach has been developed, more recently, by the biologist Jochen Bockemühl (1985a, 1986). It is Bockemühl’s Goethean methodology that I intend to use as the basis for my own work. In doing so I am not claiming that Bockemühl’s is the only possible interpretation of Goethe’s work. It is one that has, as far as I can ascertain, received the most thorough elaboration in the published literature. It represents, according to my own understanding, an authentic evolution of Goethe’s indications. Furthermore it has been developed by Bockemühl primarily through his plant work, and it is thus appropriate for my own investigations which will be with plants.

What Bockemühl has done is to mould Goethe’s method according to imagery related to the four classical elements — earth, water, air and fire.27 He adds to this an initial stage which he calls the ‘first impression’. As shall be seen in what follows, this corresponds to Goethe’s own division of his method three into stages — the

26 See my own summary of the way Goethe’s presented his method in Chapter II.A.4.
27 In his student days Goethe had an intense interest in alchemy, which he subsequently moved beyond. However, vestiges of this interest show themselves in his Faust and his scientific method. As a qualitative form of knowing the latter bears a resemblance to an alchemical approach. The use of imagery relating to the four elements is a significant feature of alchemy. The four elements were considered not merely physical substances but formative forces or powers in nature.
'empirical phenomenon', the 'scientific phenomenon' and the 'pure phenomenon'.

Bockemühl has thereby highlighted the qualitative stages of thinking as it moves
towards the 'pure phenomenon'. In essence his approach is Goethe's
phenomenological method. Its fundamental aim is the same as Goethe's,
namely, the development, by means of the experiment, of an aesthetic organ of cognition. I
am calling Bockemühl's approach 'Goethean' because he has clarified and facilitated
the use of Goethe's methodology.

Traditionally, the four elements were the means of expressing the
correspondence between the psyche and elemental substances. For example, when
water was spoken of, what was meant was not just the physical substance but also
but a fluid state of awareness and cognition. Nous, or mind, for Aristotle and Thales
before him, resembles water; it is fluid because it can run through and take on the
form of all things (Hyland, 1973:100). In terms of the traditional understanding of
consciousness, each level of consciousness corresponds to a particular element.28

These traditions recognise that different levels (or 'organs') of consciousness need to
be cultivated by means of the scientific process. In other words, scientific research has
an ontological as well as epistemological basis; it is not considered to be just about
knowing more but about being more.

The stages of the following methodology are not actually separate from one
another. They are 'moments' in the continuum which is the research process. Each
'moment' expresses a different qualitative orientation towards the phenomenon, a
different mode of observation, but are dynamically related in practice and indeed
represent a metamorphic process, one 'coming forth' out of the other. This
comparison of the research process to organic metamorphosis is not just
metaphorical; it is meant literally. As can be gathered from Goethe's explanation of
his research methodology, he saw it as a participation in the living impulse of the

---

28 The states of aggregation are solid, liquid, gas, flame. In the 'Treatise of Platonic Tetralogies' by the
alchemist Gerhard Dorn there is set out the correspondences between psychological states and the four
elements in an ascending order — from the senses, intellectual discrimination, the reason (ratio), to the
intellect which the highest form of mind, represented by fire. As the substance is increasingly distilled
and refined, so is the cognitive process (Jung, 1981:262).
phenomenon. Thus the research process itself is, in a sense, an ‘organism’ which undergoes a process of growth and development.

A. FIRST IMPRESSION

This is the crucial first step and probably the hardest to put into words. It is not something actually referred to by Goethe himself as such, yet it can be inferred from his approach in as much as he attempted to approach things with a fresh vision. In his nature study he cultivated a contemplative approach which did not rush ahead of itself into all kinds of theorising and categorising, but which was content to take the thing in on its terms and in its own time. Goethe was well aware of how we tend to view things from a constricted point of view and he discussed this in *The Experiment As Mediator between Object and Subject* (1988). Here he suggests that, right from the beginning of research, there should be a calm openness, a willingness to let a thing speak on its own terms. He advises (1988:11): “As a neutral, seemingly godlike being [the experimenter] must seek out and examine what is, not what pleases”.

The aim is to make conscious the moment of first contact with the phenomenon. That initial encounter can be a strong experience, but it may be vague and unformed — often registered as a mood. Jochen Bockemühl has highlighted the meaning and significance of this ‘first impression’. In his own ecological research he tries to bring it to consciousness by moving through a landscape as if he was entering a foreign country and then to carry this impression throughout the course of the research process. Bockemühl writes (1986:27):

*When entering a foreign country, we are apt to become more conscious of the landscape than when surrounded by familiar scenes. We try to take in the scene with all its details, and then to connect them with our first impression. In this way we discover interrelationships. What we took in vaguely with our first impression acquires substance and content.*

Everybody has a first impression when experiencing something new but this may be quickly lost, everything becoming familiar and ordinary. The first impression can be regarded as the precious first instant when one’s sensibilities are most alive and
open. It can be understood as an intimation of the ‘idea’ or ‘theory’ of a phenomenon, which Bockemühl calls an ‘intuitive preconception’. This can be recorded in whatever way is appropriate, perhaps a written or pictorial sketch.

The first impression is a sense of the ‘whole’, not the details or the parts which are focussed on later in the research process. When we walk into a landscape there are many things which are not seen to begin with — many small animals and plants may later reveal themselves as aspects of that ‘whole’. When we first encounter a plant the overall shapes and colours are registered rather than the details of the form. The mood evoked by this first encounter has a definite ontological function, is not ‘merely subjective’. Martin Heidegger (as explained by Zimmerman, 1990:141) has developed this understanding of moods:

Heidegger argued that we disclose entities not only in terms of our understanding, but also in terms of our moods (Stimmungen) . . . moods are not merely psychological ‘colourations’ projected onto things; instead, moods articulate humanity’s openness for the being of entities.

As Heidegger sees it, moods are not psychological states, secondary to what we are doing or coming to know in a particular situation but are the primary medium through which we come to know entities. He articulates this idea as follows:

All knowing is only an appropriation and a form of realisation of something which is already discovered by other primary comportments. Knowing is rather more likely to cover up something which was originally uncovered in non-cognitive comportment. (quoted in Zimmerman, 1990:141).

It would be hard to find a description which was closer to the notion of the ‘first impression’ as presented by Bockemühl. We cannot call this first impression a ‘knowing’ in the true sense of the word which is why Bockemühl calls it a ‘preconception’. Knowing is a dynamic process. Knowledge is not just the ‘facts’ which one arrives at in the end but the whole process of that knowing, beginning with the most inchoate first impression.
B. STAGE ONE — THE PHYSICAL — ‘SENSORY INFORMATION’ — EARTH

This stage corresponds to the transition from what Goethe called the *empirical phenomenon* to the *scientific phenomenon*. The *empirical phenomenon* is, according to Goethe, that which “everyone finds in nature”, the world as we experience it immediately and directly. This stage is the entry into what Goethe called the ‘experiment’, the process of exploring the phenomenon on progressively deeper levels of its being. In this early phase of research we are still at a preconceptual level and in that sense still close to the ‘first impression’ in orientation. We are still dealing simply with what is grasped by the senses but at this point the senses become more focussed on the phenomenon in question. This is the stage where an exact description of the phenomenon is carried out, using information provided by all the senses.

The methods employed at this stage are ‘empirical’ according to the current scientific meaning of this term; that is, deriving from observation and experience rather than from theory. Every sense can be employed, e.g., sight, hearing, taste, touch, smell. For example, the flower generally has a characteristic smell but so may the fruit, the seed, or leaf if it is rubbed between the fingers. Each different part of a plant may have a different taste. There is not information from any one sense which is epistemologically superior according to this methodology; data such as taste and smell is as significant as numbers of petals, length of leaf, colour, etc. In keeping with Goethe’s belief in the senses as “the greatest and most precise physical apparatus that can exist” this Goethean methodology capitalises on the senses’ capacity to take in the phenomenon in every possible way. There is in principle no limit to the amount of information which can be obtained in this way, but in the practice of this methodology a vast accumulation is not necessary. Goethe wrote (1988:24):

---

29 It could be said that, from the way I have described this methodology so far, I have been engaged in an experimental process, the ‘scientific phenomenon’, even from the point of the ‘first impression’. Everyone has a first impression of something in everyday experience and this presumably is what Goethe meant by ‘empirical phenomenon’. By trying to become conscious of that ‘first impression’, we are already engaged in ‘the experiment.’

30 Obviously in the case of research into a plant, a larger part of the information will come through sight rather than hearing, but this may not be the case if my research was into an environment filled with animals, insects and human beings.
It is like trying to drink the sea dry if we try to stay with the individual aspect of the phenomenon, observe it, measure it, weigh it, and describe it.

The aim at this stage is to be as precise and systematic as possible in one's description. The plant can be progressively described from one end to the other and the information recorded in an appropriate way; this may be both verbal and visual. The method I will be using is to move in this description in the direction of growth, that is, from the ground up.

Goethe's own descriptions of this phase of the research process highlight the need for precision of description, and of remaining as open as possible to the phenomenon in question. As opposed to the "natural way of seeing and judging things", Goethe describes this descriptive phase as most difficult because we must attempt to see things clearly and in an unprejudiced way.

[A person] loses the yardstick which came to his aid when he looked at a thing from the human standpoint; i.e., in relation to himself. This yardstick of pleasure and displeasure, attraction and repulsion, help and harm, he must now renounce absolutely. (Goethe, 1988:11).

Further on he writes: "We cannot exercise enough care, diligence, strictness, even pedantry, in collecting basic empirical material" (1988:17). Thus we can speak of the disciplines associated with this stage of the method. The precision of one's approach can be cultivated by working from memory. Drawings can be produced without facing the phenomenon, the next day or even weeks after the first observations. What is important at this stage is to use the exactitude of the drawing as an assessment of the accuracy of one's memory.

Jochen Bockemühl (1985a) has named this the EARTH stage of the research method. Bockemühl speaks about the 'observational mode' relevant to this stage as relating to the 'solid or earth element'. As he sees it, through our sensory perceptions and descriptions, living things are 'made solid' (which is the literal translation of the word in German for 'established' [festgestellt]). In other words, we have moved from an inchoate 'first impression', an overall mood, to an apprehension of the phenomenon which is immensely more 'established' and firm. A plant, in the EARTH mode, is grasped only in so far as it is a solid object, seen in
terms of its external ‘facts’. Its living, dynamic character cannot be grasped at this point; its inner transformations. Even its inner structure, its anatomical features, can only be known by making them external; that is, by dissecting the plant. And, to the extent that we perceive a living thing in this EARTH mode, we experience ourselves as separate to it, as an external observer. Bockemühl writes (1985a:9):

It slowly becomes clear to us that we come to firm conclusions, that we are always limited to the surface of things and see them as separate, exactly because the qualities solidity, impenetrability and separateness are rooted in our cognitional attitude itself.

This separateness is a vital part of the growth of one’s cognition in relationship to a living entity. Only in this way can we stand back, and see the thing as it is in itself, aside from our own needs, our pleasures and displeasures. Yet we do not stay at that point; in the ‘distillation’ process, which is how Goethe conceived of the experimental process, we move through or dissolve the ‘facts’ on this external level and seek the levels of the phenomenon of which these empirical facts are the expression. We move into an ‘inner’ dimension of ourselves and the phenomenon in a gradually deepening journey of participation.

C. STAGE TWO — TIME — ‘EXACT SENSORIAL IMAGINATION’ — WATER

This stage represents the conscious moving into another observational mode with respect to the phenomenon, more deeply into the scientific phenomenon in Goethe’s terms. The descriptions made in stage one characterised the plant as something solid and objective and as having a large number of qualities which could be apprehended by the senses. What did not come to light were the relationships between these qualities or characters. To enter this second stage of the research process is to open oneself to the dynamically relational character of the plant, to apprehend how one character derives from the other, one part from another. It is, in other words, to experience its time dimension, its growth process.

For example, we may focus on the relationship between a seed and a stem, a stem and a calyx. These are not only contiguous in space but in time and it is with the latter relationship which we are now engaged. These dynamic relationships
(growth) are not ‘facts’ in the manner of the information gathered in stage one. This stage is not concerned with perceiving movements externally but ‘taking them within’, perceiving them with one’s ‘inner’ or ‘artistic’ sense. The different parts of a plant are like ‘frozen moments’ in a moving continuum of metamorphosis. The relationship between the seed and the stem, the stem and the calyx, as contiguous organs of the plants, is that they are an expression of one generative movement\textsuperscript{31} in which thinking can participate. Goethe called the process of cognitively participating in generative movements ‘exact sensorial imagination’.

So, while metamorphic sequences can be illustrated graphically (in the manner of the figures in Chapter IV), these are not intended to be ‘merely factual’ even if they are based on empirical facts. These arrangements of plant organs in metamorphic sequences are presented in the manner of a demonstration requiring the cognitive participation of anyone who wishes to understand them. In other words, they are not merely illustrative but need to be worked through so that the imaginative faculty can come alive and the whole formative movement can come to light in thinking.

Bockemühl relates the ‘mode of observation’ relevant to this stage of the research process to water. This is the fluid element, having nothing fixed or solid about it but ever in a process of changing form. It is therefore expressive of the movement of a form through time and imaginative cognition which is characterised by its fluidity, its capacity to experience the growth of a living form. Bockemühl writes (1985a:12):

The plant . . . can be grasped as a ‘flowing form’ when our imaginative activity moulds itself to one form and then dissolves this again as it flows on towards the next form. Our own activity can thus merge with what we observe. Thereby, an ideal movement arises, which is a kind of counter-picture to the individual forms.\textsuperscript{32}

Bockemühl goes on to say (1985a:21):

With the mode of observation corresponding to the watery element, it becomes possible to go beyond the single elements of form and reach a realm

\textsuperscript{31} See my discussion of Goethe’s metamorphic principle, Chapter IV.A.

\textsuperscript{32} When Bockemühl speaks of an ‘ideal movement’ he does not mean something ‘merely subjective’. For reasons I have presented, mainly in Chapter II, ‘ideal’ in the way Goethe, Schelling and Hegel used (and Bockemühl uses) the word means a thinking which is to be able to participate in the living, formative ‘idea’ of a phenomenon.
not directly accessible to sense perception; here the sequence of forms appears as formative movement, and the formative forces can be experienced. If something is observed as an object, it is always seen from the outside, it is seen separately and seemingly from all sides at once. There, one’s own standpoint is unimportant. The object exists without me. If, however, one begins to become aware of the formative forces . . . one’s own inner activity (intentionality) and one’s own position within the whole become significant.

This last idea is of considerable significance for this methodology. Up to this point we have been dealing with first impressions, moods, and then with precise descriptions of the phenomenon from the point of view of an external observer. Bockemühl’s idea that, in this WATER stage, “one’s position within the whole become(s) significant”, introduces a notion which fully realises itself in the FIRE stage, as ‘creative action’.

D. STAGE THREE — GESTURE — ‘INSPIRATION’ — AIR

This phase of the methodology can be understood as the further ‘intensification’ or ‘distillation’ of the phenomenon in question. Whatever results were obtained through the exercise of ‘exact sensorial imagination’ in the WATER phase are deepened here through uncovering another orientation towards the phenomenon, another mode of observation. The metamorphic movements are now perceived in a way which brings them to light as formative gestures.33 These gestures may also be called its ‘formative life-principles’.

The method of working in this phase is, as in the WATER stage, both ‘inner’ and ‘outer’. That is to say, it requires a deepening participation in the phenomenon through an inner or ‘artistic faculty’, and these ‘inner perceptions’ are brought to outer expression through a suitable medium which may be visual, verbal, even musical, for here the less realistic, more expressive artforms become more appropriate for expressing gestures of the phenomenon. This is the phase of the research process when the ‘first impression’, perhaps a vague and undefined mood, becomes meaningful and can take a more formed expression. We have moved from this ‘first impression’ to the solid, objective character of the plant, understood with a

33 See my discussion of ‘gesture’ in Chapter IV.B under the heading ‘polarity’ and ‘intensification’.
thinking related to the earth element. This is ‘dissolved’ into the water element, a form of imaginative cognition which is able to live in the fluid growing processes of the plant. But this, too, requires a further ‘intensification’. Bockemühl writes (1985a:23):

The memory of the first undefined yet total impression made on us by the [plant], can help us find a further mode of observation beyond that which we have termed the watery mode. We need a mode which can help us grasp the expression both in the flower and in the whole plant. A new inner activity is needed now.

Air is like water, but without the ‘materiality’ of water. The mode of cognition associated with the AIR phase is called ‘inspirational’. One does not perceive the gestures of organic form as empirical ‘facts’ or even just movements in time; one ‘takes them in’ as one ‘takes in’ the moving gestures of music — one, in a sense, inspires them with an artistic cognitive faculty. Bockemühl writes (1985a:26):

It is characteristic of air to expand in all directions, offering is own being and activity in order that the being and activity of another can appear.

In so far as we move inwardly in accordance with this image of the air, we reach the cognitional attitude corresponding to the air element. An inner readiness is thus created for that which manifests in the world to reveal itself in us, as an image which discloses a being.

Bockemühl calls air “the element of acquiescence”. By this he means that (pure) air has the character of not containing anything itself; it is transparent, insubstantial; we see things through the air but not the air itself. In other words, air ‘takes into itself’ the form of other beings and this is precisely the character that our thinking assumes. This idea of acquiescence can be related to the meaning of truth as aletheia, as elucidated by Martin Heidegger.34 Aletheia, as Heidegger shows, is more essential than factual truth. It arises out of an engaged knowing, and signifies an act of ‘unconcealing’, a gesture of acquiescence which allows an entity to come forth and stand in the light of its truth, to ‘show itself from itself’. We could say that, while in the EARTH stage the truth we sought was factual truth (accurate correspondence of the description to the object), the truth we are seeking in this AIR stage is truth as aletheia.

34 Refer to my discussion of aletheia in Chapter II.B.3.
E. STAGE FOUR — CREATIVE POTENCY — 'INTUITION' — FIRE

This stage corresponds to what Goethe called the *pure phenomenon*; it is the 'theory' of the organism. As already discussed, Goethe did not see the 'pure phenomenon' as anything bounded or fixed. In the infinite depth of nature he recognised that there would always be higher principles under which one's axioms or theories could be subsumed. The previous stage of this methodology was discussed in terms of the apprehension of the characteristic *gestures* of the plant. This fourth and last stage of the methodology represents the further distillation of these gestures by means of another mode of observation, called by Bockemühl (following Goethe) 'intuition'. More precisely, Goethe spoke of *Anschauende Urteilskraft*, usually translated 'intuitive judgement', as a definite mode of 'seeing' (judging) a phenomenon.

In terms of this methodology, this last state represents the most 'inner' way of experiencing the plant phenomenon (if we take EARTH phase to be the most 'outer', where the phenomenon is perceived as something external and separate). Now, through intuitive perception, we apprehend what can be called the creative potency of the organism. This is the 'theory' of the plant but it cannot be formulated in any conventionally theoretical sense. Goethe talked about expressing the 'archetypal phenomenon' in terms of "short, pregnant sentences" which he compared to mathematical expressions. We can further this by saying that these intuitive perceptions could be brought to expression in any appropriate medium capable of transmitting 'potent', 'pregnant' meanings. Intuitive perception is *intellectus archetypus*, thinking 'from the whole to the parts' or, in other words, from the formless to the formed. The 'whole' is nothing substantial, nothing actualised. It is pure potentiality or potency.

Bockemühl has equated the intuitive mode of observation relevant to this stage with the element fire (and the quality of warmth). Fire is related to air in that it is an insubstantial element. Yet fire is not mere transparency; it does not have the character of acquiescence but of *intensity* and *self-generated activity* and it is

35 See my discussion of *intellectus archetypus* in Chapter IV.D.
something of these qualities which needs to enter one's mode of cognition.

Bockemühl writes (1985a:30-31):

Warmth can be perceived as something external. Yet we can distinguish our own awareness of this perception even less than with the other elements. We are intimately united with it. Warmth is an immediate presence, full of content but undifferentiated. Form and content can barely be separated. The transition from outer to inner is smooth and continuous.

We are here at the limit of what can be called a mode of observation. The warmth enters us — our inner activity itself becomes an organ. We do not experience the outer expression of a being, we become aware of its inner impulse. At those moments of inner identity, all outer manifestations disappear. They are 'burned up'.

Bockemühl goes on to relate this FIRE stage of the methodology to the stage of seed formation in a plant. Here the external material form of the plant is 'burned up', and the plant's living impulse or 'idea' returns from a condition of maximum exteriority to maximum interiority in the seed. The seed thus represents a centre of creative possibility and potency, a 'pregnant' point. To take this 'seed-condition' into one's thinking is, have attained to at least a glimpsing of the 'theory' of the plant.
CHAPTER VI. A GOETHEAN STUDY OF FOUR NATIVE AUSTRALIAN PLANTS

Certain experimental limitations need to be mentioned by way of introduction to this chapter. The study of four plants, which follows, certainly could not be considered an ecological study in a full sense. In the previous chapter I presented a methodology which essentially involves the study of the form of a plant in and of itself. Thus, the dynamic relationships I will be considering in the WATER stage are internal ones, between the developing parts of a plant individual. This is not intended to be a comprehensive ecological investigation but a study of plant morphology and one which is close to Goethe’s own form of investigation. Goethe said that the plant comes forth out of itself, that it takes form out of its own generative idea. However, Goethe did recognise that the form of plant organs does reflect environmental conditions and the Goethean methodology I am using does open the door to a fuller ecological appreciation of the plant as I explain in Appendix A. Accordingly, in the AIR and FIRE stages, I have expanded my focus to the environment in which the plants are growing and have begun to engage in the ‘being’ of the plant as it comes forth as a reflection of an environmental ‘whole’. The ‘gestures’ of plant form, I find, have meaning ultimately in relationship to their environmental context.

