Chapter 11

Eight endings

Introductory

This book and the series of four books of which it is the final volume are almost completed and it is time to provide a summing up of some of the different perspectives covered. The first volume, "What Scientists can Learn from Artists", shows how insights coming from the history and practice of drawing and painting were used to inform studies of how the eye/brain learns to make skilled use of visually-acquired information. The second volume is on the practise of drawing and the third on the practise of painting. These more practical volumes focus on the many ways in which the ideas that emerged from the eye/brain studies can elucidate those coming from traditional artistic practices and in ways that can useful to both artists and art teachers. Finally, this fourth volume builds on the material presented in the other three volumes. It purpose is to build on suggestions in them relating to the nature of artistic and other kinds of creativity.

The unifying thread which unites all four texts is a personal quest to find explanations for a number of mysteries that I stumbled across in the early years of my life as an artist and teacher. Three particularly important catalysts were:

- The dogmas of Professor Bohusz-Szyszko, my first teacher.¹
- The difficulties experienced by students trying to make accurate drawings from observation in the first evening classes which I taught.²

¹ In many places. Particularly in "Painting with Light", Chapter 1. The dogmas are: (1) All good painting is based on colour; (2) There is only one thing you need to know about colour in nature namely that he same colour never appears twice in any natural scene; (3) ... and, therefore, the same colour should never appear twice in a painting; (4) All colours in paintings should be mixtures each and every one of which should contain some proportion, even if an only a scarcely noticeable one, of complementary colour.

² Evening classes in "Figure Drawing and Painting" at Isleworth Polytechnic 1964-1967

• The ideas of Michael Kidner, my one time tutor, concerning "Systems" as a launch pad for creativity.³

From each of these starting points a separate journey of discovery was set in motion. Later, the different pathways crossed each other and became inextricably entwined in a chaos of cross-fertilisations and exciting new discoveries. The challenge was to bring the different elements together in meaningful ways. In the case of my scientific research, the processes of synthesis occurred:

- At a theoretical level, in the course of my time at the University of Stirling.
- At a practical level, through a combination of my explorations as a practicing artist and my work as a teacher.⁴

The eventual outcomes included virtually all the ideas to be found in this series of four volumes.

From the perspective of brain-processes there is little if any difference between "learning" and "creativity". An extraordinary capacity for both is one of the defining features of the human race. Although many think of the former as something that invariably requires struggle and the latter as being reserved for the gifted few, the innate adaptability of the brain ensures that both occur regularly in the daily life of us all, usually without our even noticing. However, as we all know, if we consciously set out to acquire new skills (whether manual or intellectual) we find ourself faced with a serious challenge, while significant creativity often seems to be beyond our grasp.

The level of difficulty with respect to both skill-acquisition and to generating creative outcomes relates to the context of the learning process in which we are engaged. If the necessary framework is in place, learning and creativity can come relatively easily. If not, they will be impossible: The missing steps in the building of the framework must first be put in place. Taking these steps is the remedy for those wanting to make progress, and this is what coaches and teachers aspire to help them to do.

Problems ensue if the frameworks provided prove to be inappropriate. This outcome is only too often the case, largely when ways of doing things that have proved to be effective in one context of learning are used in another in which they provide a potential barrier to progress. For example, a particular method

that works for "drawing accurately" may hinder progress with "drawing with expression", although a different strategy may help with both. Another frequent problem is that too much familiarity with strategies that have served the artist well up to a point, can fatally inhibit progress beyond that point. Because deeply ingrained habits die hard, it can be harder to help an experienced practitioner who has to either to adapt or to bypass old ways of doing things, than to teach a student with the mindset of a complete beginner. The purpose of these four volumes is to provide a kitbag of frameworks that, while enabling accuracy, leave as open as possible the way for the growth of creativity and personal expression.

Why eight endings?

When I found myself confronting the challenge of fashioning a finale that would bring together the many intertwining strands to be found in the four volumes, I found myself struggling. Ideas came easily enough and I usually managed to deceive myself for a while into feeling that I was making good headway. However, sooner or later, I would realise that what I had written just wouldn't do. No matter how promising it had seemed, I would find that I was not managing to include all the strands of what I felt needed to be said and when, eventually, I despaired of my efforts to bring in the missing elements, I would abort the whole thing.

However, as it never occurred to me to give up at this last hurdle in the writing of my books, there seemed no alternative but to take a deep breath and look for a different point of departure. In this way, I produced well over a dozen aborted endings. As one failure succeeded another, the frustration was beginning to get unbearable, when all of a sudden, without warning and "as if by magic", what my friend called a "very Postmodernist idea" came into my mind. Why not include all or, at least, a fairly large selection of the alternative endings? Together they would cover the necessary ground.

So, that is what I decided to do.

There follow eight endings, starting with some thoughts on what might be called "the natural propensity for creativity of the human visual system" and ending with a story that has stood the test of time, which can be related to the catharsis of being released from the travails of an enterprise that has taken so many years to come to fruition. Because they were written independently as stand alone endings, there is a degree of repetition within them.

³ Chapter 8, "Michael Kidner : The big bang, chaos and the butterfly".

⁴ At *The Painting School of Montmiral*, in classes given at the *Joan Zuckerman School of Painting* in Norfolk and at *Wimbledon School of Art* where I went many times as a *Visiting Lecturer* third year *Painting* students and *Post Graduate Drawing* students.

FIRST ENDING : THE HUMAN VISUAL SYSTEM

The human visual system can be said to have evolved to *create order out of chaos*, for how else can one reasonably describe the constantly changing patterns of light that strike the 150 million or so receptors in the retina?

The first step in the process is to make temporal and spatial generalisations of the input. Thus, every receptor converts complex wavelength-combinations into discrete quantities and the ubiquitous receptive-fields have a further averaging effect.⁵ The second step is to search for regularities in the environment by means of different kinds of eye-movement that, due to evolutionary design, are occurring all the time, whether in the form of:

- Seemingly random glides and saccades.
- Search procedures initiated by top-down control processes that have been automatically and preconsciously triggered.
- Movements of head or body.