These ‘experiments’ are not intended to be conclusive. I follow the methodology in order to come to a certain understanding of the plants, but this does not mean that, as I approach the stage of intuitive cognition, I will have achieved anything other than an intimation or glimpse of the ‘theory’ or ‘law’ of the plant. Stage one is perhaps the easiest part — the codification and accumulation of sense observations. Yet here, too, there are limitations; I intend to record only some of its physical reality. What I have reached towards is an overall impression of the plants.

---

36 See Chapter IV.A.
37 This is not an aspect of plant nature which Goethe fully entered into, although in his The Metamorphosis of Plants he makes a number of references to how plant form is determined by conditions of light and air. It was left to others, notably Alexander von Humboldt who was directly influenced by Goethe, to explore the wider ecological significance of organic form.
38 The plants I have chosen to study are ‘native’; I have assumed that they arose ‘naturally’ in their environments and were not imported there by human beings.
I have not delved into, for example, the microscopic parts and mechanisms of the flowers or the inner anatomy of the leaves and roots. The latter stages of the methodology depend on the awakening of intuitive 'organs' of perception and this is only ever a matter of degree. What insights I have on the occasion of these experiments may be modified or intensified on other occasions, by myself or others. I am not talking about the 'theory' of these plants in terms of 'absolute certainty.'

My methodology is not rigorous in the sense that I follow an absolutely strict pattern of giving form to my results. The first stage, the EARTH stage, is the most methodical; here, with each plant, I have undertaken a descriptive process beginning at the roots and moving to the flower and fruits. With the 'first impression', as with the AIR and FIRE stages of the methodology, I have used different modes of expression depending upon which seemed the most appropriate way of presenting my observations and insights. Most of the 'first impressions' consist of simple, descriptive statements; in the AIR and FIRE stages I have sometimes used poetry and prose in combination with visual art expression; at other times I have used one or the other forms of expression alone.

A final introductory note is that none of these plants shows a process of leaf metamorphosis such as Goethe observed in many of the plants he studied. Only one of my plants — Banksia integrifolia — demonstrates any significant leaf metamorphosis at all. In Fig. 2 (Chapter IV) there is illustrated such a metamorphic progress as Goethe considered 'archetypal'. The plant moves from more rounded, germinal leaf forms, to more differentiated forms, the leaves being progressively 'cut away' and expanded upon longer petioles. Near the flower the leaves are so differentiated and 'cut away' that they reduce to narrow, pointed forms, contracted back upon the stem. For Goethe this metamorphic sequence had an archetypal quality because it gave him a particular insight into plant nature. (Bockemühl [1985b] has studied this progression in depth). But this does not mean that this is the progression which is most commonly seen in plants. Indeed, in Banksia integrifolia, the leaf sequence would appear to be quite the opposite of this progression, moving as it does from more differentiated leaf forms in the young plant to more rounded, mature leaves. The fact that the plants I have studied show either no leaf
metamorphosis or an ‘opposite’ progression does not mean that they in any sense go against Goethe’s theory of plant development. Mark Riegner (1993:187) clarifies this (referring to Goethe’s archetypal sequence as a ‘critical phenomenon’):

The configuration of such a critical phenomenon need not be the most frequent motif observed; commonality is not a criterion for its important status. Rather, its value lies in its being a particularly clear window through which to behold the pattern of natural principle.

I do not proceed in my investigations by comparing the plants with Goethe’s ‘critical phenomenon’ of leaf metamorphosis. I will simply be taking each plant as I find it, whatever progression (or lack of it) it demonstrates, and interpret this in and of itself.
A. SCAEVOLA RAMOSISSIMA (‘HAIRY FAN FLOWER’)

These plants were observed on a headland between Avalon and Whale Beaches on the Barrenjoey Peninsula, about 30 km north of the centre of Sydney. They were close to the ground and around rocks, most visible because of their striking, purple flower. The plant’s stems and leaves were sprawling horizontally and tangled up with other vegetation. The environment here is more or less undisturbed, being a protected bushland area. There was no evidence of encroachment of weeds in the area I was studying. The only visible signs of human disturbance were the pathways cut through the vegetation.

Scaevola ramosissima belongs to the family Goodeniaceae which has ten to twelve genera and about 300 hundred species distributed in the Australasian region (a few species occurring in Malaya, Oceania and the Caribbean). The genus Scaevola is distributed around the world in the tropical zone. One species, Scaevola plumieri, is indigenous on sand dunes of the Florida peninsula (Lawrence, 1951:724). The species in question here — Scaevola ramosissima — is widespread in heath and dry sclerophyll country (plants with stiff, hard leaves), on sandstone, in the Sydney
region. It flowers most of the year (Beadle, Evans & Carolin, 1972:442). The word ‘ramosissima’ comes from the Latin *ramus*, branch, *-issima*, a superlative.

1. First impression

A tiny purple gem, shining on the ground, almost hidden in the shadows.

2. Stage one — EARTH

**Roots:** A brown, hard woody central root 10 cm long and 1 cm wide. When cut it is woody all the way through; tasteless, scabrous (rough to the touch) and bark-like on the outside. Coming away at irregular places are smaller (2 mm diameter) rootlets, which are naked (no hairs) and smooth. Just below ground level this root is twisted into a bumpy, woody knot about 3 cm in diameter, 5 cm long, out of the top of which comes about 8 stems.

**Stems:** All of the stems on this plant but three are dead; the latter have purplish brown colour, with brown, brittle leaves. The three living stems are 2 mm in
diameter. Near the woody root-knob they are a purplish colour but quickly change to a light green, covered with small white hairs (tormentum). It is 5-20 cms from the root-knot before the first leaf. The first leaves on the stems are mostly dead; at second or third leaf, in the leaf axil, another stem branches off and this often branches again a few nodes later. The most outer stems are about 1 mm in diameter, bright green and hairy.

**Leaves:** Leaves are about 30 cm apart on smaller stems; up to 60 cm apart on the thicker, larger stems. Leaves are alternate in configuration, with the lower part wrapped partly around the stem. Leaf blades are between 5-10 mm wide, 20-40 mm long; they are linear to lanceolate in shape and tormentose (covered with little white hairs and rough to touch) with a central groove and curled over at edges. Undersides less hairy and paler. Leaves on the main stem have more rounded ends; some have one or two serrations near the end giving the leaf a rough tri-partite shape. Leaves have no detectable taste.

**Flowers:** On the plant extremities, emerging from the last few leaf axils, is a hairy stem 1 mm diameter with one or two small, leaves followed by a 4 mm oblong swelling at the top of which are five leaf-like, pointed protuberances (bracts) which are much smaller and more pointed than the other leaves but also hairy. In five to seven instances no petals are present; in five instances the corollas are open. In the later cases, above the five pointed bracts is a 2 mm stem and a cup-shaped organ, open on one side, purplish on the other side and hairy. On the top of this cup are five petals separated into a fan shape (only two of the petals are opposite each other). Each petal has the same shape, swelling out to about 1 cm wide, 2 cm long, with a rounded end. Petals are pale yellowish white on the underside; each has thick, deep purple central part with thin lobed wings which have wavey edges. The central part has a network of dark veins not present on the wings; the upper side is hairless. From the base of the cup there arises a purplish stalk (5 mm long) which gets thicker as it rises up to level where the petals begin; the stalk has a half-moon-shaped head, looked at from above. It is very tormentose (hairy). Looking into the cup is seen a narrow band of white above moving to yellow deep in the centre; there are hairy ridges with dark purple veins running down to the base of the cup. Near the bottom
of the central stalk there are about five fine, reddish filaments, half the length of the central stalk, with oblong, reddish, banana-shaped heads with a tuft of hair.

**Fruits and seeds:** The part beneath the five bracts (on some of the stems which had flowers) has swollen to 1 cm diameter, green and hairy but with vertical ridges. The mature fruit appears to contain one seed, within thin skin; seed grey/black, also with vertical ridges; egg shaped and 4 mm long.

**Additional information from other sources:** Characteristic of the Goodeniaceae is the cup-like *indusium* at the centre of the flower, which contains pollen (Beadle, Evans & Carolin, 1972:15). The anthers (male parts) ripen when the flower is still in bud, and passes pollen (male reproductive cells) to the cup as it grows past them. Anthers are dead when the flower is in full bloom, so the pollen is passed to insect pollinators from the indusium cup (female part) (Mass, 1967:238).

Plate 2. *Scaevola ramosissima* — Plant in situ.
Fig. 7. Scaevola ramosissima — Whole plant showing roots, flowers and branching of stems (coloured pencil and water colour on paper, 25 X 35 cm).

Fig. 8. Scaevola ramosissima — Part of plant showing bud and fruit body (coloured pencil and water colour on paper, 25 X 35 cm).
Fig. 9. *Senecio ramosissima* — Enlargement of flower (coloured pencil and water colour on paper, 25 x 35 cm).
**General features of environment:** The headland where the *Scaevola* is growing is covered by heath growing on sandstone, the tallest plants (*Casuarina*) rising no more than 5 metres. The vegetation as a whole is very dense and is of a spikey appearance and sclerophyllous or hard, dry texture. There are numerous rock platforms which appear like islands in the vegetation. The soil is sandy and well drained. The sea can be heard below, at the bottom of a cliff face of about 60-100 m. On warm days this area can be very still and quiet. Even when a wind is coming up over the cliff and blowing over this heath environment *Scaevola* is protected for it lives in the stiller pockets and warmed spaces, between rocks and shrubs.

![Plate 3. General view of environment in which *Scaevola ramossima* is growing.](image-url)
3. Stage two — WATER

This plant shows no consistent or regular metamorphosis of leaf shape, from the seedling to the adult plant. Some of the adult leaves are roughly tri-partite with one or two spurs near the end; most, however, are linear to lanceolate and entire (smooth edged) and there is no consistent change of form. The metamorphic sequence of bud into flower and fruit is depicted in Fig. 10. Another of the growth processes of this plant on which I focussed is the characteristic branching pattern of the stems giving rise to its sprawling habit (and which led to the name 'ramosissima'). This is evident in Fig. 7.

In this WATER stage I aimed to bring the frozen ‘moments’ of the flowering and fruiting process, the ramifying growth of the stems, together with my empirical experience of the plant as a totality in the EARTH stage, into dynamic relationship through ‘exact sensorial imagination’. Thereby my formerly static images of the plant achieve a fluid condition through ‘intending’ their growth process. This WATER stage involves an inner cognitive process which, while it cannot be depicted as such, is of a quite definite nature. The results of this process appear in the next stage — the characteristic ‘gestures’ of growth which come to light when I further cognitively distil these ‘intended’ movements.
Fig. 10. *Senevola ramosissima* — Metamorphic sequence a. Bud b. Flower (pen and water colour on paper).
Fig. 10. (cont.) Senecio ranosissima — Metamorphic sequence c. Unripe fruit d. Ripe fruit with seed (pen and water colour on paper).
4. Stage three — AIR

In the case of Scaevola ramosissima I elected to give expression to the 'gestures' of the plant by means of a form which combines prose and poetry with visual imagery. As stated in the introduction to this chapter, it is at this stage that I begin to relate the plant to its environmental context, for the 'gestures' begin to have meaning in terms of the whole landscape of which they are the reflection.

SCAEVOLA RAMOSISSIMA — A SURFACE DWELLER

This is one of the many almost inconspicuous plants of the Australian bush. Low to the ground, weaving among the vegetation near the earth, the eye finds it as a tiny flash of purple in the shadows and amongst the browns of dying casuarina leaves. This plant belongs to the realm of the ants, to the leaf litter and tangle of sticks and surface vegetation. It ramifies and undulates around and through this dry environment, reaching upward only in occasional leaf-gestures — spreading, liltling, watery. Its greens are rich and turgid; its leaves long and finger-like, its coating of hair the sensitive surface of a being which responds and relates . . .

Fig. 11. Gesture sketch of Scaevola ramosissima (charcoal on paper, 40 X 55 cm).
Rocks, sandy soil,
Twigs and grasses,
even the insects,
Are woven by this plant,
organised
belong together
as a subtle organ of this landscape,
Amorphous earth is made rhythmic
with penetrations of air and light,
Gathered as water gathers,
Prepared for an appearance
earth light air
come forth as colour
a purple fan.

Fig. 12. Senecio ramosissimus — Gesture painting (water colour on paper, 40 X 55 cm).
From the earth's dark pull,
Its opaqueness,
A gem extruded,
Darkness lit to the point of purple,
Light and earth touched,
And this tiny fan hovers on the earth's mass,
Glowing and lifting.

In the midst of this tangled yet organised surface, tiny centres appear. This is what comes to the eye; they glow and gesture an inwardness . . .

The purple fans open
and yields a centre asymmetrically,
this most concentrated space,
A yellow curves to the flower's heart,
Lip of a threshold.
An earth-light,
Not merely a purple flower,
Purple itself revealed,
As a colour with a centre,
Through purple to a mystery
of light and dark,
Thereby a plant brought forth.

Surface form,
Undulating and mediating,
Sprawling to fan out and reveal,
Earth as light,
Landscape distilled
as purple's mystery.
Plate 4. Kunzea ambigua — Flowering branch.

B. KUNZEA AMBIGUA ('TICK BUSH')

The plants observed were at the same location as the Banksia integrifolia — directly behind a beach in a bushy area, 30 km north of the centre of Sydney at the back of Bilgola Beach, on the Barrenjoey Peninsula. Although there are numerous houses and roads nearby, at this particular beach part of the dunes as well its bushy hinterland are preserved. The beach and its environments is set in a small valley which contains pockets of rainforest. The bush where the Kunzea is growing appears disturbed in places; there are cleared areas where new growth is occurring. There are also tracks leading through the bush to the beach.

Kunzea ambigua belongs to the family Myrtaceae, which comprises about eighty genera and 3000 species. It is found mainly in the tropics, and concentrated in tropical America and Australia (Lawrence, 1951:634). In Australia the genera include Eucalyptus, Leptospermum and Melaleuca, all characterised by pellucid oil-glands and aromatic quality (Beadle, Evans & Carolin, 1972:306). The family has economic importance; for example, the edible fruit of the guava (Psidium), spices such as the
clove (dried flower buds of *Syzgium aromaticum*) and the allspice or unripe berry of *Pimenta dioica*, tea-tree oil (*Melaleuca*) and timber from *Eucalyptus*.

There is no observable reason why *Kunzea ambiguа* has the common name 'Tick-bush'. The name 'ambigua' comes from the Latin *ambiguус*, going here and there, uncertain. There are about twenty species of *Kunzea*, distributed in every state of Australia except the Northern Territory (Mass, 1967:120). In the Sydney region there are five species, all shrubs (Beadle, Evans & Carolin, 1972:344).

1. First impression

A hardly noticeable green shrub; yet its flowers radiate, it exudes a perfume which pervades its whole environment.

2. Stage one — EARTH

**Roots:** On the 15 cm high seedling the root is about 3 mm in diameter, and has a reddish covering over a pale yellow interior. No detectable taste. The central root goes about 15 cm into the ground before lateral roots begin, these about 0.5 mm in diameter.

**Stem:** Woody, dark brown, when peeled off reveals light yellow. There is a petiole every centimetre, arranged in a spiral around the central stem. Near the top of the plant the new stems are not woody but reddish with white hairs turning pale yellow at the extremities. The main stem of a mature plant is 30-50 mm in diameter, brown-y-white, slightly flakey bark; no detectable taste. A mature shrub is about 2 m high.

**Leaves:** Yellow at base, flattened where they connect with the stem. About 1-2 mm wide, 5-8 mm long; covered with little slightly raised spots (oil glands); whole leaf is bitter to the taste but gives a honey aroma when rubbed between the fingers. Leaves bending slightly. Leaves are crowded (in spirals of five) along short non-woody
lateral stems which come off central woody stems (also in spirals of five) at intervals of around 1 cm.

**Flowers:** Appearing on new shoots at leaf axils and bunched at tips. The bottom part of the flower is a greenish-yellow tube/cup covered with oil glands. The flowers also have a bitter taste. Coming off the rim of this cup are five roundish, pure white petals with little dots (oil glands) and between these five pointed leaf-like shapes. Inside the cup and extending 4-5 mm beyond it are numerous shiny, white threads with yellow, globular heads. At the centre and extending out as far as the threads is a thicker stalk with a U-shaped yellow head. Flowers in spring-summer.

**Fruit and seed:** On the plant where the tube has lost its petals and stalks the tube is bright crimson around it rim. Fruit a small capsule, 5 mm in diameter, with a leathery texture. Opens at top to release seed. Seed is about 0.5 mm long, slightly bent oval shape, orange brown in colour when dry.

![Image](image-url)  
*Fig. 14. Kunzea ambiguus — Flower heads showing bunched structure (pen and water colour on paper, 25 X 25 cm).*
**General features of environment:** Soil is sandy, made dark with organic matter. The *Kunzea ambigua* was observed in a sand-dune habitat about 200 metres from the ocean and directly influenced by sea winds and salt. Behind a protective wall of *Banksias* the *Kunzeas* grow in areas not made dark by overgrowing trees. They are closely surrounded by other shrubs of a similar height including *Leptospermums* and *Grevilleas*. This habitat grades rapidly into rainforest 100-200 m further from the beach (which features many palm trees). The *Kunzeas* are growing in places which receive direct light most of the day.

Fig. 15. *Kunzea ambigua* — Three aspects of the plant a. lateral branch b. stem with lateral branches c. seedling (pen and water colour on paper, 40 X 35 cm).
3. Stage two — WATER

This plant does not demonstrate any significant metamorphosis of leaf form from the immature to the mature plant. The metamorphic sequence depicted in Fig. 16 is bud, flower, fruit and seed formation development. I worked by means of 'exact sensorial imagination' with this sequence, together with other empirical information from the EARTH stage, in order to come to a sense of the plant as a living process. Significant here are the way new shoots and leaves appear, the pattern of leaf ramification and leaf formation in new growth and the overall shape of the plant in different phases of growth. These movements eventually became comprehensible as living 'gestures' which are characterised in the next stage of the experimental process.

Fig. 16. Kunzea ambigu — Metamorphic sequence a. buds (pen and water colour on paper).
Fig. 16. *Kunzea ambigu* (cont.) — Metamorphic sequence b. flowers
c. unripe fruit d. ripe fruit and seeds (pen and water colour on paper).
4. Stage three — AIR

What is expressed here are my 'inspirations' of *Kunzea ambigua* (taking this word literally as a kind of breathing in, the inner perception which allows the growth process of the plant to become 'expressive'). At this point I found not merely processes but meaningful movements or 'gestures'.

**KUNZEA AMBIGUA — RADIANT PLANT**

This shrub without flowers hardly stands out from the green mass of the vegetation. Even at its mature height it naturally mingle with surrounding shrubs. Its leaves are small and fine; they do not vary. Similarly, its branches are not prominent but blend with the overall texture of the plant, showing though only palely. But in that inconspicuousness, sameness, there is a certain gesturing. This plant occupies its space in an even way; its leaves finely divide the air in all directions...
Veil of green,
Filigree of earth-matter
shaped by air,
Blurred,
Nothing asserted or
separated out,
indefinite,
Delicate whorling
into the light.

Yet here is potentialised
a particular space,
A being of
air and light,
A space so finely organised
so refined
it begins to radiate whiteness
and honey,
as flowers
which cluster and seethe,
still finely
shimmer and exude
a sweet pungency.

Buds develop in groups along the outer branches; here there is no reaching towards a final, consummate flower. The flowers collectively speak — not of inwardness, mystery — but of full radiance . . .
Fig. 18. *Kunzea ambigua* — Gesture sketch (charcoal on paper, 25 x 25 cm).

5. Stage four — FIRE

Where this landscape
lives as
radiance,
pervadingness,
As light-space,
Not burning,
as colour,
held like a torch,
But fine light,
white,
Honey light and
sweet,
As this plant
the landscape
lives so.
Fig. 19. *Kunzea ambigua* — Image of flower as plant 'theory' (water colour on paper, 40 X 55 cm).
C. BANKSIA INTEGRIFOLIA L.f. var. INTEGRIFOLIA
('COAST BANKSIA' — 'WHITE HONEYSUCKLE')

The particular stand that I observed was in the same location as the Kunzea — behind Bilgola Beach north of Sydney centre. There is a considerable population of Banksias here with many immature shrubs growing in the more open, disturbed areas, and mature trees growing in amongst thick vegetation, making a wall at the back of what would have been the sand-dune (now a car park). Because it is tree-like in habit it represents a contrast to the other three plants I have studied.

Banksia integrifolia is a species belonging to the family Proteaceae, which comprises mainly woody shrubs and trees. The family is named after the Greek sea-god Proteus who could change his shape at will; Carl Linnaeus first used the name in 1735 to refer to South African plants in this family because he was impressed by the diversity (Wrigley & Fagg, 1989:15). There are seventy-three Proteaceae genera occurring in temperate to tropical environments, particularly in Africa and Australia and South America, and more than 1500 species. The greatest
diversity is in Australia where there are about 860 species. The family Proteaceae usually occurs in infertile soils and lateritic gravels (there are some rainforest species) (Wrigley & Fagg, 1989:16). There is a great deal of fossil evidence for the family going back about 80 million years. It is considered to be a very ancient family and it is possible that the Dryandra genus (growing only in Western Australia and belonging, along with Banksia, to the tribe Banksieae) was one the first flowering plants on the planet (Mass, 1967:55). Johnson and Briggs (1975) believe that the family originated on the great southern continent Gondwanaland (which later broke up into Australia, South Africa, South America and India) and began as rainforest species which later, as the continent dried out, became the hard-leaved specimens we know today.

The genus Banksia was named after Sir Joseph Banks. Some have the common name 'honeysuckle' because of their high rate of nectar production when in full flower. There are seventy-five recognised species in Australia, most located in the southwestern regions. Only one Banksia occurs naturally outside Australia — Banksia dentata which is widespread in Northern Australia, Papua New Guinea and Irian Jaya. None of this genus grows in the arid centre of the country nor in the rainforests. Many Banksias, in both west and east of Australia, grow in exposed coastal areas, on sand dunes and headlands; others are sand-plain species. In most cases the ground is well drained (Wrigley & Fagg, 1989:80).

Sir Joseph Banks first collected Banksia integrifolia after he landed in Botany Bay in 1770. One variety grows on the northern coast of Queensland; the species in question here grows in coastal areas, from just north of Brisbane right around into Victoria. In the northern part of its distribution it grows on sand dunes, tidal inlets and headlands. From the Latin, integer, entire, and folium, a leaf, the name refers to the entire margins of the mature leaves (Wrigley & Fagg, 1989:99).
1. First impression

Many of the Banksias in the more open areas I observed are immature; nearby, in dense bush, there are stands of mature trees. I thus received two first impressions of this tree and have divided what follows accordingly.

(a) Immature trees

In this warm and sea-blown atmosphere,
These are thin and shivery presences,
No robust welcoming here,
Tight and drawing upward,
As if crowded out,
Yet this is a space of air and light,
Silvery leaf undersides turned outward,
Where other plants luxuriate greenly,
Almost ungainly
in their youthfulness.

Fig. 20. Banksia integrifolia — 'First impression', immature trees (water colour on paper, 40 X 55 cm).
(b) Mature trees

Rounded and full. Stooping downward in a relaxed way (compared with the immature trees). A mood of completeness.

Fig. 21. *Banksia integrifolia* — 'First impression', mature tree (water colour on paper, 40 X 55 cm).
2. Stage one — EARTH

**Roots:** On seedling, central root has pale yellow woody interior, 3 mm in diameter, woody brown exterior. (I was not able to inspect the roots of the immature and mature trees).

**Stems:** Rising up 14 mm above ground before first leaf on very young plants; diameter 3 mm, baky texture, rough; at first leaf less woody, yellowish brown with brown hairs.

On immature plants of 3 m in height the stem at base is around 8 cm in diameter, the bark a thin, shiny red colour, in places with whitish knobs. This bark is easily pierced to reveal a green woody interior. Bark has thin, vertical creases. New shoots (diameter about 2 cm) are covered with dense red tormentose. The stems of these immature plants are extremely etiolated in places, with a metre or so between petioles.

The lower trunk of the mature tree is around 30 cm in diameter, with a very bumpy surface and thick, cork-like texture. It is black/grey on surface and when picked off revealing yellow ochre wood inside. Vertical creases cover over whole surface of trunk, each around 5 cm wide. The lower branches of tree bend out and downwards.

**Leaves:** The leaf on the seedling has a 2 cm petiole; leaf has a pale white underside, prominent yellow/green central vein, dense white tomentose close to leaf surface. First leaves 5 cm long, dark greeny yellow on upper surface, with small, yellow lateral veins and reticulations visible from below and above; it has spikey serrations, seven on each side of leaf. Leaves spiral around stems in whorls of five.

On immature trees leaves change from bottom to top of plant — some serrated leaves towards the bottom but none at the top. Leaves on uppermost branches are entire (smooth edged), narrow obovate, average length being 100 cm. Leaves hard and brittle.
No serrated leaves are present on the mature tree; all are narrow obovate.

**Flowers:** Flowers appear on immature trees from late summer to winter, the vertical spike appearing within the leaf whorl at the end of new shoots and also lower down the branches. The spike grows to about 80 cm, is tubular with a woody axis. The pale green flower buds appear in precise rows, in pairs and surrounded by reddish flower bracts. One spike examined had an estimated 500 flower pairs. On more developed spikes a stalk of almost 1 mm diameter comes out from each one of these pairs, with fine white hairs, and capped by a paler, slightly pointed head. In even more advanced spikes this thick stalk has split into a group of thin stalks, about 3 cm long, one of them yellow and bent, the others more red and grouped together, all held at the top by a greyish cap. In other cases this cap has broken, and the thick stalk protrudes from the other stalks by about 4 cm, becoming a pointed filament with a reddish end. The other stalks remain 3 cm long, four in number, each with grey caps (anthers). The overall appearance of the flower spike when fully open is a yellowish red, spikey and cylindrical, with a radius of 5 cm. On warm days the flowers in full bloom have a rich fragrance.

With regard to the flowers, the mature tree is the same as the immature plants.

**Fruits and seeds:** Some flower spikes have lost all their coloured filaments, have thickened and become lumpy and cone-like. Distributed unevenly around this form are half-moon shaped follicles covered with short red hair. They are embedded in a cellular matrix, which is in regular rows where the cone is not swollen, but becomes irregular where the red follicles have appeared. These cells are pale green-yellow, covered with short white hairs, with a darker centre. In other cones observed, these follicles are very pronounced, do not have red hair and are woody and brown. The moon-shaped follicles are opened and reveal a yellowish interior, each containing two seeds. The seeds are 1—2 cm long, with a hard black centre, surrounded by a white film and then by a brown/y orange wing-like film. In other cases the follicles are open, and the whole cone has become very hard, dark and woody.

Plate 10. *Banksia integrifolia* — Immature tree.
Plate 11. *Banksia integrifolia* — Bark of immature tree.

Fig. 22. *Banksia integrifolia* —  a. seedling b. slightly more advanced plant (pen and water colour on paper, 25 X 25 cm).
Plate 12. *Banksia integrifolia* — Leaf configuration of very young tree.

Plate 13. *Banksia integrifolia* — Leaf whorl of immature tree.

Plate 15. *Banksia integrifolia* — Bark of mature tree.
3. Stage two — WATER

Two metamorphic sequences of the *Banksia integrifolia* are here depicted. Firstly the changes of leaf shape from the immature to the leaves of the mature plant are depicted (Fig. 24). Not all of these can be observed on the same plant; the first three forms (a, b, c) belong to the seedling; the following four forms (d, e, f, g) were observed on an immature shrub, the serrated leaves appearing at the bottom of the plant, the entire leaves at the top. On the mature trees only forms f and g in this sequence were observed. With ‘exact sensorial imagination’ I worked with this sequence to sense the leaf metamorphosis from seedling to mature tree.

Secondly I have depicted the ‘moments’ of the development of the spike into the flower buds, through the flowering stage, to the production of fruit follicles and the release of the seed (Fig. 25). Because of the time-frame involved these ‘moments’ of development could not be observed in relation to one particular flower spike; the flowering process to the maturation of seeds is six months to one year. Consequently the images are of flower spikes on the same tree which were in different stages of development (most immature and mature plants contain all stages). *Banksia integrifolia* releases its seeds on maturity whereas many other members of the Proteaceae require a fire or the death of the plant (Wrigley & Fagg, 1989:5).

As with the other plants studied here, these depictions of metamorphic sequences are only part of the way I worked with ‘exact sensorial imagination’ in this WATER stage. In practice I cognitively ‘gathered’ all my empirical observations of the plant to ‘live into’ its developmental journey, from seedling to mature tree. Again, as in the case of the other plants, the results of this ‘imaginative’ process belong to the AIR stage of my methodology.

![Fig. 23. *Banksia integrifolia* — Metamorphic sequence of leaves a. germinal leaf b. first true leaf c. leaf of seedling d. leaf in lower parts of immature shrub e. leaf of higher parts of immature tree f. & g. leaves of highest parts of immature tree and all of mature tree (pen and water colour on paper).](image-url)
Fig. 24. *Banksia integrifolia* — Metamorphic sequence a. spike with rows of paired flower buds (pen and water colour on paper).
Fig. 24. *Banksia integrifolia* (cont.) — Metamorphic sequence of opening flowers (pen and water colour on paper).
Fig. 24. Bauxsia integrifolia (cont.) — Metamorphic sequence c. open flowers (pen and water colour on paper).
Fig. 24, Banksia integrifolia (cont.) — Metamorphic sequence d. withered flowers
(pen and water colour on paper).
Fig. 24, Banksia integrifolia (cont.) — Metamorphic sequence e. young follicle (pen and water colour on paper).
Fig. 24. *Banksia integrifolia* (cont.) — Metamorphic sequence f. mature follicle (pen and water colour on paper).
4. Stage three — AIR

**BANKSIA INTEGRIFOLIA — AN ANCIENT PLANT**

These plants reach up with great definiteness, leaves and stems stretched skyward. Close to the earth as the seedling, no beginning is made in a naive, watery spreading of rounded form; no tentative feeling out into the world. Here, even the first leaves are serrated, almost as if bringing a certain 'knowledge' with them . . .

Sculpted leaves
sharpened by an ancient experience,
Even as a seedling
commanding a space

Translated into a powerful upthrust,
Stem, leaf, flower held erect,
Like a command,
But gradually softening, rounding
towards the light,
Finding a more refined water on high.

The young trees appear white amongst the rich greens of their environment; at night they are a ghostly, silvery presence. Cold outwardly, but with a potent red axis and around it the rich green inner leaf surfaces. This makes for a great focus of power — a containment, a holding-inwards, concentrated and developed through tense, 5-fold whorls. A concentrated space so potentialised that something strong may come forth within — the flower . . .
Fig. 25. *Banksia integrifolia* — Gesture sketch (charcoal on paper, 40 X 55 cm).
The flower being,
Held as focussing
an immense space of light
in still erectness.
A manyness folded, dissolved into
implacable rows and spirals,
These many-as-one flower heads,
Live between self-containment,
utter order,
and bursting out as nectar,
yellow and sweet perfume.

They die, lingering where they formed,
Wizened presences, signs of the old
alongside the new intensities,
New, ancient plant.39

The mature leaves are rounded out as is the overall form of the mature tree. The whole form loosens; the stiff and definite erectness of the immature tree is transformed into a rounded whole, shot through with the flowers in different stages of development but the tree now containing that intensity in a more ‘comfortable’ way — no longer pressing urgently skyward but now relating those sky-borne flower-intensities back to the earth through the stooping gesture and the trunk’s corky solidity . . .

39 Nuri Mass (1967:36) writes: “Banksias, even when they are quite young, make you feel as if they have lived a long, long time and know a great many things and are extremely wise. They sit up, very straight and dignified, among their hard, stiff leaves, and there is no nonsense about them whatever.” Such a statement (coming from a source totally unrelated to Goethean phenomenology) would normally be considered subjective and fanciful. In the terms in which I am studying these plants I believe this to be a real insight and something which supports my own discoveries.
Fig. 26. Banksia integrifolia — Gesture painting (water colour on paper, 40 X 55 cm).
5. Stage four — FIRE

Most potent sun space,
Borne on high,
Veritable sun,
galvanising a
multitudinous landscape,
Giving it a moment
when it is still,
definite, incandescent,
One.
Fig. 27. *Banksia integrifolia* — Image of flower as plant 'theory'
(water colour on paper, 40 X 55 cm).
D. Grevillea buxifolia ('Grey Spider Flower')

The Grevillea buxifolia plants studied here were observed in bushland near a road about 5 km from the coast and 15 km from the centre of Sydney. The road winds through a small valley, from a ridge down to sea level, following a water course. Apart from the road itself the general environment of these plants appears more or less undisturbed. Houses are visible on the tops of ridges about 0.5 km away, overlooking the environment in question.

Grevillea buxifolia is a species of the Proteaceae family which has been described in general terms under the heading of Banksia integrifolia in the section above. Members of the genus Grevillea cover almost the whole Australian continent. They are named after Charles Greville who founded the Royal Horticultural Society in 1804. There are about 273 species of Grevillea in Australia, only four or five growing naturally outside the continent (in Papua New Guinea and other Pacific Islands) (Wrigley & Fagg, 1989:191). The species grow in a wide variety of habitats; in Western Australia in mallee and sand-plain; in Eastern Australia in heath, open forest and
some in rainforests. They usually grow in well drained soil. In the drier north other species grow in flat, open woodland (Wrigley & Fagg, 1989:192). The *Grevillea* genus comprises woody plants, varying from prostrate to spreading ground covers to tall shrubs and trees in tropical rainforests.

*Grevillea buxifolia* is a native of the sandstone regions in the central and south coast of N.S.W. and the Blue Mountains west of Sydney, growing in heath or open forest (Wrigley & Fagg, 1989:220). The name comes from the Latin, *buxus*, the box, and *folium*, a leaf, and refers to the likeness of the leaf to the European box. The common name 'spider plant' refers to the spidery appearance of the flower clusters. There are three closely related subspecies in the Sydney region, two of which are said to closely intergrade (Wrigley & Fagg, 1989:220).

1. First impression

Flowers like heads, exploding out as if from too much pressure from within. A strong plant although not brightly coloured.

2. Stage one — EARTH

**Roots:** Seedling root is yellow-brown, woody, about 2 mm in diameter. White within; no detectable taste. Lateral root off-shoots about 0.5 mm in diameter. I was not able to inspect the roots of a mature shrub.

**Stems:** Main stem on seedling is 2 mm in diameter, slightly woody, greenish-brown in colour and with small, pale-reddish hairs on the upper parts. Towards the top of 1. 5 m shrub the stems are 3 mm in diameter, pale brown and woody, with a white interior. Five stems branch off in all directions from terminal ‘knots’ of the main stems near the top of bush; these upper stems are increasingly covered with rusty, brown hairs which become dense near flower heads. On the mature shrub the lower main stem is dark brown to black, about 5 cm in diameter.
Leaves: These come off the stem on a white stalk 1 mm in length; ovate in shape. There is a white, central vein visible on upper surface, as well as other, less-conspicuous green veins. No detectable taste. Leaves pale green underneath, curled over at edges, with a few whitish hairs; on the stems they are about 4 mm apart, spiralling in whorls of five. Near the flower the leaves are 3 mm long and more lanceolate; apart from this there is no change in leaf shape from the seedling to the mature plant.

Flowers: Flower heads appear at terminal points of the branches; each flower cluster (umbel) has eight to twelve individual flowers. Flower clusters are on stalks 6 mm long, curving outwards and covered with rusty brown hairs. Flowers have no detectable scent or taste. In some cases a tube (1 mm diameter, bright red at bottom and covered with white hair) rises up then hooks back and is joined to the lower parts of the flower. In others one end of this tube is released from the flower, and it bends over like a shepherd’s crook with a bright green disk at the end and a final hook. The lower part of the flower has four segments fused together, covered with very dense, pure-white hair on top, rusty hair underneath. Each segment has a central in 2 mm wide cavity, lying directly below the green disk with four segments inside (anthers).

Fruits: The fruit is 3 cm long, banana shaped, on a purple stalk about 3 mm in diameter). It is bright yellow/green with white hairs and a shiny, brown woody part at end (remains of flower hook). The ripe fruit capsule is yellow brown.

Seeds: 1.5 cm long, light green orange colour, hairy all over with longitudinal ridges and with a woody texture.

Additional information from other sources: Peak flowering period is in spring (Wrigley & Fagg,1989:220). Seeds are released when mature. Flowers have male and female parts and are borne in pairs. Four anthers (male reproductive parts) are present and the style, when released from the perianth tube (fused petals), bends around and becomes the pollen presenter. Many species of the Proteaceae are
pollinated\textsuperscript{40} by birds or insects. Bird- and insect-pollinated flowers have this long style, which is dusted with pollen before it is released from the perianth tube. The stygmatic disk (bright green on \textit{Grevillea buxifolia}) then becomes the pollen presenter (Wrigley & Fagg, 1989:30).

\textbf{Plate 17. Grevillea buxifolia — Terminal flower heads.}

\textsuperscript{40} This means that the pollen, produced on the anthers, is transferred to the female parts (stigma) of the same or a different flower.
General features of environment: This plant was observed in a bush environment typical of the Sydney region. The soil is sandy with a sandstone foundation. The habitat in question is in a valley and near water courses and drainage areas. The Grevilleas themselves were growing on well drained soil, with overhanging Eucalypts (about 5 m high) and surrounded by other shrubs including Acacias and other species of Grevillea. Nearby there is a large wet area (damp but not a swamp) which is inhabited almost entirely by sedges. The conditions where the Grevillea buxifolia is growing are very open and light, although it is quite low and in the shadow of other shrubs and trees. Vegetation in general is luxuriant although often spikey in appearance. Further down the valley there are rainforest habitats and palm trees.

Plate 18. Grevillea buxifolia — View of whole mature shrub.
Plate 19. Grevillea buxifolia — Base of woody main stem of mature shrub.

Fig. 28. Grevillea buxifolia — Aspects of the plant a. flower head and fruit b. individual flower (pen and water colour on paper).
3. Stage two — WATER

The procedure I followed here is the same as for the above three plants; the empirical observations of the EARTH are gathered, related and made fluid by ‘exact sensorial imagination’ so that I came to an inner sense of this plant as a total growth process. In this I focussed in particular on the most evident metamorphic sequence — the development of bud to flower, fruit and seed. No significant metamorphic development is evident in leaf shape from the seedling to the mature plant, or from the lower parts of the shrub to the higher, apart from a narrowing and sharpening of the leaves just before the flower. Further cognitively ‘distilling’ this plant’s growth process, I came to its characteristic life ‘gestures’ in the next stage of my investigation.

Fig. 29. Grevillea buxifolia — Metamorphic sequence a-b. buds opening (pen and water colour on paper).
Fig. 29. Grevillea buxifolia (cont.) — Metamorphic sequence c. flower head d. dying flowers e. ripening fruit f. ripe fruit capsule and released seeds (pen and water colour on paper).
4. Stage three — AIR

GREVILLEA BUXIFOLIA — A PLANT BETWEEN

The leaves are small and pointed, gathered closely to the central axis and rising in tight, regular spirals. The leaves and stems appear as a unity, like flexible columns; smaller branches arc out in groups of five which circle around the central axis and rise. But the plant in overall gesture has no rigid uprightness or tightness; here an unevenness, a watery looseness prevails. Overall, neither predominantly loose nor compact, ordered nor disordered, this plant lives between opposites . . .

A dweller at the shadow's boundary,
Compact, ordered rising,
Tight ringing of leaves
But the branches are dispersed
in loose spaces and textures.
Not yielded, crystalised
in one direction,
Play of tendencies
held.

The flower sits high on the terminal points of the branches, like a conclusion: definitive statement of the plant. But that consummation is a chaos. The flower, in a sense, explodes out, curls and twists in all directions, is chaoticised . . .

Shafts of
scale-like leaves,
Raising a sculpture flower
on a column,
But the flower
so presented
seethes and disperses,
Fire made airy then liquid
Sun-brightness
dissipated into browns,
Curling down even as it reaches up,
Between order and convulsion
Irresolution becomes
a consummate form...
Fig. 31. Grevillea buxifolia — Gesture painting (water colour on paper, 40 X 55 cm).
Fig. 32. Grevillea buxifolia — Gesture painting (water colour on paper, 40 X 55 cm).
5. Stage four — FIRE

The between
is itself a phenomenon.
As this plant
the landscape lives it,
speaks it,
makes it present.
The between of its forces,
tendencies,
Warmth air
earth water,
The moment between
is formed,
comes forth.
Fig. 33. *Grevillea baxifolia* — Image of flower as plant "theory" (water colour on paper, 40 X 55 cm).
CHAPTER VII. SUMMARY & CONCLUSIONS

A. SUMMARY

My central question was the statement of Goethe: "Let us not seek for something behind the phenomena — they themselves are the theory". My first intention was to explicate the meaning of this statement, both in terms of the context in which Goethe uttered it, and in relationship to contemporary views of the philosophy of science. I suggested in my introduction that this statement, on the face of it, was problematic, for a persuasive contemporary view of the 'theory' is that it is a human construction, not something 'objective' in nature. It would appear that either Goethe's notion of 'theory' is obsolete, or it is a way of thinking not encompassed by present day philosophy and may be of real significance.