Upon this base a panoply of interacting neural systems build the apparently ordered world we perceive, filled with familiar objects and perceptions.

However, there are two problems that have to be solved to enable *visually mediated aspects of learning and creativity*. The first is to find ways of decomposing the familiar perceptions, which is a problem because of the fundamental ordering tendency just described. The second is to reconstruct the decomposed elements into a new order. The former, may be called the problem of "deconstruction" and the latter, that of "*reconstruction*". Neither learning nor creativity can occur without both components.

The first five volumes of this series are all much concerned with the subject of *deconstruction*. In them visual systems are described which enable *consciously initiated*, top-down control of visual analysis, using different means of physical or intellectual *constraint* to vary the aspect of visual input being focused upon. These include: deliberately closing an eye, controlling the length of gaze, rotating the eyes, movement through the environment or lack of it and using an existing knowledge-base to direct attention.⁶ Also described are ways in which visual inputs are constrained both by the way that the environment is structured and by unpredictable, attention-attracting events occurring within it (for example, ones triggered by changes in the angle of the sun, by the coming and going of clouds, by movements of objects, by unexpected sounds or by eye-directing instructions from teachers).⁷

Special attention is given to the case of paintings and drawings. Thus, it is pointed out that:

- Images of objects painted on flat surfaces are necessarily created by means of a bit by bit process of adding small quantities of paint, such that the artists have no choice but to experience them as separate elements before they become parts of the ensemble of marks and colours that provide the cognitive cues that give them meaning as images.
- The existence of the illusory space perceived in paintings depends on freeing the colours from being seen as situated on the picture-surface. Aside from the ones that provide cognitive cues, the only visual system capable of performing this separation is the one that, having separated out *surface-reflection* from *body-colour*, makes use of the information provided by the reflectance profile of the former.⁸

The outcome of both these factors is that the visual experience produced by the process of making figurative paintings or drawings is bound to be significantly different to that stimulated by the real world objects which they represent. To a lesser extent, the same is true of finished paintings viewed for the first time. In other words, the processes involved in the making and the looking at paintings are likely to encourage new experiential realities.

In all the volumes in this series, attention has been drawn to two other, interconnected reasons why the *emerging-depiction* functions as a tool for encouraging greater visual awareness: They are that:

- Neither drawings nor paintings made from observation are likely to be completed without making errors.
- Error-analysis necessarily entails comparisons between similar but different elements using same/different judgments, the supreme tool for drawing attention to unpredictable aspects of appearances.

The consequence is that hitherto unnoticed parts and features are brought into consciousness.

^{5 &}quot;What Scientists can Learn from Artists", Chapters 18-21.

^{6 &}quot;Drawing with Knowledge" and "Drawing with Feeling"

⁷ *"What Scientists can Learn from Artists", Chapter 9*, for a more comprehensive list of inputconstraining artistic aids and practices.

^{8 &}quot;What Scientists can Learn from Artists", Chapters 14 & 15.

SECOND ENDING : CREATIVITY

At the core of the definition of creativity is the notion of making something new, whether it be an idea, a painting, a recipe or anything else. Consequently, it involves going into the unknown. But whose unknown? The question is important because the unknown of the creator may not be recognised as such by other people and, if we limit matters to the unknown of the creator, then all learning is creative. It must be so since it involves the person concerned discovering something that he or she did not known before. Take the example of the acquisition of language by young children. Every new word they learn is familiar to innumerable adults, but for them it has emerged over time as the result of assembling into new configurations hitherto unfamiliar concatenations of sounds and sensations coming from a variety of sources in a plethora of different contexts, be they aural, visual, tactile, gustatory, olfactory or emotional. Every child that learns languages can only have done so if he or she possesses the neural equipment for engaging in this complex process of assembly.

Now consider the example of adult beginners attempting to make drawings of the contours of objects from observation. Because they have never drawn before, their eyes are not trained to look in appropriate ways. This leaves them with no alternative but to be guided by habits of looking developed for other purposes (almost certainly ones that do not require analysis of contours). The result will be inappropriate looking strategies and consequent errors. Awareness of these means that attention has been drawn to differences between a contour being observed and a copy of it. Since the errors are by definition unintentional, they will occur in unpredictable locations and draw attention to previously neglected aspects of appearances. In this way comparisons engendered by error detection force new ways of looking and new levels of awareness.

Nor is it only beginners that depend on making mistakes. An analogous argument can be used for highly experienced artists who find themselves mired in the only too common state of affairs known as an "*artists block*". To reach their current level of achievement they must have developed the habits/skills of looking that have made this outcome possible. The problem for them is that it is precisely these formerly appropriate habits/skills that are now blocking their progress. To rectify the situation new habits/skills must be developed capable of transforming the situation for the better. But these new habits/skills cannot come from nowhere: They will have to be built on the basis of already existing lower

level habits/skills. The experienced artists will have to find a new combination of these that will enable them to bypass their old habits of looking and develop new ones that will make it possible to discover and make use of formerly undetected mistakes.

The realisation of similarities between artists of different stages of development encourages us to take a broader perspective. For this purpose a good starting point is the indisputable fact that artists, whatever their current level of achievement, start as children. No matter how advanced they are, obtaining even the smallest step forward in the development of eye/hand coordination requires making use of already existing skills that have been in the process of development since the first days of life. The artists' information-gathering capacities will have been being acquired and extended over days, months and years, making use of an almost inconceivable number of interactions involving their ever-moving eyes and their ever-changing physical and emotional environment. Each and every one of these represents an extension of the experiential world available to them.

Luckily for the human race nobody is exposed to the same sequence either of visual inputs or of emotional contexts. The daily experience of all individuals is different, for every one of us:

- Notices and overlooks different aspects of appearances.
- Feels differently about our perceptions.

This also means that the experience of seeing is different for each individual at whatever stage of development they happen to be. In other words, it is just as true for beginners as for more advanced practitioners.

When making a first attempt at drawing from observation, every beginner can do no other than adopt a personally forged analytic strategy. Sometimes, his or her past has led to habits of looking and doing that facilitate the task, in which case he or she is said to be "*naturally good*" at drawing. Sometimes, previous experience has resulted in the development of skills that cannot easily be applied to drawing tasks, in which case he or she is said to "*lack talent*". My research at the University of Stirling shows that there is no significant difference in basic capacities for making visual measurements (of length, angle or curvature) between bad drawers and good drawers. The difference lies in the appropriateness of the habits of looking that they particular individual has acquired.

These conclusions, backed up by 25 years of observing students at the

Painting School of Montmiral strongly supports the assertion of many drawing teachers that everybody can be taught to draw accurately however incompetent they may have originally thought themselves to be.

Likewise, everybody can learn to use drawing as a powerful tool for expanding awareness, not only of the characteristics of objects in their environment but also of themselves as people.

The key to expanding ones awareness in these ways is the seemingly paradoxical truth that it is necessary to use habit to go beyond habit if we are to find our way into the "*unknown*", that uncharted territory where new perceptions, sensations and ideas are spawned. At first the necessarily unfamiliar situation is chaotic but the brain has ways of making syntheses from the chaos. How it achieves this miracle is still a mystery, but its way of doing so has a long track record of producing sayings along the lines of the one made by Andrew Wiles (the celebrated solver of Fermat's last theorem): "*I was sitting at my desk when suddenly and quite unexpectedly the solution came to me*." While it cannot be disputed that the crucial insight only came because he had been preparing his mind by focusing exclusively on the problem that he was trying to solve over the previous eight years, it seems that, when it did come, it did so "*as if by itself*".

Earlier celebrated creative people used different words, coming from different conceptual frameworks, but their meaning was essentially the same. For example, many of them attributed their synthesising experience to some beneficent outside agency over which they had no direct control. No wonder that they talked of the "grace of God"

But the same miracle happens to each of us every day. True it mostly does so in small ways that may well go unnoticed. However, quite frequently its occurrence is evident, such as when we solve a recalcitrant crossword puzzle clue, or a stubborn everyday problem that has been frustrating us. It only very rarely it happens in ways that take one of us beyond the realms of existing human knowledge into the territory of what the world acknowledges as "*great ideas*".

But what about creativity in painting? Do the same considerations apply? Can all of us, whatever our level of current achievement, aspire to worthwhile creativity? Of course we can, as my beginner students have demonstrated. All that is necessary is for them to have used their unique eyes, their unique store of knowledge and their unique feelings to gather highly complex information from their different visual worlds and put it together in unique ways, and this is something they manage to do, over and over again.

THIRD ENDING : HEREDITY AND LEARNING

One of my strongly felt reasons for writing these volumes was to demonstrate the falsity, in all its interpretations, of the commonly believed saying that, *"artists are born not made"*

Many people are persuaded of the truth of this aphorism, but not necessarily for the same reason. Some assume that it means that artists are people with an *innate capacity for drawing accurately from observation*, others, for whom accuracy has little interest, take it for granted that what is being referred to is *a gift for artistic creativity*. Both of these conclusions imply that there are some people who lack the necessary genetically determined endowments and, in consequence, have no chance of becoming artists. Fortunately, neither assumption stands up to critical examination.

If I had any doubts on this matter, they were conclusively dispelled by the process of gathering the material presented in these four volumes. Accordingly, when I first arrived in Montmiral, fresh from my period of scientific research, I was fully confident that my new, science-based understandings had provided me with ample ammunition to scotch this double nonsense for ever. I felt it would be easy to persuade students that, whether artists are defined as "*people who can make accurate drawings from nature*" or those with a capacity for creativity, the aphorism should be changed to read, "*artists are both born and made*".

There follows a summary of arguments in support of this highly significant modification, first with respect to *capacities for drawing or painting accurately from observation* and second with respect to *capacities for creativity*.

The argument with respect to accuracy:

The experiments done at the *University of Stirling* explored the relative performance of skilled and unskilled adults with respect to *copying accuracy*. They provided evidence to show that, rather than some people being naturally good and others naturally bad at making visual measurements, all had severely limited capacities and all were similar with respect to the average size of the errors they made.⁹ This conclusion gains support from:

• The history of the artistic practices that have been widely used by the artistic community, including all the acknowledged masters, whose usefulness

⁹ At least with respect to making judgements of the relative lengths of lines, the angles between them and the relative positions of their end points.

is only explicable in terms of a need to compensate for unreliable analytic skills.

- In-depth studies of eye and brain function that suggest an abundance of plausible explanations for the universality of poor performance.
- Observations of my students, including professional accurate drawers, when first faced with unfamiliar material. All consistently made errors that were often larger than the averages produced by my experiments.

However, despite these limitations, it is the experience of teachers like Betty Edwards¹⁰ and myself that, with the help of appropriate training, virtually everybody can achieve high levels of accuracy when drawing from observation. These volumes provide not only a massive amount of evidence to show why this is the case but also offer in depth suggestions concerning appropriate training. In other words, they show that, whatever initial appearances my suggest:

All people have the eye/hand coordination capacities necessary for becoming an artist, according to the first of the two definitions given above.