My examination of Goethe's world-view opened up his relationship to the 'organic' world conception which is derived from Plato's Timaeus and further back from the ideas of the pre-Socratic philosopher Parmenides. Bruno and Spinoza were the two philosophers in that 'organic' tradition to which Goethe was particularly attracted. Contemporary to himself and also highly influential on his thinking were the German Romantic philosophers Fichte, Schelling, and Hegel. I showed that his statement "the phenomena themselves are the theory" can only really be understood from within the perspective of this organic tradition which sees the 'idea' or 'archetype' (theory), not as something merely subjective, but as a formative principle working in all living things and able to be apprehended with a 'thinking-perception' or intuition which 'distills' sensory information to find its inner qualities or gestures. Through intuitive perception, the way Goethe understood it, one is able to comprehend the 'theory' as a 'higher' aspect of the phenomenon.

I also showed that Goethe's form of nature study is what we would now call a phenomenological approach. As such Goethe has a connection with contemporary phenomenological thinkers such as Martin Heidegger. What distinguishes Goethe from the latter is that he was not primarily a philosopher; he was a practical scientist
('nature looker') and artist who believed what was most decisive was the doing rather than the thinking. However, in a general sense, Goethe's approach can be aligned with the fundamental aspiration of phenomenology — to try to understand phenomena on their own terms, to let them 'speak for themselves' rather than become the subject of theoretical manipulations; to try to find a thinking which is adequate to the phenomena rather than trying to fit the phenomena into a standard conceptual system. Put another way, the task of such a phenomenological approach is to cultivate a thinking which cares for the phenomenon, which is, in a certain sense, responsible for it.

For Goethe, knowledge at the level of intuitive perception becomes creative; it finds the 'creative potency' in a living form and allows this to come to expression or be continued in human creativity. I discussed this notion of creativity in relation to the contemporary ecological philosophies Deep Ecology and Social Ecology. Hegel had spoken of the need for a 'living thinking' pertaining to the study of nature. I suggested that Goethe brought such a notion of living thinking to actual expression as a methodical way of studying natural phenomena. He strove for an 'integral approach' in which scientific and artistic modes of cognition are essentially united (rather than merely an integrative approach which tries to relate the two). Goethe's integral approach is, I suggested, inherently ecological and ethical in character and is what constitutes today 'a new ecological discipline'. As such it relates to the ancient meaning of art as techné, art here including all forms of human production.

My purpose in carrying out experimental work on four Australian native plants was to take these ideas out of the realm of philosophy into practice. My choice of plants as a subject was in part inspired by Goethe having occupied himself to a great extent with botanical research, and in part due to my own interest in plants. Through his botanical research he isolated four principles of plant development — metamorphosis, polarity, intensification, archetypal phenomenon — which I discussed in some detail. The methodology I used draws to a large extent on the ideas of the Goethean scientist, Jochen Bockemühl. In essence it is Goethe's own phenomenological method; Bockemühl has highlighted and clarified the stages thinking goes through in the journey of participation in the plants' living process. It
is a methodology which, in accordance with Goethe's own approach, provides a means of cultivating new 'organs' of aesthetic cognition.

My investigations of four Australian native plants are not in any sense intended to be complete; they are only preliminary applications of this Goethean methodology to Australian flora. My intention was not to come to any definitive 'explanation' of these plants, only to understand them better. The methodology I have used is one which has helped me to 'participate' in the living process of these plants, to learn about their life principle or 'theory' from out of a close identification with them. My artworks, at least in the latter stages of my research process, I do not consider to be merely subjective representations. According to Heidegger's notion of truth as 'unconcealing', my artistic work has been a means of bringing the inner principle of these plants to light, into a new kind of presence. The 'truthfulness' of my results in relationship to these four plants depends on whatever is insightful about these artistic expressions, not on any argument relative to Goethe's notion of 'theory'.

B. CONCLUSIONS

My conclusion falls into four sections: 1. Conclusions relating to my investigation of four Australian native plants; 2. Goethean phenomenology, morphogenesis and dynamic morphology; 3. Wider applications of Goethean phenomenology; 4. The meaning of 'responsible' knowledge in the context of contemporary environmental issues.

1. Conclusions relating to my investigation of four Australian native plants — *Grevillea buxifolia, Scaevola ramosissima, Banksia integrifolia* (and) *Kunzea ambiguus*.

There are two questions which I wish to address by way of bringing my research into these plants to a conclusion. Firstly: how does my method of research compare with the standard botanical approach? and secondly: is there any special value in my way of understanding these plants, with respect to the needs of contemporary culture?
The methodology I have used in my experimental work with these four Australian native plants is quite at variance with conventional botanical practice. This, to some extent, was made apparent in my discussion of Goethe’s world-view and the contemporary philosophy of science. In the most general terms, I have not proposed a hypothesis and sought to test it by way of an experimental procedure. The ‘theories’ I arrived at in relation to these plants are not theories in the standard sense of ‘explanations’ arising from an analytical reasoning process. Thus my conclusions cannot take the form of predictions based upon whether or not a hypothesis has been proved, the standard form of a scientific conclusion. All I can assert is that my results may have demonstrated something truthful about these plants which may be of use to others.

To clarify this somewhat further, conventional ecological research might, for example, seek explanations for the optimal conditions in which these four plants germinate or develop fruit. This sort of approach seeks information about particular aspects of the plants’ characteristics. I have attempted to approach each of these plants as a ‘whole’ entity; my question of these plants had been, not so much about how or why the plants behave in any particular way, but about what the plant is as a living being. I do not mean what the plant is in a classificatory sense, as, for example, when we say that a plant is a monocotyledon or a dicotyledon. The question I have been asking as to the what of the plant is an ontological question; what is the plant ‘in itself’? Without doubt such an endeavour is outside the domain of standard empirical science. My methodology, while being empirically based (that is, starting with exact descriptions of the plants), did not proceed by inductive or deductive processes but moved to a level which called into play intuitive perception so that the ‘formative principle’ or ‘theory’ may come to light. Finally, my theories found expression though a primarily artistic mode which would be unacceptable in conventional empirical science.

My contention is that, while my methodology and results cannot be equated with conventional scientific procedure, this does not necessarily mean that there is a conflict of interests. To illuminate the relationship between the two approaches it is useful to refer to Adolf Portmann’s analogy of the ‘drama’ (1987:139). Conventional
science, he suggests, operates 'behind the stage', analysing the mechanisms of how a thing works, "the technical underpinnings that make a performance possible". In the case of the flowering plant, the latter kind of investigation provides knowledge on the factors of seed germination, soil requirements, plant anatomy and physiology, the functions of flowers, the mechanisms of pollination and sexual reproduction and so forth. The complementary form of investigation sees the plant from 'before the stage', where the experimenter is a participant or empathetic observer in the life-process. The 'before the stage' perspective, Portmann's shows, is Goethe's participatory way of understanding of the plant. He suggests that the two approaches are complementary (1987:139):

In contemporary scientific research the work behind the stage has developed in a powerful and extremely specialised way. For many, it represents true research, the actual goal . . . That which I experience before the stage is not 'more correct' than that which the physiologist, the microbiologist, the molecular biologist fathom in his or her study behind the stage of life. Research proceeding from each of the two starting-points had meaning; each way of seeing has a different significance, a different propriety.

What Portmann is speaking out against is a science which is one-sided, which takes its position as the only position worthy of bearing the name 'science' and 'truth' (and here his view corresponds to the thrust of Goethe's own criticisms of science). Where there is no ontological appreciation of natural entities, as beings unto themselves and not just objects to be classified and explained, there arises the possibility of a disastrous gulf opening between ourselves and nature. Portmann writes (1987:144-145):

The accelerated development of biological research in the direction of genetic engineering, that investigates the visible realm in order to achieve mastery over the processes of nature — this unavoidable development will result in a horrifying impoverishedness of our relationship to nature if we do not begin immediately to take to heart the value of an extensive experience with living form for the cultivation of the soul. New forms of science of nature are called for, a science of nature which is not a pale reflection of today's science, but rather leads to a deepening experience with the realm of living forms and makes nature for us a true home.

Portmann's suggestion that these two forms of science are complementary is good as far as it goes. However, it does raise further issues as to the exact nature of this relationship. One of the most important of these has to do with the question of
evaluation. With respect to classical, analytical science, the matter of evaluation is relatively straightforward. There is a tried and tested methodology available, a procedure of hypothesis presentation, experimental testing and theory formation. Evaluation of such science is based on the coherence of the experimental procedure, the accuracy of the observations and the logic of the theory. It should be a procedure which another researcher can repeat and confirm or refute. However, when it comes to the experiential, ‘before the stage’ approach, the matter of evaluation is less clear, especially as it involves artistic expression as has my own experimental method. The two ‘sciences’ (considering the Goethean qualitative approach as a phenomenological science) may be said to be complementary, but the question remains as to how to evaluate their relationship.

David Seamon discusses the question of validity of qualitative, phenomenological approaches in terms of “intersubjective corroboration”. He writes (1982:122):

The positivist interest in explanation leads to a certitude grounded in the demonstration of cause and effect relationships identified by logical and mathematical techniques which locate degrees of association. In contrast, a major phenomenological criterion for validity is intersubjective corroboration; do I find in my own life-situation and experience what other phenomenologists have found? The aim is not explanation but understanding: the coming to see more thoroughly and respectfully the essential nature of the thing and the context in which it finds itself.

This, I suggest, is a way of evaluating my own experimental work with these four native Australian plants in relation to research done into the same species according to analytical, ‘behind the stage’ scientific procedures.

This leads to the question of the usefulness of my results. The practical value of the conventional botanical approach is not difficult to see; explanatory knowledge of a plant such as its growth characteristics, its relationships with other organisms like pollinators and so forth, has immediate applications in horticulture, for example. However, when we speak of the aim of phenomenological research as being understanding, it is more difficult to see how this can have a practical outcome and a social benefit. Understanding, after all, can remain a purely personal affair, the ‘cultivation of the soul’ as Portmann puts it. However, Portmann is actually
indicating that such a cultivation of one’s inner faculties is necessary if our relationship to nature is not to become impoverished. Seamon, following from Heidegger, speaks of the need for a ‘respectful’ approach to things, an approach which does not force living phenomena into “arbitrary cerebral constructs.” Certainly these statements are in harmony with Goethe’s own desire not to ‘torture’ nature by making it fit pre-determined categories.

I see the results of my research into these plants as being in every way preliminary. They are not only preliminary investigations of these particular plants, they are preliminary as regards research, using a Goethean methodology, into Australian flora altogether. No other published work on Australian plants, using a comparable methodology, has to my knowledge been published. There is, however, one work which should be mentioned here, a study of *Banksia menziessii* by Philippa Nikulinsky (1992). Nikulinsky does not follow an explicitly Goethean methodology. She begins her work with a quotation from Goethe but the connection with Goethe otherwise remains implicit. However, her research is easily comparable to my own methodology in Stage 2 where I looked at growth processes, or, in other words, the time dimension of plant form. Her text primarily consists of a series of drawings which illustrate the ‘moments’ in the metamorphosis of the banksia, from the stage just prior to floral formation through flower production, to the formation of the fruit and seeds. Accompanying the illustrations are short pieces of text which capture, in a somewhat poetic way, her participatory experience of these ‘moments’. She writes at one point (1992:31):

> Just a lot of dead and dying flowers? Each of the pollinated flowers is the source of incredible potential — new seeds, which in their turn can become new life. Looking at this stage of the banksia’s cycle, for me there is a sense of growing suspense, of anticipation.

And later (1992:42):

> At this stage I am holding my breath ... The swollen follicles are full of tension, they appear about to burst.

I drew on Nikulinsky’s work in my own research into another species of banksia, *Banksia integrifolia.*
Turning now to the implications arising out my work on these plants for the broader meanings of creativity: in Chapter III I discussed Goethe’s understanding of the creative dimension of knowledge in relation to the Social Ecology of Murray Bookchin. Here I referred to Bookchin’s explication of the need for human beings (second nature) to find ways of ‘creatively intervening’ in non-human nature (first nature), ways that are ‘symbiotic, nonexploitative and ecologically guided’. Bookchin, as I discussed, sees this task as a human potentiality and responsibility which accrues from the fact that we ourselves evolved out of ‘first nature’ and are ‘the self-reflexive voice of nature’. I proposed that Goethe’s form of ‘nature study’ represents a ‘new ecological discipline’ which is capable of meeting Bookchin’s challenge, that it potentially fulfils the necessary ‘conditions of wholeness’. Goethe’s approach, I explained, is essentially integral rather than integrative; it does not merely attempt to synthesise art and science but works ‘out of the whole’, out of the essential unity of the two. Human creativity (which here includes productivity and technology of all kinds) is ‘just’ or harmonious (at least potentially) when it derives from an approach which is integral or whole. This was the ancient meaning of art as technē.

I carried out my experimental work on these plants with the aim of practising a form of creative investigation which is ‘whole’ and thus ecologically responsible. However I can make no claim as to the degree with which I have succeeded in this; again, I have not set out to prove anything about these plants, nor about the efficacy of the Goethean methodology. If my findings can to some extent be corroborated in the work of others, then outward benefits of my work may be established. When I embarked upon these investigations I had to leave behind theoretical notions such as ‘the self-reflexive voice of nature’, ‘symbiosis’, ‘ethical’, and simply work with these plants, participate in their living natures, become more intimate with them, let them ‘speak’ through my creative expression. My findings will have to speak for themselves.

I do, nevertheless, wish to allow myself the opportunity to make certain speculations as to where my work on these plants may lead in the future. Apart from more studies on particular species of Australian flora and fauna using a
Goethean methodology, it could also serve as the basis and stimulus for more 'expanded' creative projects. These could include studies of whole environments, both non-human and human. Importantly, it may include research leading to situations where humans need to 'creatively intervene' in non-human nature in some way, by architectural or landscape design, farming, or technological development in any form. Some more 'expanded' creative projects have taken place in other parts of the world, and in section 3 of this conclusion I report on several of these in order to indicate possible directions creative research could take in Australia.

2. Goethean phenomenology, morphogenesis and dynamic morphology

There is a whole field of contemporary science which bears a direct relationship to the work of Goethe and goes under the names of 'morphogenesis' or 'dynamic morphology'. As Sinnott notes (1960:1-3) it was Goethe who first used the word morphology to describe the descriptive study of organic form and the German biologist Ernst Haeckel who first used the cognate form Morphogenie in 1959 to describe the study of the origins of form. According to Sinnott (1960:3) morphogenesis means both the description of the changes in plant form and the experimental examination of how those changes come about (which may include external factors such as light and water, and internal factors such as growth substances and genetics).

There are different levels in which the field of morphogenesis has evolved. The biologist Ludwig von Bertalanffy is mainly known for bringing systems theory into the realm of biological science (Bertalanffy, 1968). His concern has been to take the descriptive science of morphogenesis to a deeper level, "to an explanation of wholeness and form by their resolution into dynamics and dynamical laws" (1951:82). Bertalanffy acknowledged his own biological approach as "an offspring of Goethe's conception of nature" (Bertalanffy, 1951:82). More recent workers in the field of plant morphogenesis are Mae-Wan Ho and Brian Goodwin. Mae-Wan Ho (1988:118) describes her area of concern as being 'integration and process' in living.
form and refers back to ‘the poet-scientist Goethe’ as one of the founding fathers of her discipline. She is reaching towards a more dynamic understanding of plant structure and speaks in a way which distinctly reminds one of Goethe’s own way of speaking:

Living organisation is dynamic and fluid down to the organism’s genome. Surely, there is a lesson here for us; unless we too are intellectually supple, we shall never really come to grips with nature. (Ho & Fox, 1988:15)

Brian Goodwin (1988:161) writes that the contemporary study of morphogenesis “addresses the problem of biological form: what processes underlie the generation of the remarkable diversity of organismic forms? Are there generative principles whereby this diversity can be understood as an intelligible unity?” Goodwin is seeking for a science of biological form which unifies heredity and morphogenesis, a science “that has been remarkably elusive since Goethe introduced the term morphology into biology in the late eighteenth century and indicated how this could be achieved in terms of transformation, or metamorphosis” (Goodwin, 1988:161).

Another prominent scientist working in the area of plant morphogenesis is Rolf Sattler. Sattler, like Ho, is calling for “a more dynamic plant morphology” (Sattler, 1990:303). Sattler is interested in the relationship of the three ‘classical’ structures in plant development — roots, stems and leaves. The science he calls ‘process morphology’ recognises that structure is never static, that structure (or form) must be seen as a spatio-temporal process. Consequently the distinct boundaries between these three ‘classical’ structures may be blurred, for in different plant species one is often modified into another. In his discussion of ‘process morphology’ (1986:103) Sattler refers to Goethe’s realisation that all the structures of a plant are homologous; that is, are essentially the same. Goethe, according to Sattler, is a forerunner of contemporary ‘process morphology’ in that he recognised the different organs of a plant as being transformations of one another.

I do not intend to enter deeply into the technical and theoretical aspects of dynamic or process morphology. However, to the extent that I have built my study upon a methodology relating to Goethe’s scientific approach, a contemporary field of science which accepts Goethe as a ‘founding father’ is obviously of relevance. In a
general sense my own study has something in common with this contemporary form of biology, namely, my attempt to understand the structure of the plants I was studying in dynamic terms. More specifically, Bertalanffy speaks of seeking the 'dynamic laws' and Goodwin the 'principles of formation' of plant form. I would suggest that these terms could also describe my own aims in investigating these plants. Whether the way I go about understanding these principles is the same as these scientists is another matter.

My question here is: while Goethe is acknowledged by these scientists for his emphasis on process in the study of organisms, to what extent are the actual methods he used given value in the new science of morphogenesis or dynamic morphology? It would appear that the answer to this is — not very much. The pre-Socratic philosopher, Heraclitus, who said "everything flows", is also regarded as an originator of the 'dynamic perspective' in science. To some extent it is similar with Goethe; while his principle statements regarding metamorphosis have been remembered, the means whereby he came to his insights have long been brushed aside in the sweep of modern theoretical science.

One does not see evidence that Goethe's phenomenological method has had much impact in the new science of morphogenesis I am discussing here, and it is not very hard to see why. Goethe's approach, proceeding as it does from a level of empirical description to intuitive or artistic perception of the 'archetypal plant', is still at odds with science, even this more radical, 'process-orientated' kind. Bertalanffy's model of dynamic organic systems, for example, is highly theoretical in nature. Sattler (1992) makes use of mathematical operations such as multivariate analysis to test his hypothesis that there are no hard boundaries between roots, leaf and stems. Out of the recognition that structure is process, he argues that our descriptive language of plants should be modified. For example, he suggests that, rather than speak in terms of a static concept such as size, we should speak of 'growth rate' or 'growth duration' (Sattler,1990:306). The problem, for Sattler, is theoretical and linguistic. My intention is not to assess the relative merit of any of these approaches, only to point out that Goethe's phenomenological method is not used at any stage.
The reason for this may be further clarified if we explore what lies at the heart of this contemporary need to find a more dynamic understanding of plants. It comes down to a basic question of the nature of life itself, which of course was of great interest to Goethe. The biological sciences are concerned with living beings; yet, as Sattler points out (1986:216):

For a long time the exactness, simplicity, generality and predictiveness of classical mechanics have been an ideal for many biologists. Consequently they have tried to model biological theory after it, i.e., to explain life in terms of classical mechanics. Thus, living systems are simply viewed as matter in motion obeying the laws of classical mechanics.

The morphogenetic approaches mentioned above are the outcome of the work of those who have been attempting, in recent times, to forge a true life science, using conceptions appropriate to phenomena under study which are alive. Still, Sattler explains, the ongoing problem in the life sciences is to find an adequate definition of life; most definitions, he says, tend to leave out what cannot be conceptualised but only experienced intuitively. He writes (1986:233):

Feeling life may reveal just as much of life as thinking about it and analysing it scientifically. In fact, feeling may reveal more about life than thinking. Some would go further and claim that feeling (or intuition) alone reveals life as it is, and thus answers the question: ‘what is life?’

Sattler goes on to point out that the mystical experience may be the only one which is capable of experiencing life as such, beyond the dichotomies and categories of discursive thought to a vision of life’s oneness. However, as he says, conventional scientific methodology does not allow for such intuitive insight (although he regards present-day ecology as a science providing a more unified, dynamic approach).

It is in connection with Sattler’s point about the limitations of conventional scientific methodology that the value of a Goethean phenomenological methodology can be assessed. Certainly Goethe had a dynamic perspective on the organism; what distinguishes his view from that of the contemporary life sciences is that he considered life as such could only be apprehended (and even then, not in any absolute sense) if one’s ‘organs’ of aesthetic cognition are cultivated through the experimental process. His phenomenological approach is integral; it relates the
conceptual and the intuitive, the scientific and the artistic. We do not come up against the barriers which are described by Sattler. As Sattler observes, the question ‘what is life?’, which stands at the centre of the contemporary life sciences, cannot be adequately addressed in terms of a definition, a theoretical structure. Goethe recognised that the ‘external’ facts of empirical, conceptual thought, when ‘distilled’ by the ‘inner’ organs of aesthetic or intuitive perception, give rise to a ‘knowing’ which is creative, which is a form of experience rather than an abstract knowledge. It is some of the potentialities of this creative dimension of his phenomenological methodology which I explore in the next section.