The argument with respect to creativity

When considering the nature of *creativity* earlier, the conclusion reached was that at the simplest level of description it requires two stages. The first is to decompose an existing order and the second is to re-order the decomposed elements in new and satisfying ways. The tools that enable decomposition are available to us all. They harvest the *fruits of interactions with the environment in* either *chance-driven* or *knowledge-driven* ways:

- *Chance-driven* depends on unpredictable, attention-grabbing happenings which can be: provoked unintentionally as a consequence of eye, head or body movements, stimulated by external events, indicated by other people (for example, teachers) or brought to attention by *comparisons*.
- *Knowledge driven* depends on deliberately guiding attention either in new directions or to different levels of description. The former depend on strategies that provoke *chance-driven* outcomes involving *comparisons* of inputs to the eyes, whether produced by rotating the eyeballs, moving the head or displacing the whole-body. The latter involve deliberate switches of attention from one modality of input to another (for example, from contour, to

10 Betty Edwards, 1979, Drawing on the Right side of the Brain, Tarcher, Los Angeles.

colour or to texture).

In themselves these manoeuvres can do no more than draw attention to parts of a scene that had so far been overlooked. However, since the location of these will always be unpredictable, the outcome can only be an expansion of visual awareness. Whether knowledge-guided or otherwise, this will involve going down the levels of description, from wholes to part and then from parts to parts of parts, to details, of parts and so on (landscape, tree, branch, twig, bud, shape-type, curvature-type, etc). If recognition takes place at any of these stages, artists will have the option to stop and draw the recognized element from information in memory. To continue, down the levels of description, new search activity will have to be triggered, whether by knowledge-driven strategies or by chancedriven ones. In any case, it will involve further use of the analytic looking cycle and further comparisons. The degree of plausibility of the outcome will depend on the nature of the information stored in memory, relating not only to the current level reached but also to previous levels reached, for the descent through descriptions involves an accumulation of knowledge that can be used by the artist. Efficiency with respect to this accumulation is something that can be learnt and enables skilled artists to draw seemingly accurately from memory. However, they can only do so if they go far enough down the levels of description and if they are able retain information from higher levels in memory.

If nothing familiar is discovered at any one level, the process of comparison will run on until it reaches the level of the *visual primitives* within the domain of the visual systems being privileged (for example, those dedicated to the analysis of contours, of surface-form or of colour relativities). Since these are the building blocks of all visual perception, they will always be *familiar*, and since they are by definition the simplest forms, they can always be remembered with the highest possible level of accuracy. In other words, it is here that what we "*see*" and what we "*know*" are the nearest to being the same. Accordingly, artists whose goal is the highest degree of *accuracy* must descend to this level.

However, breaking a scene up into bits that can be drawn accurately leaves open the question as to how we put them together again. Though extremely familiar in themselves, the *building blocks of visual perception* have no meaning except as themselves, unless integrated into a meaningful context: for the artist seeking *accuracy*, this means the scene he is depicting as a whole. We do not know precisely how this is done but it is clear that it depends on the use of both *working memory* and *long-term memory*. The *working memory* makes use of the recent accumulation of knowledge relating to the specific scene,¹¹ and the *long-term memory* provides what might be described as "*templates of appearances*" and *knowledge of structure* that can guide integrative looking strategies.¹² In both cases, the memory stores concerned are influenced both by *inborn characteris-tics* and by the *fruits of experience*. As there is a great deal of variability in the genetic inheritance and as no two people's experiences are the same, this means that the synthesis of each individual will tend to be unique.

But there is another less abstract and more common way of thinking about creativity, namely in terms of the trail left by each learning experience. It can be illustrated by reference to the example of reactions to the brushstroke by brushstroke accumulation of colours that make up a completed painting. Every new application of paint that comes in response to any of the steps in the decomposing processes, just described, will come with unpredictable characteristics (location, shape, colour). The more so because of the inevitable differences between intention and realisation that occur, partly on account of the unavoidable limitations on the artist's palette of colours and partly as a consequence of the experiencedependent, generalising nature of the brain's output instructions. The array of colours shapes and images that result will be an example of creativity, even though the artist has experienced its production as a stream of learning experiences that seem to him or her to have little to do with originality, inventiveness or imagination. Indeed, since literal accuracy is in theory unobtainable in the case of colour matching and in practice unobtainable in the case of shape description, they can always be described as a succession of failures with respect to achieving objectives. Too often students see them as such and find themselves preoccupied with self-deprecatory feelings relating to what they perceive as their ineptitude. They can be so convinced of their shortcomings that they cannot understand or give credence when, as is often the case, their finished paintings are greeted by admiring comments.

Other artists can be excited by the unpredictability of the process and might find themselves assessing matters in a more open-ended and positive way. They might feel encouraged to further develop matters: instead of analysing nature, they may start asking questions of the painting in a more open minded way, allowing for the possibility discovering new criteria. Instead of, "*how can I accurately characterise this colour or shape*?", the artists would have to embark upon a sequence of "*What if*?" questions. For example, "*What if I increased the difference between these two reds*?" or , "*What if I made the blue and the orange more equal in lightness*?" The outcome would be another journey into the unknown. This time it would be the combination of the serendipities within the totality of the marks produced and the artists responses to them that would be directing the journey. In effect, the painting would be painting itself through him or her, as enriched by his or her unique combination of heredity and experience.

From the above we can conclude that all those who engage either with the analysis of natural appearances or with drawing or painting in any of their manifestations have the possibility both of being confronted by a personal chaos and of finding their own order within it. It follows that there is nothing to stop anyone, who seeks it, from experiencing in personal creativity. In other words:

All people are born with and cannot help but accumulate the capacities necessary for becoming an artist, according to the second of the definitions proposed above.

As so often, Matisse has a way of summing up the situation, "*Creation is the artist's true function. Where there is no creation, there is no art. But it would be a mistake to ascribe this creative power to an inborn talent.*"¹³

Outcomes

As indicated earlier I was confident that the persuasiveness of above arguments would make it easy for me to convince everybody, whatever their current level of achievement, that they can learn both to be accurate and/or to be creative. Nor was my confidence ungrounded. Over the years, my experience as a teacher provided substantial evidence in support of the claim that anyone that can be persuaded to put their trust in the evidence just summarised and who has sufficient motivation to persevere, can make very significant and often spectacular progress.

Unfortunately, experience has also shown that some people are extremely difficult to persuade. Despite all my efforts at information-based persuasion, they still see mistakes as evidence of their ineptitude and the hopelessness of their prospects. To help these stubborn cases, there is little I can do but repeat the list of reasons why they are having so much difficulty. In particular, I recall my introduction to the drawing lesson described in "*Drawing with Feeling*" where I warn that: "*common sense, my long experience as a teacher* and *the scientific evidence suggest*

¹¹ An important ingredient of the drawing lesson in *Chapters 9-11* of "*Drawing with Feeling*", *Book 1* of "*Drawing on the Right Side of the Brain*".

¹² The subject of "Drawing with Knowledge", Book 2 of "Drawing on the right side of the Brain".

¹³ Unless we describe the fact of being a human as an inborn talent.

that some people will find the going tougher than others". It would be extraordinary if everyone were simultaneously to reach exactly the same stage in their development of the relevant eye/hand coordination skills: some will have advanced further than others, and it will be the rank beginners who are faced with the biggest gap between aspiration and performance. Nor is it surprising that amongst these there are some who loose courage and blame their predicament on unfortunate heredity.

But all the evidence is against this conclusion. Once again I plead with the doubters, once again reassuring them that if only they will give a fair trial to the ideas and suggestions on offer, they will be pleasantly surprised at the progress they will make. To encourage them further, I tell them of other students who arrived with capacities as poor or worse than theirs and who were drawing at a high level by the end of the course.

I also tell of one of my "*failures*". Despite being quite unusually inept when she first arrived, a woman student desperately wanted to realise a long standing dream of being able to draw. She had no previous training, but trusted in my teaching and worked hard for long hours during the course. However, despite giving her a great deal of extra attention, she made hardly any progress. For the first time in my teaching career, I felt defeated. But as it turned out, I should have had more confidence in the student. The next I heard of her (only a few months later), she had been accepted as a student in Art School. Since then, she has become an art teacher and has exhibited her work internationally. When I asked her how this seeming miracle had occurred she told me that, when she got home from Montmiral, she worked at drawing from observation for two hours each day, basing her efforts on what she learnt from me. Before too long, she found that she was making progress and felt encouraged to persevere. The rest was now history.

In summary, my hope is that nobody, who has read these books, will allow themselves to be influenced by arguments based on the ill-founded belief that "*artists are born not made*".

FOURTH ENDING : PAINTING IS LIKE WRITING

When describing the ideas behind my early abstract paintings, I wrote of my determination to thoroughly test the dogmas of Marian Bohusz-Szyszko.¹⁴ My way of doing so was to give as little thought as possible to a first application of colours, which I bashed in "*any old how*" and "*any old where*", before taking a deep breath and facing

up to the resulting mess, armed as I was with the two rules of not repeating colours and of always using mixtures containing some proportion of complementary. In this way I became accustomed to long battles in which the original chaos gradually gave way to a sense of everything working together. Later, I used the same method for my figurative pastel paintings, working fast, sometimes in the darkness of *contre jour*, and with as little thought for organisation as possible, before spending days or, more usually, weeks making rigorous use of my *self-imposed constraints* to help me make something worth while of the result.

When I came to setting out on the task of producing a book, I had lots of ideas in my head (as it turned out, more than enough to fill these four volumes), but, having had a very limited experience of writing, I had no confidence in being able to organise them. To get myself going, I decided on a policy, similar in spirit to that adopted for my paintings, of bashing on regardless and seeing where that led. Somewhat to my surprise, I found that, to my perception, the outcome of this approach was of a stream of crystal clear ideas bubbling out like water from a mountain spring. Buoyed up by what proved to be a period of *massive self-deception*,¹⁵ I was amazed how easy it was. Even when I re-read the latest addition to my manuscripts, I could not help being pleasurably astonished at the high quality of the writing.

The first warning sign came when friends, kindly reading my efforts, kept finding what they called "*typos*" (word-processing errors). Some of these were unbelievably gross. How could I have been so blind? But much worse was to come when, after an interval of some months in which I occupied myself with other tasks, I began what I thought would be the relatively easy task of giving my "*chef d'oeuvre*" a last polish. What a shock it all was! I felt like Xavier Krebs in his studio the morning after being convinced that he had painted a masterpiece, finding himself faced by an unequivocal disaster.¹⁶ Months and, indeed, years of further work lay ahead, during which I discovered that I could go over and over the same paragraph, time and time again and still leave it in a state that, in the work of any other writer, I would immediately recognise as embarrassingly unacceptable. From all this salutatory experience, I can only conclude that, if my texts are now less badly written, it is as a result of processes almost identical to those by which I refine my paintings. When I look back at the number of corrections and re-writings I am left wondering how all the great writers of the past could

^{14 &}quot;Painting with Light", Chapter 1.

¹⁵ Chapter 9, section on "self-deception".

¹⁶ Chapter 9, Ibid

have managed without the miraculous editing powers of the word processor.

In sum, creativity is a messy business, requiring sustained motivation and a great deal of luck. The extraordinary thing is that these two ingredients so regularly come up with palpably worthwhile rewards. Should we follow the many famous creators who have thanked *God* for performing miracles of this kind? Or should we simply be grateful to the *processes of creation* for evolving brains which, if given half a chance, will achieve them all by themselves?

FIFTH ENDING : SERIOUS AMBITION

For some of my students painting is a pastime, for others it is a vocation. For these latter, the issue of *originality* is often of prime importance, and here lies a problem for, how can anyone know how to do something that has never been done before? As Degas put it, "You can't make art on purpose". In their search for a way of responding to this central conundrum of creativity, these students will spend an inordinate time in Contemporary Art Galleries or reading Contemporary Art Magazines trying to fathom what is special about the artefacts featured in these places. Amongst the things that their researches reveal is an emphasis on *noveltv* and this is often taken by them to imply that paintings that have any similarity to those of artists of the past (however recent) are to be frowned upon. The situation has been particularly difficult in recent years when the taste-setting galleries and magazines have concentrated on work that explores ideas that are best presented by means other than that of paint on a picture-surface. As a result, painters feel themselves to be in a no win situation. They fear that if they opt for doing either what they know how to do (namely, paint) or what they want to do (namely continue to paint), they will thereby deprive themselves of the possibility of making the significant work to which they aspire.