3. Wider applications of Goethean phenomenology

In Chapter III.D. I spoke of Goethe’s approach to ‘nature study’ as ‘a new ecological discipline’ and suggested that it is a way of fulfilling a vital need in our time — to discover the ethical dimension of creative activity (creativity meaning human productivity in general). I showed that, implicit in the traditional meaning of art or techné was the notion of responsibility, that a genuine techné guards things, cares for them in the act of producing them. I worked with four plants in order to put this discipline into practise; I now wish to point to applications of the Goethean approach.

(a) Responsible landscape research and design

Ways of researching and working with landscapes using a Goethean approach have been described by Jochen Bockemühl in his *Dying Forests: a crisis in consciousness* (1986). This book is about the disastrous environmental situation currently of great concern in Europe. Bockemühl’s studies of different environments, as presented in this book, take a substantially pictorial form. His paintings include images of landscapes almost destroyed by human intervention, as well as more or less healthy landscapes which have been ‘co-created’ by human beings, often with animals and birds present. The accompanying text outlines the Goethean phenomenological approach he used (which is the approach related to the four elements which I outlined in Chapter V). Bockemühl makes it clear that morphological studies of
individual plants and studies of whole environments have one and the same aim (1986:7): “to encourage the development of an enhanced sensitivity to the creative as well as the destructive forces at work in the natural and human world”.

In the course of this thesis I have established that what Goethe meant by the ‘theory’ can also be called the ‘creative principle’ or ‘idea’ of an organism. In Dying Forests Bockemühl discusses the ‘idea’ of a whole environment seen as an ‘organism’, its ‘inner unity’, “which is mirrored in human consciousness and is more or less intentionally transformed by human aims” (1986:85). The ‘idea’ of the ‘whole’ environment is reflected in the form of all the ‘parts’ — the plants, birds and animals. What takes physical form in the flora and fauna can become ‘idea’ in the human consciousness. The grasping of this ‘life-context’ or ‘idea’ requires the development of an imaginative or pictorial consciousness (the same as I have been referring to as ‘aesthetic cognition’ in previous chapters). Bockemühl discusses how this ‘idea’ is all too easily mistaken for a subjective mental picture imposed on a landscape; as opposed to this interpretation he goes on to explain what he means by the ‘idea’ of a landscape as an “effective reality at work in the outer world” (1986:86).

Regarding the potentiality of a Goethean methodology to allow a researcher to come to an experience of this ‘inner unity’, he writes (1986:82):

Responsibility can ... only arise where one is able to find a connection to a totality which can be surveyed and comprehended in all its aspects.

The responsibly he is talking about has do with participating with one’s thinking with the reality of the landscape and creatively working from out of that inner connection. Bockemühl writes (1986:68):

A balanced and healthy relationship can only be fostered where the individual is able to enter into a dialogue with the spiritual forces at work in nature, and to make this the basis of his actions. This will obviously need to include the choice of appropriate forms of technology. Vigilance will be needed to assure that this takes place in freedom and not under the influence of social or technical constraints ... Where man so collaborates with nature that its qualities and forces are allowed to develop, beautiful landscapes come about.

While the central subject of Bockemühl’s book is the problem of the dying forests, he uses this as an entrance into a discussion of more fundamental problems of
humanity’s relationship to nature. This ‘collaboration’ is creative in the most
general sense; Bockemühl refers to new forms of farming and technology, new social
forms, the disposal of waste, ecological education, landscape design, even just the
action of planting a single tree.

At least in general terms, Bockemühl’s approach is what is advocated in Ian
McHarg’s _Design with Nature_ (1971) where he writes:

> We need nature as much in the city as in the countryside. In order to endure
we must maintain the bounty of that great cornucopia which is our
inheritance . . . We need, not only a better view of man and nature, but a
working method by which the least of us can ensure that the product of his
works is not more despoliation.

However when it comes to McHarg’s proposed methodology we find little in
common with the Goethean phenomenological method employed by Bockemühl.
As a landscape architect and city planner, McHarg sets about developing an ecological
method for development of all kinds, in which many different values are taken into
account. These include geographical values such as soil type and susceptibility to
erosion, and social values such as recreational values, residential values, forest
values, wildlife values, and historical values. His method involves ranking all these
and superimposing them in map form in order to provide a visual image of the
situations most suitable for development.

(b) Architectural design: an example of a Goethean approach

The idea that architecture should be responsive to its environmental context is
nothing new in architecture and has been especially emphasised by the so-called
‘organic’ movement of recent architectural thought. Quite standard in architectural
thinking is the notion of ‘spirit of place’ or _genius loci_, meaning the unique
character or ‘spirit’ which is experienced in a particular environment and which
may be reflected in the building design. The ‘organic’ approach has worked against
the functionalist tendency of modern architecture which seeks to provide just for
the basic necessities such as shelter, light, living space and access. A kit home, for
example, may be erected on any site which is suitably cleared; its design and location
does not have anything to do with the unique character of the site except perhaps for its physical features which may impose certain limitations. Of course, while many socio-economic factors are recognised as connected to these issues, it is widely perceived that the modern design of cities has led to a sprawling ugliness which has destroyed nature in its path.

The Goethean approach I have used has applications in the development of new forms of organic design. In an unpublished paper by Margaret Colquhoun and Christopher Day (Study and development of place: an exercise in the use of Goethean science as a tool for environmental planning, 1992) the design process for an educational centre in rural Scotland is described in detail. Their way of working was exactly paralleled by my more focused study of the four plants. Margaret Colquhoun, a biologist, and Christopher Day, an architect, together with a group of interested people, undertook a collective research and design process on a piece of run-down land which had been worked for many centuries. It is a varied site with many diverse habitats including bare hilltop, open marsh, wooded valley, plantations and streams.

The research began with the exercise of becoming open to the ‘first impression’:

We walk, in silence, round the whole place. This takes two hours or more. Each person tries to become as open and aware as possible, to look, listen, feel and generally open his or her soul to this first encounter — both with the place as a whole and with the differentiated areas and their boundaries within the whole. Afterwards we record our experiences from memory in whatever way seems appropriate. For some people colour is the most appropriate tool. The colours used represent the inner mood of the place and may or may not be the same as the outer physical colours. (p.3)

The next stage (Stage one, which I called ‘The Physical — EARTH’) consisted of recording of all possible information derived from sensory experience:

General facts are shared such as height above sea level, aspects of slopes, orientation in the points of the compass, prevailing wind direction, rainfall, soil types, underlying geology and such essential basic information. At this stage it is also useful to make a map . . . the aim is to collect as many physical phenomena, details and facts as possible in the time available by measuring the area (in paces), charting trees, shrubs, rocks, artefacts, noting species, size, colours, forms and so on. We also draw the place from without and from within looking out, record sounds, smells, temperatures — anything we can
experience with our senses. Records are in the form of diagrams, lists, annotated and coloured sketches. (pp.4-5)

As part of this process each person located a place within the total environment which they were particularly drawn to, and focussed their research there, although always in relationship to other sub-places and to the environment as a whole.

In the next stage (Stage two which I called ‘Time — WATER’) this group attempted to come to an apprehension of the metamorphic processes working in this landscape as a whole (just as I did with the forms of the individual plants). Day and Colquhoun write:

The next step is to study the time processes of the place. How has [this environment] come to be what it is today? While the formative processes of geological and ancient time can only be guessed at, more recent evidence such as ordered lines of trees and stumps, old bridges, marks of tracks or fences, droppings of grazing animals and history recorded in the shapes of trees or landforms and downwind spread of plant species give firmer evidence in a variety of time spans. Consultation of old maps can often confirm findings read in ancient tree stumps or the residual flora of an erstwhile wood . . .

Once each person has reconstructed as much of the history of his or her place as possible we try to build imaginative pictures by living within the stream of time of both our separate places and of [the environment] as a whole . . . Slowly the whole place starts to become alive in its ‘becoming’ . . . slowly a sense begins to emerge of what is ‘right’ for the place and what not. (p.5)

In the next phase (my ‘Phase three — Gesture — AIR’) Colquhoun and Day describe how the group attempts, through what they had already learned, to ‘listen in’ to the ‘inner mood’ or ‘soul expression’ of the place and how this is reflected in gestures of the land forms. People here worked with poetry, music or painting:

At this stage we might experience an extraordinary purging of our personal feelings, wishes or desires and, when freed from these, the most profound experiences can be ‘inspired’. We approach the ‘Spirit of the Place’ and, given space and a listening ear, it will speak within us. Many people can only express something of this in music or poetry or another art form.

Sharing experiences at this point the strongest impressions of all were polarities. Polarities between shelter and exposure, between valley bottom and hill top, between being embraced by the hills in the south and open to the wide expanses of the north, of being held and cherished but at the same time being able to look out, of being abused but still maintaining the life forces to react and respond in a healing way. (p.7)
As reported in their paper, the last phase (my phase four 'Creative potency — FIRE') was actually the beginning of the second half of the process when they started to focus on the potential forms of the buildings. The 'Spirit of Place' in its multiform gestures became the source of a new creative action:

Having glimpsed the Genius Loci with respect to the past coming into the present and perhaps a little of the future possibility we now have to look at our human aims, endeavours, aspirations and ideas; to examine them rigorously to see a) if they are at all appropriate to marry with this place and b) if they are, which aspects fit where and how.

The 'human aims' of this group were the creation of a number of buildings for a research and educational centre. These were to include a social centre, guest accommodation, a study centre and a painting studio. The requirements of each building were looked at separately, and identified in the first place as expressive of a particular mood (which was represented using different colours). These were matched with the 'mood maps' which had already been created for the whole environment and a location for each building was decided upon if the building 'mood' corresponded to a particular 'mood' in the environment. Further design work was then carried out at each particular site, with posts and strings to orientate and define the buildings, and sketches were made to define details such as materials, shapes, windows, doors and pathways. Clay models were constructed which brought up questions of internal organisation and volume. This shared process moved slowly to the point where the whole design formed itself in the imagination of those involved and a development plan for construction was sketched out. Day and Colquhoun report a remarkable agreement with regard to details of the design between those who went through the whole process together.

Thereby a place would slowly come into being which is at one and the same time an object of research and sensitive listening growth; where the learning, practice and teaching of a modern wholistic scientific study of the past can lead to a transformation and healing of the creative deeds of all those who are involved in building its future.

Whether a process involving a group of people, as described in this paper, is possible or practicable in every design situation is not relevant here. In principle, there is no reason why such a procedure could not be carried out in many other areas of architectural and landscape design.
(c) Goethean environmental education

Bockemühl speaks about the need to develop an enhanced sensitivity to the creative as well as destructive forces at work in the environment, a need for a path of knowledge which can lead to an understanding of 'inner unity' or 'idea' of environments. This is a call for new forms of education to meet such needs. Environmental education has a rapidly growing significance in curriculums at all levels of education. Here I will not expand upon this, but Appendix B comprises an essay of mine on the subject of a Goethean approach to environmental education [published in the *Australian Journal of Environmental Education*, 1994]. The main points I made in this essay are as follows. There is currently a growing school of thought which wishes to apply 'constructivist' ideas to environmental education. This is the view that knowledge is merely a human construction, a matter of 'selected fictions'; it is a relativist philosophy which I claim is actually a new form of nihilism. I present Goethe's phenomenology (supported by the ideas of Martin Heidegger) as a way beyond constructivism and as means of an authentic return 'to the things themselves' (the things of our environments). Goethean 'nature study' is, I suggest, a form of 'natural hermeneutics' or way of 'reading' the landscape through a participatory consciousness. I present a preliminary outline of a Goethean environmental education under four headings: human creativity in partnership with Nature (which I have been discussing above); experiential learning, which involves a participatory mode of knowing things; the whole and the parts, or, in other words, the meaning of Goethean phenomenology as a form of holistic research; and the role of the teacher where I point out the similarities between a Goethean environmental education and a conventional arts education.

4. The meaning of 'responsible' knowledge in the context of contemporary environmental issues

In the introduction to this thesis I asked the question: does Goethe's conception of the 'theory' (and his associated scientific methods) have something of value to offer us today with respect to the contemporary debate about 'responsible knowledge'? The journey towards the answering of that question necessitated an excursion into
Goethe's world-view and the historical background to his notion of 'theory'. This was necessary because, as I have shown, his views are at variance with conventional and even some of the more radical notions of theory today. From the conventionally realist scientific point of view, theory is a human artefact but if it is 'true' it accurately corresponds to an actual reality. The more radical, relativist point of view maintains that, at least in its extreme position, a theory is only a human construction, that there is no 'truth' or objective reality to which it corresponds. Goethe, influenced by the 'organic' tradition of knowledge, understood the 'theory' as the formative 'idea' of the phenomenon, its living essence, which is not merely factually known but in which a 'living' thinking participates. He wished his thinking and knowing to do justice to the living nature of the thing he was studying. In the above sections of this concluding chapter I have shown that Goethe's method of studying nature (or, at least, a methodology derived from Goethe's approach), which has as a primary goal a desire to be responsible for the thing being studied by letting it appear and 'speak' on its own terms, has important implications for us today. Goethe's insight that, for a science of life to be authentic, it must develop a 'living' form of cognition, is not only relevant to science today, but many fields of creative endeavour such as environmental design.

One of the outcomes of my exploration of Goethe's world-view and the 'organic' tradition has been the realisation that, while the idea of caring for and being responsible for nature may sound like a late twentieth century environmental exigency, it is in fact an ancient concern. Those within the 'organic' tradition have always regarded nature as in some way sacred, as worthy of the greatest reverence and respect, as something infinitely creative and inviolable. Inasmuch as we humans are part of nature we have a particular place and responsibility within it; that was the thought which impelled Goethe in his quest for a form of scientific research which was in harmony with these ideals and insights. But before him, it could be said that individuals such as Spinoza, Bruno and Plato were searching for something similar, for a way of understanding nature which at the same time cultivated a thinking able to encompass universal perspectives and which would have a beneficial effect on the whole of nature and human society. It would appear, from the amount of material being published about it, that Goethe's contribution to
this tradition has special relevance for us today. This, I suggested, is because he proposed a basis for a qualititative methodology, an integral phenomenological approach of a most practical kind which embraces both science and art, an ethical mode of creativity which provides the basis for a new form of ecological discipline.

What would appear to be as true today as it was in Goethe’s time is that, beyond all the theorising that goes on within science and art, there remains the need for individuals to be able to cultivate new ‘organs’ of perception, to develop the capacity for ‘delicate empiricism’, which Goethe believed belonged to an enlightened age (not his own and presumably not ours). There is no reason to believe that, just because two centuries have gone by, the difficulty of achieving such a ‘delicate empiricism’ will have lessened. It is even possible to come to the conclusion that, with all the sophistication and multiformity of contemporary philosophy and theory, it is even harder than ever to find one’s way to a simple relationship with a phenomenon such as a plant, a relationship that does not involve ‘tortuous’ mechanical processes, advanced statistical methodologies and theories to come to the point where we can rightly speak of ‘knowledge’ and ‘truth’. For, even two centuries ago, Goethe felt compelled to write (Goethe, 1988:311):

To escape the endless profusion, fragmentation, and complication of modern science and recover the element of simplicity, we must always ask ourselves: What approach would Plato have taken to a nature which is both simple in essence and manifold in appearance?

I, too, have questioned the meaning of responsible knowledge in relation to contemporary ecological issues and I have found myself drawn back to the ideas of Goethe and the Naturphilosophie movement. Goethe was drawn back to the thinking of Plato. Plainly the notion of ‘responsible’ knowledge’ is nothing new; yet it has to be reformulated and worked with in each historical period in response to the unique conditions and circumstances of that period.41

---

41 Nisbet writes (1972:2): “The fundamental truths concerning nature — in so far as we can ever establish any fundamental truths at all — have long since been discovered, [Goethe] thinks, if only in an incomplete form, so that on a more profound level, the development of science can be visualised as a cyclic movement, towards and away from truth.” Goethe himself wrote: “The cycle through which mankind must pass... has... already completed its course more than once... In this way, all true opinions and all errors are repeated” (quoted in Nisbet, 1972:3)
Is our sense of responsibility for the environment deriving from our own awareness and creative freedom or is it deriving from more generalised social dictates? Bockemühl is exhorting us to ask such questions when, in the passage quoted above, he writes that vigilance is required so that our creative actions are not "under the influence of social or technical constraints". Of course, in research or creative situations, there are always 'human motives'; for example, in the environmental design process described above, there was the need to create buildings for human use. But then, even the need to find a non-human perspective (what Deep Ecologists call an 'ecocentric' orientation), a way of revealing a phenomenon in terms of itself, is a human motive! To quote Goethe again (1988:308):

In observing nature on a scale large or small, I have always asked: Who speaks here, the object or you?

Margaret Colquhoun and Christopher Day talk about the coming together of non-human nature and the requirements of human nature as a 'marriage'. That 'marriage' (like any genuine marriage) is bound to be healthy and enduring if it is enacted in freedom and without social constraint.

There is, today, a very strong social dictate which is moving us to 'save the environment', the urgency of which derives from the view that we have so altered the planet's ecosystems, so disturbed the natural order, that we are ourselves in danger of perishing. As a result science receives a very strong, socially dictated imperative — 'research and understand so that we may avert this danger'! Grange (1977) calls a 'dividend ecology' the environmental consciousness grounded in a sense of fear and economic threat. Such a 'dividend ecology' speaks of the need to preserve wilderness, fix the ozone layer, prevent pollution and so forth, as primary motivations behind research. Grange, drawing from Heidegger, also describes a 'foundational ecology', an approach grounded in the 'sparing and preserving' of things and inspired by a desire to care for and be responsible for things in and for themselves. He suggests that a 'dividend ecology', while apparently making great advances towards solving our problems, will ultimately fail because it does not arise out of an authentic and free relationship with nature. Goethe, as I have shown, was acutely aware of how impatient human aims interpose and distort any research
process. The same kind of distortion can take place due to the environmental imperatives of today. I suggest a Goethean methodology can be of value in our time in that it can help to cultivate a freedom and authenticity of approach and so provide the basis for a ‘foundational ecology’. While our environmental problems are real and our concerns quite legitimate, it would seem vital that we find our sense of responsibility in freedom. Then there is the possibility that our ‘voice’ and the ‘voice’ of nature can sound in accord.
BIBLIOGRAPHY


Chalmers, A.F. (1976), *What is this Thing Called Science*, University of Queensland Press, St. Lucia.


Fichte, J.G. (1956), *The Vocation of Man*, The Liberal Arts Press, N.Y.


King, R. (1950), 'Goethe and the challenge of science in western civilisation', Goethe on Human Creativeness and other Goethe Essays, (ed. by R. King), University of Georgia Press, Athens.


Langer, S. (1951), Philosophy in a New Key, Mentor, N.Y.

Lawrence, G.H.M. (1951), *Taxonomy of Vascular Plants*, Macmillan, N.Y.


Sattler, R. (1986), Biophilosophy, Springer-Verlag, N.Y.


APPENDIX A.

Goethean and Darwinian views of evolution.

In my discussion of Goethe’s principles of plant development (Chapter IV) and in my own experimental work with four Australian native plants (Chapter VI) I was concentrating by and large on individual plant phenomena. I was studying the morphological changes which take place in plants as they move through their cycle of growth and was reaching towards the ‘pure phenomenon’, ‘archetypal plant’ or ‘theory’; the formative principle by which the plant comes into being. However, in my concluding chapter (Chapter VII) I suggested that this way of studying individual plants has applications in a broader ecological context — in the study of whole environments or ecosystems. I wish here to provide some indications which might be furthered in such studies.

It seems to me that a good way to do this is to compare Goethe’s and Darwin’s ideas on evolution. Goethe lived just before the time when ‘ecology’ became a recognised scientific discipline. I have discussed his contribution to the development of ecology in Chapter II.A., noting in particular his connection to the German biologist Alexander von Humboldt who initiated ‘holistic’ studies of environments, investigating patterns of flora and fauna and relating them to environmental factors such as climate. Goethe himself carried out no such investigations and thus provides no model for our use. However, he did speculate on notions about evolution and the interrelatedness of organic life, and it is to these which I wish to draw attention here. They can serve as a guide for the contemporary adaptation of his methodology to broader ecological research.

In his essay Towards a General Comparative Theory (1988:53-56) Goethe expresses a number of ideas regarding evolution. This is by no means a systematic treatise but it does reveal the essence of his views on the subject. Goethe is concerned with the notion, current amongst the theistic thinking of his time, that organisms are ‘given’ or ‘created’ with certain features or characters so that they will be able to occupy a certain ‘place’ in the world. The example he gives is a fish; the latter view explains
the appendages on this creature by saying that they are there so that the fish can successfully exist in the water, or, as Goethe expresses it: "The fish exists for the water". Goethe does not believe this view recognises the true interrelationship of the fish and the water. He writes (1988:54):

The statement "The fish exists for the water" seems to me to say far less than "The fish exists in the water and by means of the water". The latter expresses more clearly what is obscured in the former; i.e., the existence of a creature we call "fish" is only possible under the conditions of an element we call "water", so that the creature not only exists in that element, but may also evolve there.