However, not all manifestations of the desire-for-originality problem are perceived in such radical terms. For example, it is quite common for artists who have reached a high level of achievement with respect to one way of making paintings to feel that they have arrived in a *cul de sac*, and want to find another point of departure. Particularly prevalent is the case of those who have excelled with respect to *pictorial realism*,¹⁷ and now want to find a more *personal* and *expressive* style involving distortion, abstraction or construction. The problem is that, when trying to make this transition, there is a high chance that the working practices that have been successful in the past will get in the way of achieving new goals. Indeed, it is often the case that the best way of making progress will involve a temporary regression. A new start will require revisiting lower level skills.

For example, it might involve going back to basics in the ways advocated in the drawing lesson described in "*Drawing with Feeling*".¹⁸ This can be a difficult step since, when deprived of the familiar ways of doing things, these highly skilled artists are likely to find themselves performing like *complete beginners* with respect to making judgements of relative lengths and orientations.¹⁹ If this is the case, I need to convince them that there is nothing to worry about.

I have two approaches to doing this. The first is to reassure my highly accomplished students that what has happened to their performance is normal. To buttress my case, I cite my experimental results, which show that skilled artists perform just as badly as beginners when faced with unfamiliar contexts. The second is to provide anecdotes that take the form of examples of how advanced students have fared when being forced to eschew the props on which they had previously relied. Although at first their level of accuracy has plummeted, it was soon clear that their previous experience has not been wasted. Higher-level skills are always built on a scaffolding of lower level ones and experienced artists are almost certain to have more developed underpinning skill-structures than beginners. Even though the acquisition of the required new analytic-looking skills necessitates a degree of dismantling, what remains is substantial and will give the experienced artists are quite normal and will very soon be left behind: A day or two is usually sufficient.

Another manifestation of what, at its roots, is the same problem, faces artists who have found a gallery to represent their current work, but feel the need to develop it in new ways, often in the direction of the latest *avant garde*. Widespread rumour has it that changes in style will not be well received by gallery owners and, needless to say, it can be difficult to embark upon open-ended experimentation if ones livelihood may be threatened by doing so. What should the artist do: stay with the old ways or plunge into radical change?

My advice is to take time to consider the situation. In theory and sometimes

¹⁷ Often to the level of basing successful professional careers on them.

¹⁸ Book 1, Chapters 8, 9 &10 of "Drawing on Both Sides of the Brain".

¹⁹ *"What Scientists can Learn from Artists", Chapter 8* gives details the research results which show that all people, beginners and advanced artists alike, have poor capacities for making accurate visual measurements when drawing unfamiliar shapes and arrangements of lines.

in practice, radical new departures can stimulate exciting work, but they can also lead to *cul de sacs*. Success depends on establishing hitherto untried foundations, which is never an easy option. It can require a great deal of stubborn self-belief and more perseverance than many can cope with.

In contrast, while it is true that continuing with the old way of doing things has too often led to stagnation, it is also a fact that the overwhelming majority of the acknowledged greats have made good use of *slowly evolving, coherent, feeling-driven growth patterns*. Despite fears to the contrary, there should be no reason why adopting a less spectacular approach of this kind should not produce original and interesting work. It is well to reflect how often a slow but steady approach has led eventually to mind bracing change, not to mention its positive record as way of maintaining the interest and support of the gallery owners during times of transition.

None of the above discussion alters the fact that whether the choice is in favour of a decisive break with the past or, of slow evolution, there is always a risk that it will not turn out well. However, that is a state of affairs that no artist who aspires to serious creativity can or should want to avoid.

SIXTH ENDING : LIVING WITH UNCERTAINTY

Most people like to feel that they *know what they are doing*. It may never occur to them that this might be a bad thing. What they are overlooking is that *knowledge of outcomes* is incompatible with creativity. It must be so since, by definition, creativity entails *making something new* and since logic decrees that novelty can only be achieved by journeying *beyond knowledge into the un-known*. Accordingly we have no alternative but to accept that only initiatives whose outcomes cannot be predicted can lead to creativity.

Unfortunately some people find it difficult to cope with the *inherent uncertainty* of the situation. These doubters can be comforted by statistical evidence suggesting that seriously undertaken and tenaciously pursued learning journeys have a very high chance of producing worthwhile results. Consider, for example, the astonishingly high proportion of doctoral theses, dealing with a huge variety of subjects, that have succeeded in unearthing something novel about our world. Or, look at the outcomes of any initiative that you yourself have gone into both seriously and with an open mind. Has it ever failed to bear at least some unexpected fruit? However, theories are one thing and practice another. Going into a subject seriously can only too easily lead to a longer journey than expected, and openmindedness means being prepared to have deep seated preconceptions overturned. Continuing to make objects that do not fit in with previously cherished values may require both a strong willpower and a great deal of trust in the potential of the chosen path. To give two examples of artists who kept going in face of this kind of uncertainty:

- Matisse's desire to push himself beyond his preconceptions led him to make paintings that he and others found abrasive.²⁰ But, far from being deterred, he saw the abrasiveness, as evidence of the possibility that he had pushed himself into the "*unknown*". True, his negative reaction could signify that something undesirable had occurred, but it could also mean that something new and potentially exciting was shocking him out of his comfort zone. The problem was to decide which of the two alternatives to choose. Making the required value judgement was a key step in Matisse working process and required a period of gestation, reflective thought and, if necessary, further experimentation.
- As recorded in *Chapter 6*, Michael Kidner's *conceptual framework* took him for long periods of time away from his interest in *colour in its own right*, which was not at all what he had hoped would happen. On occasion, it even took him away from painting itself.²¹ But it never took him away from creativity. On the contrary, it opened up new pathways.

In both these examples, the point to stress is that, at a given time, something about the product of a learning journey was difficult to accept. One of the conclusions indicated by the evidence presented in these four volumes is that an analogous difficulty must have faced every single artist who has ever achieved significant creativity. If we allow existing knowledge to guide all our actions, the outcomes can only be the products of *past ways of doing things* (the downside of *academicism*). All who want explore the unknown must careful not to let preconceptions create barriers that block the way either to experimentation or to the forging of new conceptual frameworks. All must learn to live with the *uncertainty* inherent in journeying in the unknown.

In short, while we should never dismiss out of hand what our feelings are telling us, we should hesitate before assuming that negative feelings mean negative outcomes. Due to the fact that our brains are *habit-driven*, our feelings have an in-built

²⁰ Hilary Spurling, 2005, *Matisse – The Master*, Hamish Hamilton, London. Shukin made a habit of only buying paintings he did not like.

As did the learning journey of Marcel Duchamp and Ellsworth Kelly

tendency to be react negatively to the *novelty* which is an essential ingredient of the creative process.

But, be warned. This does not mean that a negative reaction guarantees that something must be good. I once met an artist who saw the fact that nobody liked his paintings as evidence of their high quality. Clearly he was taking a potentially plausible argument to absurdity.

However, a negative reaction does always provides an opportunity for questioning both habit-driven behaviour and the criteria upon which it has been built. Artists need to follow Matisse in striving to keep their minds open to the very real possibility that negative reactions, whether of themselves or somebody else, open up pathways to creativity.

It is the same in science. If experiments produce results that are inconsistent with currently accepted theory, there are two possibilities: Either they have mould breaking potential or they are badly conceived. Both should be taken into account before getting too excited or downcast, and it can be extremely difficult to decide between the two. Normally it can only be done by means of further experiment.

SEVENTH ENDING : SEEKING VALIDATION

Everybody wants to produced good work. For some this means achieving "*accuracy*" and for others, "*significance*". In the end each individual must learn to judge these matters for themselves. However, whatever, the nature or level of their ambition, almost everyone is sensitive to the opinion of others. Most are concerned with the reactions of their friends and contemporaries, though it is by no means rare to come across artists who proclaim themselves more interested in long term recognition. As a teacher, I have thought of various ways of responding to the widespread unease of students concerning these worries, each provides a different perspective on essentially the same issues. Here are five of them.

A learning experience

The first response is to ask the students whether they feel that, for them, the process of making the drawing or painting in question has involved a *learning experience*. Most answer confidently in the affirmative and, even if they show doubts, it is usually easy enough to uncover learning outcomes suggested by their work to which they will admit.

Once the existence of *learning* is acknowledged, I can take the process a step further by pointing out that, by definition, the process of acquiring new knowledge means taking steps along previously unexplored pathways in unknown territory. I can also suggest that although nobody can know where these will lead, they will inevitably open up questions, and that these will always be capable of initiating further research and leading to new discoveries. It follows that benign cycles of this kind are intrinsic to all productive learning journeys and, consequently, a part of all artistic growth.

The rewards are particularly well summed up by Norman Doidge: "We must be learning if we are to feel fully alive, and when life and love becomes too predictable and it seems that there is little left to learn, we become restless."²²

Which is the more important?

The second response to student who doubt the significance of their artistic output comes to similar conclusions. It starts by asking a question: "Which is the more important in a two horse race, the winner or the looser?" When I ask this question I find that most people immediately assume the former (unless they suspect a trick question), presumably because it is the answer our culture has brainwashed us to make. But how can winners win without there being losers to come in behind?

Within the community of scientists, it is the unobtrusive efforts of the large majority that favours the emergence of the occasional frontrunner responsible for a paradigm shift that can be equated with the winning post in the two horse race analogy. Without these unheralded contributions, progress could not have taken place at all.²³ This being the case, how should these less trumpeted members of the supporting community assess their input? And what about the scientists who come up with breakthrough ideas only to find that they have been beaten to the finishing post by someone who has independently come up with the same idea? Have they been any less creative?

As a way of discussing the issues that lie hidden in these questions, I turn to the example of my own scientific experiments, as described in *"What Scientists can Learn from Artists"*. How should I evaluate their outcomes? Do subsequent events support my original gamble on the possibility that coming to science with the perspective of an artist might open up useful new pathways? Or, since science

²² Norman Doidge, 2007, "The Brain that Changes Itself", Penguin

²³ John Waller, 2006, Fabulous Science, OUP.

is supposed to be going forward at a hectic pace and since the main scientific ideas in these volumes are more than twenty years old, has the passage of time rendered them redundant? And, even if the answer is "*yes*", does it matter? Two examples help us to think about these questions:

- Is our achievement in producing our own *colour-constancy algorithm* diminished or enhanced by the fact that, when we tried to publish, we found that unknown to us a sizable clutch of other people had come up with their own *lightness algorithms*?²⁴
- Is the value of our ideas concerning the fundamental role of the emotions in all brain-guided activity validated or invalidated by my subsequent discovery of the fascinating work of Antonio Damasio²⁵ and Joseph Ledoux.²⁶

For me the answer is clear. By whatever route they came to me, the ideas fuelled the progress of my own journey of discovery. Not only did they provide me with the unparalleled excitements that go with the creative process when pieces of a complex jigsaw start falling into place, but also they had an enormous influence on the path I was to take with respect to later initiatives, whether these related to my ongoing research into eye and brain function, to the creativity of my interactions with colleagues, to my painting, to my teaching or to any other aspect of my life's adventure. Nobody else has or could have used the ideas in the same ways.