The same principle holds true for all other creatures. An initial and very general observation on the outer effect of what works from within and the inner effect of what works from without would therefore be as follows: the structure, in its final form, is, as it were, the inner nucleus moulded in various ways by the characteristics of the outer element.

Goethe goes on to talk about the 'mysterious architecture of the formative process' in terms of an internal and external interaction. He suggests that these observations point to a method of research which should yield far-reaching benefits for human understanding.

The question is (regarding Goethe's discussion of the relationship of an organism to its environment and specifically his contention that an organism is a product of an environment rather than being created for an environment): is this not the essence of what we would now call the Darwinian understanding of evolution, and thus nothing new at all for contemporary thinking? Certainly, if this were true, it could fairly be said that Goethe has nothing much to offer us in this regard, considering Darwin's systematic elaboration of his theory of evolution and vast amount of work done on it since. All the complexities of Darwin's theory I will not be entering into here: I will remain with the central points. As Worster (1977:156) shows, the bedrock idea on which the theory is built is that "all survival on earth is socially determined". Darwin considered Nature to be "a web of complex relations" from which no creature could live independently. Each organism's 'place' in this web is not fixed; there is constant competition for 'places' and it is the fittest which wins. Genetic variation in the offspring of organisms means that they may have characteristics which are more adapted to certain environmental conditions and thus win the competitive struggle. In this way the forms of life evolve. In other
words organisms are not made for environments; organisms are products of environments.

Is, then, the answer to my question, that Darwin’s theory is a highly developed version of Goethe’s view? Certainly we can say that Darwin was directly influenced by Goethe’s views. Worster (1977:127) notes that Darwin was “well tutored” by the Romantic nature philosophers. Brady (1987:270) establishes that Darwin had definitely read Goethe on the subject of morphology. Actually the precise way these ideas were transmitted between these individuals is not of great significance here. What is important, I suggest, is that while in one respect Goethe and Darwin offer the same point of view on evolution, in another respect their views are utterly opposed.

Darwin indeed saw that organisms are the products of environments, but his conception was mechanistic through and through. The mechanisms are genetic variation, competition and selection of the fittest. Environmental conditions ‘select’ the organism with the most suitable form for survival. There can be no question of ‘inner purpose’ (teleology) and ‘necessary form’ in his ecological model; organisms are the products of chance genetic variation and changing environmental conditions. The forces which determine the form are mechanical forces of the environment which cause it take one form or another.

Goethe, as stated above, also expressed the view that organisms are products of environments. But in the second part of his statement he talks about “the outer effect of what works from within and the inner effect of what works from without” and about organic form as “the inner nucleus moulded in various ways by the characteristics of the outer element”. It is here that we find what is profoundly different from Darwin’s mechanistic conception. For Goethe, an organism is not a result of chance happenings; it comes into being through an ‘inner’ intelligent or formative principle. This was also what he called the ‘archetype’ or ‘theory’ of the organism. For him this was not a matter of belief but of intuitive perception or participatory knowledge. As I have shown in Chapter IV.D. the ‘theory’ or ‘archetype’ is nothing formed or actualised; it is a ‘creative potency’. It has a definite potential (or telos) but this is moulded (or actualised) in different ways depending on
the external conditions. What he calls the 'inner nucleus' above cannot be equated with the genes of the organism; what is grasped through intuitive perception is not any particular physical part or organ but the 'whole' which is the principle of unity. The forces which determine the form are not mechanical but creative. Rudolf Steiner (1988:19) explains:

[Darwin's view] assumes that outer influences work upon the nature of an organism like mechanical causes and change it accordingly. For Goethe, the individual changes are the various expressions of the archetypal organism that has within itself the ability to take on manifold shapes and that, in any given case, takes on the shape most suited to the surrounding conditions in the outer world. These outer conditions merely bring it about that the inner formative forces come to manifestation in a particular way. These forces alone are the constitutive principle, the creative element in the plant.

Steiner finds that both ways of looking at evolution are complementary. He shows Goethe cannot be merely considered the forerunner of Darwin but that Darwin took an aspect of Goethe's thinking and developed it in a particular way.

These different ways of thinking lead to completely different ways of conducting environmental research. In the Darwinian approach, one makes observations of certain organisms (or patterns of organisms) in an environment and then seeks causal factors in the environment (for example, climate, heat, light, soil factors) which may be responsible for determining those forms or patterns. Using a Goethean approach one would certainly be cognisant of these environmental conditions. However, one would study the organism using a participatory approach (a Goethean phenomenological methodology such as I have used myself in Chapter VI). At the point where one intuitively moves 'from the whole to the parts', from the 'creative potency' into the actuality, one, in a sense, experiences the moulding effect of the external influences. Thus the unique character of an environment can be 'read' in its constituent organisms which create themselves within it.
APPENDIX B.

Applications of Goethe's form of 'nature study' to educational practice; an article by Nigel Hoffmann published in the *Australian Journal of Environmental Education*, Vol. 10, Sept., 1994:

**BEYOND CONSTRUCTIVISM: TOWARDS A GOETHEAN ENVIRONMENTAL EDUCATION**

**INTRODUCTION**

Environmental education is only at a developmental stage, having originated in response to the environmental problems which have been most pressingly felt in the last thirty years or so. There is a general concern that we do not unconsciously carry into our new philosophies and methodologies the very dysfunctions which led to our environmental problems in the first place. Consequently there has been a search for paradigms of knowledge and enquiry which are adequate for the new problems that we face, paradigms which recognise the essential interrelatedness of all forms of life and the fact that enquirers are themselves part of environments, not just external observers as it is considered in classical rationalist science. The philosophy and method of critical evaluation which goes by the name 'constructivism' declares itself to be a way which can lead us beyond the mistakes of earlier theories of knowledge. I will be contending that, rather than being a way beyond rationalism and positivism, the constructivist approach is entirely bound up with that which it seeks to criticise, even if it assumes a radical posture. Out of this critique of constructivism and by way of the ideas of the German philosophers Friedrich Nietzsche and Martin Heidegger and the scientific methods of the poet and 'nature-philosopher' Johann von Goethe, I will adumbrate an approach to a new form of environmental education which I believe can satisfy our concern that the problems of the past are not perpetuated in a new guise.
CONSTRUCTIVISM AND NIHILISM

The principal tenets of constructivism are traceable to the Kantian separation of the human subject and the unknowable ‘thing-in-itself’. Kant believed that the ‘truth’ of the external world cannot be ‘out there’ in the objects; he came to doubt that we can know anything about the world directly even though our thinking may ‘correspond’ to it in some way. Contemporary constructivism has furthered this way of thinking and has concluded that ‘knowledge’ is nothing but a human construction, that ‘existential reality’ is simply the stories we tell to each other to suit different purposes.

As Noel Gough (1991:32) writes, the modern schools of thought known as ‘structuralism’ and ‘poststructuralism’ are concerned with revealing the “constructedness” of the stories which make up our lives, the fact that they are determined by our perceptual and social activity. The perceptual, cognitive aspect is emphasised by others (for example Guba & Lincoln,1990; Maturana & Varela,1987) who see knowledge as a personal construction, arising out of our subjectivity and structured by our physical organisation.¹ I will be using the term ‘constructivism’ in a general sense, embracing both the personal and social dimensions of this philosophy. In other words, I am considering constructivism as the style of thinking which defines knowledge as a human creation.²

My criticism will not be directed towards discussion of the obvious relationship between knowledge and human subjects in historical contexts; only towards the reductionistic tendency of constructivist thought, the implication that knowledge is nothing but ‘a human construction’, nothing but ‘selected fictions’. These very terms betray the reductionistic character of this philosophy. For me this is reductionism in precisely the same sense as saying a person or a plant is nothing but a play of electrons and chemicals, only it makes the reduction at another level. Poststructuralists, for example, talk about human reality as nothing but a ‘play of signifiers’ (names). What appears absent in much constructivist thinking is an appreciation of the place and role of human cognition within the greater ‘whole’ which may be called Being, God, Nature, Tao or simply ‘life’.³
Noel Gough (1991) bases his proposal for a new direction in environmental education upon a poststructuralist thesis (that is, he emphasises the social aspect of the construction of knowledge). He finds that many of the 'fictions' which are associated with positivist science and transmitted through the education system are 'unsustainable' and destructive to the environment. Gough focuses in particular on the 'fiction' that the earth is an object of instrumental value, merely a resource to fulfil our needs, and on the Western 'myth' of progress. The method he conceives for an environmental education is based on the mutual construction of new 'fictions' which are sustainable. The 'fiction' he recommends most strongly is that the world is a related whole in which we are 'intractably involved'. He is inspired to make this suggestion through observation of modes of living in Aboriginal culture connected with the Dreaming. While all this at first glance appears most laudable I believe that Gough's proposal is hollow and unworthy to serve as a basis for an environmental education of the future.

In order to begin to justify this claim I would like to turn briefly to the beginnings of twentieth century culture, to the philosophy of Friedrich Nietzsche. It can readily be discerned how much constructivism has in common with Nietzsche's nihilism; indeed, it would seem that the terms 'constructivism' and 'nihilism' are quite interchangeable. Nietzsche accepted Kant's idea that things are unknowable 'in themselves' and arrived at the conclusion that reality is merely a composition of 'human perspectives'. In his Will to Power he wrote:

The subject alone is demonstrable; hypothesis that only subjects exist — that 'object' is only a kind of effect produced by a subject upon a subject — a modus of the subject. (1967:307)

There exists neither 'spirit', nor reason, nor thinking, nor consciousness, nor soul, nor will, nor truth: all are fictions that are of no use. (1967:266)

Nietzsche believed that, beyond the fictions of the human animal there is — nothing. He courageously took these ideas to their logical conclusion and was eventually forced to recognise something that David Hume had glimpsed a century before him; with the dissolution of the 'objective' world the 'self' is also
threatened with annihilation — for might not the ‘self’ be just another fiction (Reinhardt, 1960:108)?

Nietzsche’s ideas, explosive and visionary by nature, were absorbed first into the underground of Western culture. Everywhere in the avant-garde art and philosophy of the first part of this century there is evidence of an ‘existential encounter’ with the ‘nothingness’. And almost a century after Nietzsche’s time such ideas become the basis for ‘innovative’ university courses and educational methods under new appellations such as ‘constructivism’ and ‘poststructuralism’ — now, however, with a much more friendly face and in a more palatable form. But this is pure nihilism; beneath the surface it is nihilism almost precisely as Nietzsche had conceived it. The point is that ‘reality as fiction’ is not an innovative, postmodern notion at all; it has been a significant formative idea within Western culture since at least the turn of last century and its roots go back much further. ‘Modernism’ could in one sense be defined as the attempt to come to terms with the nihilistic vision of the world.

Nietzsche encountered an abyss at the heart of Western culture. He rationalised that since he was no longer bound to any laws of nature or ‘truths’, these being only human fictions, he was absolutely free to make his own ‘truths’. Since reality has no ‘real’ existence and thus provides no criteria for decision and action, he came to think that the necessity for human survival, the self-determined ‘will to power’, was all that was left in the face of the ‘nothingness’. As Kurt Reinhardt (1960:110) has summarised it:

A aware of the fact that the so-called objective world harbours no objective values (the strongest ones) will then feel free to engage creatively in value projects of their own making, and in this way they will eventually learn how to dominate the world.

Where there are no ‘true’ points of reference beyond oneself, the only responsibility can be to oneself, to the fulfilment of one’s own needs. For Nietzsche, the educating of strong, courageous and ‘creative’ individuals becomes the raison d’être and most important goal of human society. Nietzsche’s
programme is now being carried out, apparently unwittingly by some, under the banner of constructivism and articulated in such statements as the following:

What matters is not that these truths, these stories, match some reality, but that they work, that they serve their purpose — although often this purpose does not precede the story, but the story generates its role and purpose. (Second of January Group, 1986:23)

We have proposed a shift in ontology and epistemology that places humans at the centre of the enquiry process and defines them not simply as discoverers or receivers of knowledge but as its creators. (Guba & Lincoln, 1990:152)

If humanity is to survive, we must recognise that there is no outside from which to speak or act; we must gain a new normative matrix for the conception and production of the world. Survival is the one universal value that transcends the proclamation of difference. (Fry & Willis, 1989:231)

There is something extraordinarily alluring about this talk of absolute creative freedom, expressed in the catch phrase; "The rationalists have only interpreted the world; the point is to invent it" (Second of January Group, 1986:31). The modern arts have long since travelled down this path. The main danger, as I see it, as the 'new wave' of nihilism enters the environmental sciences, is that of self-contradiction. The exponents of constructivism proclaim it as innovative, anti-conservative, as a paradigm of enquiry most suited to address our environmental problems. But how can one say in the same breath that "the objects, elements and meanings that constitute our 'existential reality' are social constructions" and also that there is a "global environmental crisis" (Gough, 1991:32-4)? How do we know that there is such a crisis; perhaps that too is just a fiction? Moreover there can be no real motivation for remedial action if we suspect that this crisis may be merely fictitious. And is it valid to make assertions about "human interdependence" with nature (Gough, 1991:36) unless it can be shown in what way such a statement is 'true'? For the constructivist the only thing that can be safely assumed about the idea of the 'interdependence of life' is that it is a fiction, albeit a very strong and useful one at a time when human survival appears to be in doubt. Constructivism cannot ever provide any 'real' criteria for improving the world, for protecting the environment. This gets to the heart of the matter — nihilistic 'freedom' necessarily revolves around our needs, our stories. What can I ever
'know' about the needs and potentialities of plants, rocks and animals? Even the seemingly indisputable notion of 'sustainability' appears as just another fiction which is going to prove useful for our continuation (and potential domination of the planet?)

The methodology of constructivism harbours related problems and pitfalls. This methodology has been described as having two aspects: hermeneutics and dialectics (Guba & Lincoln, 1990:146). The hermeneutic aspect consists of depicting and critically examining one's beliefs and assumptions (constructions) in any given social context. Another word often used here is 'reflexivity'. Thus far the process could be compared to Heidegger's deconstructionism, the meditative process of reflection upon and bringing into question the fundamental structures of one's thinking. The constructivist now engages in a dialectic process with others in a particular group, in order to collectively fashion a new construction which has a much consensus as possible and meets a particular need. But this is easier said than done, for there is no longer any such thing as 'truth' to guide one, only tenuous notions such as whether one construction is "more sophisticated" than another (Guba & Lincoln, 1990:147). Even if a momentary consensus is reached it can be immediately broken again in the reflexive process; there is never a 'true' position from which to act and one is suspended in an infinite regression of self-analysis. In this self-referential, fictional world no cognitive contact can ever really be made with entities in the environment; there is only the endless interplay of human stories. Within constructivist methodology there lurks Nietzsche's abyss. However, the danger is not so much the abyss as the fact that it is not recognised. Heidegger's insight into nihilism was that, while the deconstruction process opens up the mind to its own structures, it is the recognition and experience of the abyss which may be the occasion of a 'turning', an entering into a more 'essential thinking' or openness to the being of entities (Zimmerman, 1990:220).

Constructivism, as a 'celebration' of subjectivity (Guba & Lincoln, 1990:146), tries to found a methodology upon a nihilistic philosophy when in fact nihilism by its very nature can provide no such foundation.
"TO THE THINGS THEMSELVES" — AN ORGANIC CONCEPTION OF KNOWLEDGE

We come to the brink of the abyss — it is on all sides, it is within — there is nothing that can logically be done to resolve the situation. However if the abyss is faced directly it appears that a different kind of response is called for; Martin Heidegger (1969:32) has spoken of what is required as a 'leap' and 'letting go':

The spring leaps away, away from the habitual idea of man as the rational animal who in modern times has become a subject for his objects.

This is the self-release of the 'clench' of the rational mind which is always analysing experience, trying to define itself over and against things and finally retreating into a 'celebration of subjectivity'. Heidegger describes the abyss of nihilism as something which at first threatens but which may be realised as a point of entry into a more authentic mode of being:

The abyss is neither empty nothingness nor murky confusion, but rather: the event of appropriation. (1969:39)

A spring is needed in order to experience authentically the belonging together of man and Being. The spring is the abruptness of the unbridged entry into that belonging which alone can grant a towards-each-other of man and Being, and thus the constellation of the two. The spring is the abrupt entry into the realm from which man and Being have already reached each other in their active nature, since both are mutually appropriated, extended as a gift, one to the other. Only the entry into the realm of this mutual appropriation determines and defines the experience of thinking. (1969:33)

These ideas are difficult because they are not directed to the analytical, representational mind. Heidegger is attempting to 'speak' out of another mode of cognition and uses a language which tends towards the poetical. A human, as a being, belongs with all non-human beings to the realm of Being, but the everydayness of habitual thought and prejudice can obscure that 'belonging-together' and render us oblivious to it. The 'leap' returns us to a more original, essential experience of our selves and other beings. By 'Being' Heidegger doesn't mean the metaphysical ground of things or 'seamlessness' beyond the 'illusion' of human thought. He means the 'intensive depth' of a phenomenon, the unity
found within difference or differentiation (Heidegger, 1969; Bortoft, 1986a:49). It is out of the experience of the Being of beings that authentic language speaks.

The 'leap' brings us into the 'open' of a more essential, authentic relationship with things. We return "to the things themselves", not through a motivation to know them in the sense of 'to explain' them, but from a solicitude which desires to preserve and 'guard' their essential being by allowing them to be disclosed in their own terms. This act of disclosure or 'unconcealing' is what Heidegger designates as 'truth', a primordial meaning of truth which has always been present in Western culture but has been obscured by the meaning which became dominant — 'truth as correctness', the correct correspondence of a concept to an objective reality (Heidegger, 1971:50-78, Heidegger, 1992:256-273). Here we have something which shakes loose Gough's concept of existential reality as a composition of 'selected fictions'. In the terms in which Gough argues nothing could be said to dispute this, but the foregoing discussion has brought something else to light; namely, the potential of every person to enter an authentic mode of individualised being, to emerge from dissolution in their cultural background of more or less fixed meanings and values. The latter is what Heidegger (1992:277) calls the condition of being "lost in one's world". As I will shortly describe, even the language in which one 'speaks' one's experience of things can come to be more authentic in the sense Heidegger uses the word.

Two centuries ago the German poet and natural scientist Goethe indicated an authentic way of investigating natural phenomena. Concerning the study of plants he wrote (Goethe, 1988:11):

Like the sun which draws forth every plant and shines on all, [the true botanist] must look upon each plant with the same quiet gaze; he must find the measure for what he learns, the data for judgement, not in himself but in the sphere of what he observes.

Goethe's work in the sciences was extensive, particularly in the areas of colour research and plant and animal morphology. For a long time conventional science has not recognised Goethe's contribution, being as it is so completely at odds with the dominant rationalist paradigm. Goethe also said: "Let us not seek for
something behind the phenomena — they themselves are the theory” (Goethe, 1988:307). His understanding of ‘theory’ is close to the original Greek *theoria* which means ‘to behold something’. Thus, for Goethe, the ‘theory’ is not merely an intellectual abstraction or conceptual correspondence to a thing but the revelation or disclosure of the essential ‘idea’ of the thing through an intuitive mode of cognition (or ‘thinking perception’). This is similar to what Heidegger (1992:51) meant when he defined the phenomenon as “that which shows itself from itself”. Goethe did not think of the ‘idea’ as a rigid, divine ‘law’ or an absolute, unchanging principle upon which phenomena are modelled. He spoke of the ‘idea’ as something fluid and unfinished, at work in the phenomena; he was pointing to a generative, organic as opposed to a mechanical, causal principle of creation (Bertalanffy, 1951).

Goethe was concerned with disclosing the essence of a phenomenon, with learning how to perceive its shining forth in the visible aspect of the phenomenon. Kant, too, had recognised the significance of an intuitive mode of cognition which he called *intellectus archetypus*, the consciousness which apprehends the essential nature of a thing directly by proceeding “from the whole to the parts” (Kant, 1952:63-4). While scientists sometimes speak of intuition as an inspirational flash, Goethe showed intuition to be an actual method of science, and the correct one for investigation of the organic realm (Steiner, 1988a:98).

Goethe was drawn to the tradition in philosophy which understands the world as a dynamic, organic whole, an idea usually associated with Plato. Aristotle also had an ‘organic’ world-conception; in *De Anima* he describes how reality exists potentially and only attains full existence when it is known (just as a plant develops from a condition of potentiality in the seed to one of actuality in the adult); this view of knowledge was elaborated further by Aquinas and others in the Middle Ages (Barfield, 1965). These ancient organicist conceptions were reshaped in the philosophies of Bruno and Spinoza who inspired the so-called *Naturphilosophie* movement in eighteenth and nineteenth century German culture, of which Goethe was a part (along with philosophers Fichte, Schelling and Hegel and artists such as Caspar David Friedrich). *Naturphilosophie* embraced
a participatory way of thinking which never presumed the radical separation of
the human subject and the object-as-known. This tradition can be clearly
distinguished from that of scientific rationalism which is best exemplified by the
philosophy of Descartes who saw an irreconcilable division between mind
(thinking substance or consciousness) and extended substance (bodies or objects).
Rudolf Steiner, the first editor of Goethe’s scientific works, has illustrated the
organic conception of knowledge in the following way (1979:65):

Does not the world produce thinking in the heads of men with the
same necessity as it produces blossoms on a plant? Plant a seed in the
earth. It puts forth root and stem, it unfolds into leaves and blossoms.
Set the plant before yourself. It connects itself, in your mind, with a
definite concept. Why should this concept belong any less to the whole
plant than leaf and blossom?

This is an understanding of the role of human cognition which implies a
particular responsibility, as Henri Bortoel (1986a:66) indicates:

The participatory view of the role of consciousness in knowledge is...an
evolutionary view, in the widest sense, because the state of ‘being
known’ is an evolutionary development of nature itself. When
consciousness is properly prepared it becomes the medium in which
the phenomenon itself comes into presence. We call this ‘knowing the
phenomenon’, and understand it subjectively. But in a more
comprehensive view it is the phenomenon itself which appears in
consciousness when it is known. The act of knowing is an evolutionary
development of the phenomenon and not just a subjective activity of
man. This is the ontological significance of intuitive knowledge.

Such an conception of organic knowledge can provide, I believe, the basis for
the development of an environmental education which can take us beyond the
 crisis of rationalism. Participatory knowing is truly holistic in that it experiences
Being as the reality from which a human can never be separate. For Heidegger,
even inauthentic, untruthful existence is still a mode of Being-in-the-world
(1992:219-224). By contrast, a ‘counterfeit’ holism works with strategies such as
trying to replace the unsustainable ‘fiction’ of separateness with another more
holistic one (Gough, 1991:38-41). Here holism turns out to be nothing real or of
inherent value, just a useful ‘fiction’. The environmental education which I am
advocating proceeds neither by the inculcation of objective ‘facts’, nor by giving
subjectivity free rein. It highlights the human responsibility for all things
belonging to nature and indicates ways in which that responsibility can be assumed.

HERMENEUTICS — ‘SPEAKING’ THE PHENOMENA

Knowledge has no existence outside the language in which it is uttered; this is the essential insight of the modern philosophy of language and hermeneutics (the science of interpretation). As H.G.Gadamer (1979:432) has put it: “being that can be understood is language”. In other words, a phenomenon cannot be understood prior to its articulation; we do not form a concept which we then articulate and communicate by means of language. The primary function of language is to ‘disclose’, to allow the phenomenon to come forth into view and the communicative function of language is secondary.

For the constructivist, our thinking and knowing is inextricably embedded in language which is our own creation. According to this way of thinking we may, however, attempt to adopt a mode of language which is more useful to us, which, for example, is more ‘holistic’ in nature. The organic conception of knowledge which I have been presenting defines the phenomenon as that which may become the revelation of Being; both Goethe and Heidegger recommend letting the thing ‘speak’ for itself in any phenomenological investigation. Yet if language is always interposing between us and the thing, this conception of knowledge would seem to count for nothing. The question is: can we ever really ‘speak’ the language of the thing itself, or is our utterance always destined to be a projection of ourselves, something which ‘enframes’ the phenomenon within our thinking no matter how innocently we approach it?

From the point of view of the organic conception of knowledge, such a ‘speaking’ of the thing is indeed possible but by no means a capacity which is ‘given’ us like the perceptual faculties we are born with or the language we unconsciously assimilate through our social development. Goethe (1988:307) spoke of a ‘delicate empiricism’, the capacity to ‘see’ or disclose the phenomena as its own theory, a ‘thinking perception’ which results from the conscious
development of our perceptual faculties. Heidegger (1992:56) discusses the possibility of an authentic language which allows the phenomenon to "show itself from itself"; for Heidegger the language which 'speaks' the Being of the thing is a more original (essential), poetic form of utterance although this is not limited to poetry in the modern sense. He derives his meaning of poetry from the Greek poiesis, meaning to produce, to bring forth or disclose, a meaning which actually encompasses both art and technology (from techne, to make) (Zimmerman, 1990:234). We are really only able to take hold of Heidegger's sense of language when we invert our habitual way of understanding the relationship of language to human consciousness:

For, strictly, it is language that speaks. Man first speaks when, and only when, he responds to language by listening to its appeal. Among all the appeals that we human beings, on our part, may help to be voiced, language is the highest and everywhere the first. Language beckons us, at first and then again at the end, toward a thing's nature. (Heidegger, 1971:216)

Heidegger goes on to say that such a speaking of a thing's nature can never be definitive or expressed in a matter-of-fact way. A person must work towards the capacity to 'see' and 'speak' the phenomena, and "the greater is the purity with which he submits what he says to an ever more painstaking listening...the further what he says is from the mere propositional statement that is dealt with solely in regard to its correctness or incorrectness."

To understand hermeneutics in the Goethean sense we must enlarge our definition of language even further whereby the form of the thing is itself seen to be a mode of language. When Goethe said that the phenomenon is its own 'theory' he meant that the 'idea' of the phenomenon is perceived concretely in the phenomenon itself. Gough (1991:36) has noted that the great landscape painters and pastoral poets of the eighteenth and nineteenth centuries considered their work as the interpretation of 'nature's text'. Through a new application and interpretation of Goethe's methodology the reading of 'nature's text' may be reinstated as a valid scientific/artistic endeavour. Henri Bortoft (1986a:59) writes:

The aim of (Goethe's) natural hermeneutics is to learn to read the phenomenon in terms of itself. The holistic biology of animal form
illustrates this clearly. When the mammal is disclosed in terms of itself then it becomes its own language. In this moment of intuitive perception the mammal is language.

Edmund Husserl, the early twentieth century phenomenologist and forerunner of modern hermeneutics, was close to Goethe when he spoke of 'eidetic knowledge'. He too recognised the 'idea' as not merely a subjective construction but as something real and inherent in the form of the thing, apprehensible when one attains to what he called an 'intuition of essences' (Reinhardt, 1960:123; Stewart & Mickunas, 1974).

Numerous books have been written in recent times which are direct developments of Goethe's form of phenomenology (or 'natural hermeneutics'). His approach has borne fruit particularly in the areas of plant and animal morphology, water and colour research and landscape ecology (for example Bockemühl, 1951, 1986; Shad, 1977; Adams & Whicher, 1982; Schwenk, 1965). Gradually a whole genre of this literature is coming into being. One recent text (Amrine, Zucker & Wheeler, 1987) contains a bibliography of five hundred publications concerning Goethe's scientific approach, selected from around four thousand since 1932. Some more recent writings on the subject are Fink, 1991; Riegner, 1992, 1993; Sloan, 1991; Cornell, 1990; Tauber, 1993. Goethe's phenomenology is undergoing a major reappraisal in our time after having been largely ignored or misunderstood by conventional science for almost two hundred years. It is now being realised how relevant this approach is to contemporary environmental issues.

A PRELIMINARY OUTLINE OF A GOETHEAN ENVIRONMENTAL EDUCATION

1. Human creativity in partnership with nature

One of the central issues in the contemporary environmental debate, and certainly a point of focus for environmental education, is the role of human creativity. I am not using the word 'creativity' here in a narrow sense; it is intended to include all
forms of human productivity — building, manufacturing, farming, technology as well as art making of every kind. While it has become increasingly clear how destructive some forms of human creativity have been to the world’s natural environments, the solutions and ideal alternative ways of proceeding are far from obvious.

A Goethean environmental education would concern itself with environments ranging from wilderness areas to cities. The philosophy which I have been considering recognises that humans are part of environments, that one cannot study an environment as an external observer as is presumed by conventional ecological methodology. Even in coming to ‘know’ an environment, we are, in a sense, creatively participating in it. As I have already discussed, the organic, participatory view of knowledge is that ‘being known’ is an evolutionary development of nature. Therefore the way we cognise natural phenomena becomes a matter of creative responsibility and a fundamental environmental educational issue.

The aim of the Goethean phenomenological approach is to learn to engage with or participate in the phenomena we encounter in environments so that our creative activity, in whatever form it takes, can come to be authentic, to work in partnership with nature. Without doubt we have freedom in this matter; our creative work may either stimulate and extend the creative forces inherent in nature, or may work in a way which suppresses or distorts them. This approach is a way of deepening our relationship with environments and phenomena, not just through ‘feelings’ nor the accumulation of ‘facts’, but through the cultivation of the qualitative, intuitive form of knowing which may be called ‘cognitive perception’. Strategies for conservation, sustainable development and so forth are secondary to this cultivated experience of relationship — they are creative outcomes of it.

Environments with which humans have creatively engaged we call ‘landscapes’. That participation may have simply been in the form of our cognising presence or artistic representations, or else may be the more radical
physical changes we introduce. Through learning to work creatively in partnership with the creative forces of an environment we have the potential to bring about landscapes in which the elements — including zones of habitation and industry, areas of cultivation, special places for contemplation and creativity and as well as wilderness areas — develop together as in an artistically conceived garden.

2. Experiential learning

Jochen Bockemühl (1986:7) has described how he conducts his courses in landscape ecology using a Goethean approach. He and his students enter an environment and sketches are made to record the first impression. This first impression is very significant for Bockemühl; he sees it as the first intimation of the ‘whole’ or ‘idea’ of that environment (1986:27):

> When entering a foreign country, we are apt to become more conscious of the landscape than when surrounded by familiar scenes. We try to take in the scene with all its details, and then to connect them with our first impression. In this way we discover interrelationships. What we took in vaguely with our first impression acquires substance and content.

On the following day a shared picture is reconstructed through blackboard sketches leading to a final painting. Bockemühl has found that, with this pictorial background, it becomes much easier to then study how particular entities relate within this environment, how the ‘whole’ of an environment expresses itself in all of its ‘parts’. Bockemühl’s guiding idea is always to ‘begin with the whole’. He writes (1986:52):

> By continually referring back to the overall impression, we can look at each stone, each plant, each animal, and attempt to find its place in the totality out of the specific quality of its appearance.

Goethe (1988:24-5) had described his scientific method in terms of three stages. The first stage, which he called the “empirical phenomenon”, is the everyday experience of a phenomenon. The second stage, the “scientific phenomenon”, is the careful observation of this phenomenon and its relationships. We learn to ‘participate’ in the dynamic character of a living thing though what he called
"exact sensorial imagination". In this way, for example, the metamorphic changes in leaves and other plant organs are studied. The third stage is where the "pure phenomenon" or 'idea' comes to light. This is reached through a gradual deepening of participatory cognition into 'intuitive perception'. Bockemühl (1986:44-52; 1987) has further developed this method with reference to the four classical elements — earth, water, air and fire.

The colours of plants changing with the seasons, the forms of animals, even the song of a bird, all may be seen to express the identity of a place in different ways. The human being is the 'part' of an environment in which that environment becomes conscious of itself. As Bockemühl puts it, it is in the human consciousness that the 'idea' of the environment is mirrored. The 'idea' of the environment is the inherent creative principle at work in that environment, coming to consciousness in the human being in what Heidegger called 'the event of appropriation'.

It should be clear from everything said so far that 'experiential education', in the Goethean sense, does not mean simply going physically into environments to 'have experiences', the counterpoise to theoretical learning. Participatory, intuitive knowledge is itself a mode of 'experience' — the 'theory' is encountered concretely in the phenomenon. Goethe, in his scientific studies, continually endeavoured to overcome abstract thought which he regarded as lifeless and thus inappropriate for the study of living entities. He wrote (Nisbet,1972:31):

Theories are usually the premature conclusion of an impatient understanding which would prefer to get the phenomena out of the way.

Goethe tried to avoid the tendency he saw all around him in conventional scientific procedures which was to fit phenomena into preconceived thought categories. He strove for not just a greater understanding but for a more reverent appreciation of nature. He wanted his thinking to be as ‘alive’ as possible, to become "as natural and plastic as the example she (nature) sets for us" (Brady,1987:283). In other words, he attempted to allow phenomena to 'speak' out of their own nature. Such an approach is experiential in the broadest sense.
3. The whole and the parts

The notion that ‘the whole is more than the sum of the parts’ is often voiced today; its understanding and application is not so easy. According to the organic conception of knowledge, the apprehension of the whole is possible through intuitive cognition. Goethe’s meaning of the whole or unifying ‘idea’ can easily be confused with the rationalist scientific meaning of ‘system’ or ‘law’. The latter two are abstractions which are arrived at through a systematic analysis of the parts of a phenomenon. The model for this approach is the machine; when we study the cause and effect relationships between all the parts of a machine, a system or unifying law can be deduced for its operation. This is the way in which natural science has proceeded, by looking for simple mechanical (cause and effect) relationships between biological entities or their components and out of these deriving a unifying law as an explanation for the functioning of the whole entity. In the case of ecology this becomes difficult because natural environments are so complex; systematic analysis of the parts of an environment leads to ever expanding networks of cause and effect relationships (Bockemühl, 1951; 1986:86). In this process the whole, as a living, generative principle, is never encountered or intuitively experienced.

Clarification can be gained here by turning to the arts. A musician learning to play a piece is guided by an intuition of the ‘whole’ of the piece. The rendering of melodies and harmonies, the shaping of every passage of notes, is guided by the intuition of the whole or what could be called the generative ‘idea’ of the piece. To interpret each note or passage of notes in isolation is to end up with a performance which lacks unity and meaning. One of the principal goals of an education in musical interpretation is to help the student think in terms of the whole as it expresses itself in the parts — in effect the kind of cognition Kant had called intellectus archetypus.

This is precisely the way Goethe approached the plant; as he was an artist it was natural for him to bring his artistic instincts to bear upon such a study. He sought,
first and foremost, the 'idea' or generative principle which he also called the 'archetypal plant'. He then found that he could interpret why the leaves were shaped in a particular way, why the petals were of a certain colour and form. This is what we would now call his 'natural hermeneutics'. He discovered this whole not in some abstract idea or explanation of the plant, but concretely, in the parts of the plant, each part in a different way expressing the whole (Arber, 1959; Goethe, 1988: 76-97). As Henri Bortoft (1986b: 287) puts it:

A part is a part only inasmuch as it serves to let the whole come forth, which is to let meaning emerge... The recognition of a part is possible only through the 'coming to presence' of the whole.

I have already suggested how this would translate into the practice of environmental education. To reach the point of participatory or holistic understanding of an environment is to be in the position where one's creativity can have integrity and authenticity in that it 'brings to presence', in a unique way, the whole or 'idea' of that environment. This is the essence of caring for an environment — where what one creates (produces, develops, transforms) in an environment is not imposed from without (albeit with the best intentions) but originates from within; where it becomes, in a sense, the 'speaking' of that environment. As David Seamon (1978: 247) writes:

Goethe's approach is important [for environmental education] because it offers a different way of understanding nature. It teaches an alternative mode of interaction between person and environment that entails reciprocity, wonderment, and gratitude. Goethe wished us to converse with nature and discover in ourselves its multifaceted reflection.

4. The role of the teacher

Many issues could be considered in relation to the application of the organic conception of knowledge to environmental education; issues such as the nature of learning and communication, teaching techniques and so forth. Here I will be limiting myself to one fundamental question; is there a role for a teacher in a Goethean form of education, in the traditional sense of guide and exemplar? One only has to take a glance at current trends in environmental education to see to what extent this traditional conception is being eroded. For example, White
(1992:66) outlines a tertiary environmental education built upon constructivist theory where the role of the teacher has been minimised in line with a 'deschooling' philosophy. For the constructivist there are no 'truths' to be discovered; there is only one's 'fictions' and the 'fictions' of others which can be shared through dialogue. By means of a dialectical process, new, consensual 'fictions' can be arrived at. The 'teacher' is seen as a 'co-learner' or 'co-enquirer', who facilitates this process and is otherwise indistinguishable from the 'students'. The experiential aspect of this constructivist orientated education is the focus on the students' own experiences rather than on what might be learned (or experienced) through the agency of the teacher.

We can again turn to the arts for clarification here, where the accepted teaching methods are similar to those most suited to a Goethean environmental education. In music and drama schools, for example, students find their way into the company of a generally respected teacher or director, someone who has achieved some degree of recognition both for their technical skills and insight, say, into the works of Shakespeare or Beethoven. The aspiring students gladly and respectfully place themselves under the guidance of such a teacher and as the students follow the interpretation suggested by the teacher they are actually involved in a process of learning to 'see'. The question of proof doesn't arise here any more than it does in Goethean science; there is no desire to pin down the richness of reality in this way and different insights are respected by an openminded teacher. But this doesn't mean that 'everything is a matter of opinion' and merely subjective or fictional. The 'idea' is inherent the phenomenon itself — that is the essence of the phenomenological method. Two people may have different insights into the same phenomenon depending upon the angle from which they are looking and the phenomenon then appears as modified in different ways. The art of interpretation becomes a matter of seeing in a way which is not onesided, which is true to the nature of the thing being studied and as little as possible conditioned by the prejudices and habits of everyday thinking. Great intuitive-scientific interpretations of natural phenomena, like great works of art and artistic interpretations, cannot be 'proved' to be good; however they tend to withstand the
passing of time whereas interpretations which are just subjective flights of fancy (inauthentic in the sense I have indicated) tend to fall by the wayside.

NOTES

1 The work of the Chilean neurobiologist, Humberto Maturana, has been used as support for the constructivist approach to environmental education described by White (1992). To take one example from his experimental work with frogs (Maturana & Varela, 1987:125-6): Maturana cut the eye of a tadpole and rotated it 180 degrees; the frog matured and its response to the external world was then tested. When the rotated eye was covered the frog was easily able to catch a worm with its tongue; when the normal eye was covered, the tongue shot out at a deviation of exactly 180 degrees. For the experimenters this showed that living beings in general do not have direct access to ‘reality’, only to a ‘reality’ determined by the structure of the knower, in the case of the frog by the “internal correlations” between eye and mouth.

The chief problem here, as I see it, is one of self-contradiction. Pure ‘objectivist’ scientific research is being used to underpin a constructivist philosophical position which denies that ‘objectivist’ science has any validity, which claims that objective ‘facts’ are really fictions. This is to say nothing of the cruelty of this experimental work, which is then used as a support for an environmental education which purports to encourage care for living beings.

2 Some may protest that there is an important distinction to be made between the social and personal construction of knowledge; however, in constructivist terms, these are aspects of one and the same process (in other words, the difference is one of emphasis). Constructions are not produced, located or legitimated ‘in society’. They are created in the minds of individuals and may be transmitted in time and space and re-created (perhaps in a modified form) in the minds of others. Society is nothing other than a collection of individuals.
Constructivists, who will perhaps be surprised at being called reductionists, might consider in their response the fact that the whole Neo-Kantian, constructivist position is built upon the assumption of a particular notion of truth, the so-called ‘correspondence theory’, whereby a concept is considered true or false depending on whether it corresponds to objective reality. Heidegger (1992:258) has pointed out that this understanding of truth was assumed by Kant who believed that things are unknowable ‘in themselves’. Constructivists, likewise, take this concept of truth and conclude that direct knowledge of objective reality (or Being as such) is impossible, that we remained wholly bound up in a subjective, fictional world. Upon this questionable conclusion they have erected a vast theoretical edifice. As Heidegger indicates, what should be inspected is the validity of this theory of truth. Rudolf Steiner (1988b:106) is saying much the same thing when he writes:

Kant accepted the customary concept of what knowing is and asked if it were possible. According to this concept, knowing is supposed to consist in making a copy of the real conditions that stand outside our consciousness and exist in-themselves. But one will be able to make nothing out of the possibility of knowledge until one has answered the question as to the what of knowing itself. The question: What is knowing? thereby becomes the primary one for epistemology. With respect to Goethe, therefore, it will be our task to show what Goethe pictured knowing to be.

This leads on to my consideration of Goethe’s phenomenology and intuitive knowledge. Intuitive knowledge is participatory; it is the thinking which thinks out of the nature of a thing, not the thinking of a subject about an object. It relates to what Heidegger was attempting through his ontological interpretation of human nature. Zimmerman (1990:148) writes:

Heidegger emphasised that what he had been calling “the understanding of being” was misleading in that such understanding could be interpreted in the traditional way as a human faculty or capacity. “The understanding of being,” he explained, is not to be construed as an achievement of the subject, as when we say, for example, that “he finally understood the problem.” Instead, “the understanding of being” is in effect identical with the event of being itself: the event of disclosedness or presencing by virtue of which entities show themselves.
4 I am by no means the only one attempting to point out the self-contradictions inherent in the constructivist position. For example, John Searle (1983:75), in a devastating review of *On Deconstruction: Theory and Criticism after Structuralism* by Jonathan Culler, notes that at one point Culler states that truth is “a kind of fiction”, and later that “truth is both what can be demonstrated within an accepted framework and what simply is the case whether or not anyone could believe it or validate it” (Searle’s italics). Searle observes that Culler is trying to have it both ways, that the italicised phrase is not consistent with the idea of truth as fiction.

5 The method of deconstruction is narrowly understood to be the process of critically reading a text by those who trace it back only as far as the work of the French poststructuralist Jacques Derrida. In fact, as Searle (1983) notes, Derrida derived most of his deconstructive tools from Heidegger, and deconstruction as a method can be traced further back to the philosophy of Nietzsche. Furthermore, as Searle shows in this review, Derrida’s interpretation of Heidegger emphasising ‘text’ is in itself dubious.

6 Martin Heidegger uses this as a maxim for the phenomenological method deriving from his teacher Edmund Husserl.

7 Gough (1991:37) would appear to escape pure nihilism by referring to the ‘seamlessness’. However the following sentence of his should be carefully considered: “Assigning a name to something constructs the illusion that what has been named is genuinely distinguishable from all else” (1991:37). In other words, everything is the same thing, things cannot ‘really’ be distinguished from each other, there is only a homogenous oneness — the ‘seamlessness’. What he is actually talking about is an absolute no-thingness, a vacuity. Perhaps he would want his ‘seamlessness’ to be equated with the Indian Brahman, or the Chinese Tao, the Absolute Reality; this would imply a mystical truth. However in Gough’s thesis there is no evidence of the subtle argumentation by which philosophers in both the East and West have demonstrated how the One appears in or as the many (or, in terms relevant to Goethe, how an organic whole or unity generates a
multiplicity of parts yet remains a unity). Speaking strictly from the constructivist point of view, Gough's idea of the 'seamlessness' has to be considered as the greatest fiction of all.

8 A very clear philosophical exposition on the meaning of qualitative cognition or 'cognitive perception' is given by Hegge, 1987.
REFERENCES TO APPENDIX B.


Barfield, O. (1965), Saving the Appearances, Harcourt, Brace and World, N.Y.


___ (1977), *The Question Concerning Technology and Other Essays*, Harper and Row, N.Y.


___ (1988a), *The Science of Knowing*, Mercury, N.Y.


Appendix C.

Summaries of recent articles and books relating to Goethean phenomenology.

In the two centuries since Goethe's time a great deal of literature has been produced concerning his scientific approach, much of it in the German language (around 10,000 items altogether). However there is now a growing awareness of Goethe's scientific importance in the English-speaking world. Below is the result of my own research into literature in the English language, relevant to the topic of this thesis and published between 1983 and the present (1994).


Altner begins his arguments with a depiction of the ever-increasing environmental destructiveness in which he finds the call for wholeness unmistakable. That wholeness does not merely require consideration of the environment in terms of technological and political changes. Altner finds that the conceptual mode of the sciences is itself a destructive power. He writes: 'The cognising self that isolates itself from nature in the subject — object relationship subjects nature to the methodology of its experimentation and calculation. It degrades nature as a living encounter; the self destroys the wholeness of nature in making it an object of human experience.' Altner finds in Goethe's contemplative form of science a method in which that 'living encounter' with things becomes possible. For this reason he believes him to be the forerunner of an alternative science.


This text, more than any other published in recent years, serves to highlight the increasing interest and in recognition of the significance of Goethe's scientific approach in the twentieth century. It contains nineteen essays on various aspects of Goethe's science (including a contribution from the eminent
biologist Adolf Portmann), a postscript in the form of reduced version of a 'round table' discussion held at a Harvard conference on Goethe and the sciences, and an annotated bibliography of 500 items related to Goethe's scientific work. The latter were selected from some 10,000 up to 1982. A number of the essays in this book raise implications of the Goethean approach for environmental issues in the modern world.


This is an account of the theory of participatory scientific knowledge, in relation to the history and philosophy of science, which is especially valuable because it relates Goethe's approach to some of the most significant twentieth century thinkers, in particular, Martin Heidegger, Hans-Georg Gadamer, Thomas Kuhn and Edmund Husserl. Bortoft finishes this book by suggesting: "Instead of mastery over Nature, the scientist's knowledge would become the synergy of man and Nature. The historical value of Goethe's work, in the wider sense, may be that he provides us with an instance of how this can be done."


Bortoft asks the question 'What is wholeness' as a prelude to his discussion of the science of Goethe, which he believes exemplifies the principle of authentic wholeness. Bortoft demonstrates how an authentic whole is discovered, not in abstracting what is common from the parts, from stepping back and taking an overview, but concretely in the part, by going further into the parts. In the parts of a phenomenon, the whole 'comes to presence'; the emergent whole "comes forth into its parts." The 'whole' is like an 'active absence'; it is not visible but can be grasped through a receptive or 'intuitive' mode of consciousness. Bortoft goes on to explain that Goethe's science cultivates the intuitive cognition through which the 'whole' (for Goethe, meaning the 'law' or 'theory' of the
phenomenon) can be experienced. He suggests that in our time, with its growing need for a renewal of contact with nature, a new science of nature is required, a science based on the discovery of authentic wholeness.


This author discusses the developmental aspects of Goethe’s biology which he links to humanity’s own evolution through reference to Goethe’s *Faust*. He is emphasising that Goethe’s notions of teleology are not merely hypothetical but ‘visible’ in the phenomena. As this author points out, Goethe’s notion of ‘theory’ goes back to the original Greek ideas and suggests a deep openness to natural phenomena. This author says that Goethe’s idea of the theory makes his biological ideas both difficult and important, for it suggests that we cannot separate our ideas about what we see from what we ourselves are, as striving, truth-seeking organisms. He concludes by discussing the significance for modern biology of Goethe’s notion of reciprocity; that is, the will of the researcher to observe and understand (the organism *observed*), balanced with the respect for the authority the objects themselves exert over the researcher (the organism *observing*). Cornell calls the onesided desire for biological doctrine and self-satisfaction the ‘Mephistophelian temptation’ of the researcher.

Fink, K.J. (1991), *Goethe’s History of Science* Cambridge University Press, Cambridge. This scholarly work traces the relationship between Goethe’s experimental science and the influence of his thinking on the history of science. Fink shows how Goethe, in his natural science, searched for the ‘boundary conditions’ where growth and change occurs, where the unity of nature is experienced. Goethe applied this method to the history of science and to ideas on the teleology of science, to show how the scientist of today projects and directs the scientist of tomorrow. This book is distinguished for its comprehensive examination of Goethe’s extensive texts and letters (for the most part not translated into English), and for its assessment of modern Goethe scholarship.
Fink believes Goethe's philosophy of science to be the forerunner of contemporary scientific views regarding the relationship of the subject to the object, and the biographical dimension of scientific research (with particular reference to the ideas of the modern philosopher of science Thomas Kuhn).


This book comprises Goethe's main scientific writings, many of them previously untranslated into English. It covers his work in methodology and general scientific topics, morphology, botany, zoology, geology, meteorology, physics, and selections from his *Maxims and Reflections*. In particular in his essay *Fortunate Encounter* he describes how, in his confrontation with Schiller, he became clear how the 'archetype' (theory) is not merely an idea but an *experience*. In other essays, notably *The Experiment as Mediator Between Object and Subject, Judgement through Intuitive Perception, and Analysis and Synthesis*, he expounds his notion of the 'theory' as the aspect of the phenomenon apprehended through intuitive perception.


This article is mainly concerned with elucidating the meaning of 'holistic' with respect to Goethe's form of science. The author outlines the way he actually goes about the teaching of imaginative cognition which leads to a 'holistic' perception of entities and environments, a capacity to 'see with the imagination', so that the 'gesture' or 'whole' (in other words, Goethe's meaning of the 'theory') becomes a living presence. He finds this participatory approach a very valuable counter to modern alienation from the natural world, the so-called Cartesian dichotomy of object and subject, which has had such dire consequences for nature.

Riegner, M. (1993), 'Towards a holistic understanding of place: reading a landscape through its flora and fauna', *Dwelling, Seeing and Designing: Towards a*

The author here details his research into various aspects of plant and animal morphology, using a Goethean scientific approach. He shows how different plant and animal forms give expression to particular qualities of their environments; for example, an aquatic environment is characterised by smooth, rounded, 'watery' leaf forms. In this way it becomes understandable why, in environments in different parts of the world, we find animals and plants with similar or 'convergent' morphological features. His Goethean 'reading' of plants and animals revolves around the idea that organisms are not in environments, but that the environment is an extension of the organism (or conversely, that the organism is an extension of the environment).


Sloan is responding to an attempt by Professor R. Arnheim to find a solution to a major problem in the modern world — the division between knowledge on the one hand and meaning, value and purpose on the other. This author points to destructive environmental consequences of a positivistic and instrumentalist science which seeks merely to dismantle and explain the world and asks whether the division between the two realms will be overcome with anything less than new ways of knowing that can provide genuine knowledge, not only of quantities, but also of qualities (both objective and subjective). Arnheim had identified Goethe as the pioneer of just such qualitative ways of knowing, but in the opinion of Sloan, stops short of recognising the full revolutionary significance of Goethe's approach for our time, its importance as a way of knowledge that fuses science, art and religion.


This is a general outline of Goethe's scientific approach brought into relationship with modern biomedicine. It is both critical and supportive of
Goethe’s approach. This author is interested in the value of ‘holistic’ perspectives in modern bioscience. He sees many attempts at holistic science as just reactions to Cartesian reductionism, but also sees the need to find the validity of the holistic approach. Overall he feels that Goethe’s holistic scientific vision has a powerful modern relevance. He discusses Goethe’s notion of ‘theory’ in relation to modern perspectives.
GOETHE’S NOTION OF ‘THEORY’:
GOETHEAN PHENOMENOLOGY AS A
NEW ECOLOGICAL DISCIPLINE

Nigel Hoffmann

A thesis submitted in fulfilment of the requirements
for the degree of Master of Science (Honours).

October 1994

School of Social Ecology,
University of Western Sydney, Hawkesbury,
Richmond, NSW 2573
Australia
PLEASE NOTE

The greatest amount of care has been taken while scanning this thesis,

and the best possible result has been obtained.
“This thesis contains no material which has been accepted for the award of any other degree in any other university. To the best of my knowledge and belief, the thesis contains no material previously published or written by any other person except where due reference is given in the text”.

Signed: [Signature]

Nigel R. Hoffmann
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>3</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>5</td>
</tr>
<tr>
<td>LIST OF PLATES</td>
<td>7</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>8</td>
</tr>
<tr>
<td>SYNOPSIS</td>
<td>9</td>
</tr>
<tr>
<td><strong>CHAPTER I. INTRODUCTION</strong></td>
<td>10</td>
</tr>
<tr>
<td><strong>A. INTRODUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Contemporary ecology and ‘responsible knowledge’</td>
<td>10</td>
</tr>
<tr>
<td>2. Goethe’s notion of ‘theory’</td>
<td></td>
</tr>
<tr>
<td>3. Science and art</td>
<td></td>
</tr>
<tr>
<td>4. A Goethean methodology</td>
<td></td>
</tr>
<tr>
<td>5. Avenues for further research and application</td>
<td></td>
</tr>
<tr>
<td><strong>B. OVERVIEW OF THESIS STRUCTURE</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>CHAPTER II. THEORETICAL FRAMEWORK</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>A. GOETHE’S PHILOSOPHY OF SCIENCE</strong></td>
<td>20</td>
</tr>
<tr>
<td>1. World-view</td>
<td></td>
</tr>
<tr>
<td>2. The Phenomenon</td>
<td></td>
</tr>
<tr>
<td>3. Knowledge</td>
<td></td>
</tr>
<tr>
<td>4. The Theory</td>
<td></td>
</tr>
<tr>
<td><strong>B. CONTEMPORARY PHILOSOPHY OF SCIENCE</strong></td>
<td>49</td>
</tr>
<tr>
<td>1. World-view</td>
<td></td>
</tr>
<tr>
<td>2. The Phenomenon</td>
<td></td>
</tr>
<tr>
<td>3. Knowledge</td>
<td></td>
</tr>
<tr>
<td>4. The Theory</td>
<td></td>
</tr>
<tr>
<td><strong>C. GOETHE IN RELATION TO THE CONTEMPORARY PHILOSOPHY OF SCIENCE</strong></td>
<td>64</td>
</tr>
<tr>
<td><strong>CHAPTER III. GOETHE AND CONTEMPORARY ECOLOGY</strong></td>
<td>68</td>
</tr>
<tr>
<td><strong>A. ECOLOGY</strong></td>
<td>68</td>
</tr>
<tr>
<td><strong>B. DEEP ECOLOGY</strong></td>
<td>72</td>
</tr>
<tr>
<td><strong>C. SOCIAL ECOLOGY</strong></td>
<td>77</td>
</tr>
<tr>
<td><strong>D. GOETHE AS FORERUNNER OF</strong></td>
<td></td>
</tr>
<tr>
<td>A NEW ECOLOGICAL DISCIPLINE</td>
<td>80</td>
</tr>
<tr>
<td><strong>CHAPTER IV. GOETHE’S THEORY OF PLANT DEVELOPMENT</strong></td>
<td>89</td>
</tr>
<tr>
<td><strong>A. METAMORPHOSIS</strong></td>
<td>90</td>
</tr>
<tr>
<td><strong>B. POLARITY — EXPANSION AND CONTRACTION</strong></td>
<td>97</td>
</tr>
<tr>
<td><strong>C. INTENSIFICATION OR ENHANCEMENT</strong></td>
<td>100</td>
</tr>
<tr>
<td><strong>D. THE ARCHETYPAL PLANT</strong></td>
<td>104</td>
</tr>
</tbody>
</table>
CHAPTER V. A GOETHEAN METHODOLOGY FOR PLANT STUDY

A. FIRST IMPRESSION

B. STAGE ONE — THE PHYSICAL — ‘SENSORY INFORMATION’ — EARTH

C. STAGE TWO — TIME — ‘EXACT SENSORIA IMAGINATION’ — WATER

D. STAGE THREE — GESTURE — ‘INSPIRATION’ — AIR

E. STAGE FOUR — CREATIVE POTENCY — ‘INTUITION’ — FIRE

CHAPTER VI. A GOETHEAN STUDY OF FOUR NATIVE AUSTRALIAN PLANTS

A. SCAEVOLA RAMOSISSIMA

B. KUNZEA AMBIGUA

C. BANKSIA INTEGRIFOLIA

D. GREVILLEA BUXIFOLIA

CHAPTER VII. SUMMARY AND CONCLUSIONS

A. SUMMARY

B. CONCLUSIONS

1. Conclusions relating to my investigation of four Australian native plants

2. Goethean phenomenology, morphogenesis and dynamic morphology.

3. Wider applications of Goethean phenomenology.

4. The meaning of ‘responsible’ knowledge in the context of contemporary environmental issues.

BIBLIOGRAPHY

APPENDICES

APPENDIX A.
Goethean and Darwinian views of evolution.

APPENDIX B.

APPENDIX C.
Summaries of recent articles and books relating to Goethean phenomenology.
LIST OF FIGURES

Fig. 1. Random grouping of leaves of field poppy.

Fig. 2. Leaves of field poppy arranged according to similarity of forms.

Fig. 3. Two leaves from the field poppy.

Fig. 4. The natural sequence of the field poppy leaves from below upwards in the plant.

Fig. 5. Six expansions and contractions in plant development according to Goethe.

Fig. 6. *Scaevola ramosissima* — ‘First impression’ (water colour on paper, 40 X 55 cm).

Fig. 7. *Scaevola ramosissima* — Whole plant showing roots, flowers and branching of stems (coloured pencil and water colour on paper, 25 X 35 cm).

Fig. 8. *Scaevola ramosissima* — Part of plant showing bud and fruit body (coloured pencil and water colour on paper, 25 X 35 cm).

Fig. 9. *Scaevola ramosissima* — Enlargement of flower (coloured pencil and water colour on paper, 25 X 35 cm).

Fig. 10. *Scaevola ramosissima* — Metamorphic sequence a. Bud b. Flower c. Unripe fruit d. Ripe fruit with seed (pen and water colour on paper).

Fig. 11. *Scaevola ramosissima* — Gesture sketch (charcoal on paper, 40 X 55 cm).

Fig. 12. *Scaevola ramosissima* — Gesture painting (water colour on paper, 40 X 55 cm).

Fig. 13. *Scaevola ramosissima* — Gesture painting (water colour on paper, 40 X 55 cm).

Fig. 14. *Kunzea ambiguia* — Flower heads showing bunched structure (pen and water colour on paper, 25 X 25 cm).

Fig. 15. *Kunzea ambiguia* — Three aspects of the plant a. lateral branch b. stem with lateral branches c. seedling (pen and water colour on paper, 40 X 55 cm).

Fig. 16. *Kunzea ambiguia* — Metamorphic sequence a. buds b. flowers c. unripe fruit d. ripe fruit and seeds (pen and water colour on paper).

Fig. 17. *Kunzea ambiguia* — Gesture painting (water colour on paper, 40 X 55 cm).
Fig. 18. *Kunzea ambigua* — Gesture sketch (charcoal on paper, 25 X 25 cm).

Fig. 19. *Kunzea ambigua* — Image of flower as plant 'theory' (water colour on paper, 40 X 55 cm).

Fig. 20. *Banksia integrifolia* — 'First impression', immature trees (water colour on paper, 40 X 55 cm).

Fig. 21. *Banksia integrifolia* — 'First impression', mature tree (water colour on paper, 40 X 55 cm).

Fig. 22. *Banksia integrifolia* — a. seedling b. slightly more advanced plant (pen and water colour on paper, 25 X 25 cm).

Fig. 23. *Banksia integrifolia* — Metamorphic sequence of leaves a. germinal leaf b. first true leaf c. leaf of seedling d. leaf in lower parts of immature shrub e. leaf of higher parts of immature tree f. & g. leaves of highest parts of immature tree and all of mature tree.

Fig. 24. *Banksia integrifolia* — Metamorphic sequence a. spike with rows of paired flower buds b. opening flowers c. open flowers d. withered flowers e. young follicle f. mature follicle (pen and water colour on paper).

Fig. 25. *Banksia integrifolia* — Gesture sketch (charcoal on paper, 40 X 55 cm).

Fig. 26. *Banksia integrifolia* — Gesture painting (water colour on paper, 40 X 55 cm).

Fig. 27. *Banksia integrifolia* — Image of flower as plant 'theory' (water colour on paper, 40 X 55 cm).

Fig. 28. *Grevillea buxifolia* — Aspects of the plant a. flower head and fruit b. individual flower (pen and water colour on paper).

Fig. 29. *Grevillea buxifolia* — Metamorphic sequence a-b. buds opening c. flower head d. dying flowers e. ripening fruit f. ripe fruit capsule and released seeds (pen and water colour on paper, 25 X 25 cm).

Fig. 30. *Grevillea buxifolia* — Gesture sketch (charcoal on paper, 40 X 55 cm).

Fig. 31. *Grevillea buxifolia* — Gesture painting (water colour on paper, 40 X 55 cm).

Fig. 32. *Grevillea buxifolia* — Gesture painting (water colour on paper, 40 X 55 cm).

Fig. 33. *Grevillea buxifolia* — Image of flower as plant 'theory' (water colour on paper, 40 X 55 cm).
LIST OF PLATES

Plate 1.  *Scaevola ramosissima* — Plant *in situ*.

Plate 2.  *Scaevola ramosissima* — Plant *in situ*.

Plate 3.  General view of environment in which *Scaevola ramosissima* is growing.


Plate 5.  *Kunzea ambigua* — General view of shrub (not in flower).


Plate 8.  *Banksia integrifolia* — Flowering branch of immature tree.


Plate 10.  *Banksia integrifolia* — Immature tree.

Plate 11.  *Banksia integrifolia* — Bark of immature tree.

Plate 12.  *Banksia integrifolia* — Leaf configuration of very young tree.

Plate 13.  *Banksia integrifolia* — Leaf whorl of immature tree.


Plate 15.  *Banksia integrifolia* — Bark of mature tree.


Plate 17.  *Grevillea buxifolia* — Terminal flower heads.


ACKNOWLEDGEMENTS

I would like to thank various people for helping me to bring this thesis to fruition:

My family, for their support and forbearance.

My supervisor, Lesley Kuhn-White, and my co-supervisor, Glen Albrecht, for their advice and encouragement.
SYNOPSIS

Around two hundred years ago Goethe made the statement: "Let us not seek for something behind the phenomena — they themselves are the theory". This would appear to be the antithesis of the claim of certain contemporary schools of epistemological thought, that a 'theory' is a construction of the human mind. Yet Goethe's scientific aims are resonant with a present-day ecological need: to find a form of 'nature study' which springs from a desire to care for things rather than merely to explain them, which can help to create a harmony between human and non-human nature. Goethe's approach is phenomenological in that it seeks to uncover things 'on their own terms'; it is integral in that it embraces both art and science. I use a Goethean methodology to study four Australian native plants — Grevillea buxifolia, Scaevola ramosissima, Banksia integrifolia and Kunzea ambiguа. In conclusion I suggest that Goethe's way of 'nature study' fulfils the contemporary need for a participatory knowing which is responsible for the thing being researched, and I indicate various possibilities for further research and application — in the biological sciences and in disciplines such as architecture, landscape design and environmental education.