Who chooses the finishing post

The third response returns to the analogy of the horse race. In a first-pastthe-post competitions of this kind, we have a simple criteria for deciding which is the winner and which the loser. With respect to the progress of art and science the situation is far less clear. If there are any winning posts, they are countless in number and nobody knows quite where they are. We should not be surprised if nobody is looking for a winner at the critical moment. As the poet wrote:

"Full many a gem of purest ray serene

The dark unfathom'd caves of ocean bear:

Full many a flower is born to blush unseen,

And waste its sweetness on the desert air."²⁷

Annie Hulbert, 1986, "*Formal connections between brightness algorithms*" Journal of the Optical Society of America A, Vol. 3, page 1684

27 From Thomas Grey's "Elegy Written in Country Churchyard".

Even if they are noticed, significant departures and mould-breaking ideas have only too often taken a long time to gain appropriate recognition. In many cases the process has required more than a lifetime, as is illustrated by the cases of Vincent Van Gogh and Gregor Mendel.²⁸ No wonder that one of the most challenging problems for artists is assessing their own work. This is why I have suggested that my students should consider the matter in terms of deciding whether or not they have been experiencing a *learning journey*. As repeatedly emphasised, learning always means opening up at least one pathway of exploration. The explorers might not be able to tell where the process is leading them but they can be sure that it is going somewhere. Work done in this spirit will rarely fail to have the quality that seems always to accompany genuine, open-ended research. It will certainly have meaning for the artist and it will give the best chance of value for others.

Alternative value systems

The fourth response to the widespread unease concerning validity of ones own artistic output focuses on the role of *constraint* in creativity. As has been emphasised throughout these volumes, there are many kinds of conceptual frameworks that can help artists and scientists by providing thought constraining limitations. In the majority of cases well established divisions such as those between Art and Science provide over-arching domains of enquiry. Within these there are many widely accepted sub-domains such as painting, drawing, physics, chemistry, etc., each of which has its own hierarchy of subsidiary conceptual frameworks. However there is always the possibility of finding cross-domain exceptions. An example would be when artists and scientists from any of these sub-domains pool their different experiences when working on shared projects.

The opportunities for creativity provided by inter-disciplinary cross-fertilisation are a well known. There are an abundance of examples of how physicists have inspired chemists, how chemists have helped molecular biologists, how mathematicians have helped physicists and of how one school of artistic expression has gained inspiration from another. As repeatedly emphasised in these four books, this is because each artist or scientist brings unique ways of seeing and thinking that has been developed over a lifetime and, as a result, the potential for cross-fertilization of ideas is ever present whether in the context of cooperations between individuals or within or between groups.

²⁵ Antonio Damasio, 1995, Descartes 'Error, Picador

²⁶ Joseph Ledoux, 1998, *The Emotional Brain*, Phoenix.

²⁸ John Waller, 2006, *Fabulous Science*, OUP.

Examples of different perspectives that have been brought from one domain into another, would include the jolt to the preconceptions of the *early Modernist painters* provided by *Japanese* woodblock prints or the way that the constraints of computer modelling have provided food for thought to students of brain function. Sometimes, the constraints in both art and science come from the use of mechanical aids, as when artists have used the perspective-frame or the photograph, or when scientists have sought help from the microscope, telescope or spectrometer. Sometimes the benefit for individuals derives from limitations due to heredity, like myopia, dyslexia or amblyopia ("lazy-eye"). In some contexts, these may make life difficult for those that have to live with them, but in others they can be a distinct advantage even if only because they create problems that others do not have to face. In this way, the seeming defect opens up new ways of looking and, consequently, the possibility of finding solutions that people without it would be less likely to stumble upon.

Having thought about these related questions and issues over the years, I have come to the conclusion that, at a fundamental level, they are beside the point. My personal journey has proved to be intensely stimulating and, whether they came in first, second or last in the race for recognition, the ideas about colour constancy, analytic-looking, constraint, context and the role of the emotions have proved their worth in providing insights of value within the small pool of researchers which contains myself, my colleagues and my students.

In summary, winners can only arrive first at the finishing line if there are others coming in behind them and, since creativity depends on constrained chance, there is no alternative to facing up to risk and insecurity. According to the gene-pool theory, it would be stupid to deny the ecological value of both lichen-coloured and black moths whether the air is polluted or not, for one will always be available to ensure the survival of the species and the other will be there to feed the birds. All we can do is get on with being ourselves, knowing full well that our weaknesses can be our strengths and that, even our strengths, are no great disadvantage, if we don't get too uppity about them.

Artists are like scientists²⁹

The fifth and last of my list of responses to the unease of my students concerning the value of their work compares artists to scientists, os to suggest that artists when making paintings are necessarily in the same position as scientists doing experiments. In both disciplines, all efforts would be would be meaningless if the experimental outcomes could be predicted with any certainty: If it is possible to predict the rewards of carrying them to their conclusion, the experiments are not worth doing. The whole procedure can only be a gamble. For this reason, those who want to make new discoveries or original contributions must live with the fact that there is no alternative to living with uncertainty. Anyone who claims otherwise is deluding himself or herself.

As some experiments yield more interesting results than others, potential experimenters may want to know the odds relating to the value of the outcomes for theirs. In the case of scientists, the statistics should be reassuring for, al-though few achieve major breakthroughs, a large majority succeed in making valuable contributions to the collective effort of the scientific community as a whole. The fact that only a small number of these have come to public notice does not mean that the remainder are not valuable. History shows conclusively that playing a humble role in a cumulative process involving numbers (often very large ones) of scientists, possibly working in different places, sometimes involving different generations, can prove to be quite as important to the march of progress as the mould-breaking discoveries of their more celebrated brethren. Without the confirmation and elaboration by means of less glamorous investigations, the great theories would never have gained the acceptance.³⁰

It is also worth pointing out that, although the most obvious value of the experiments of scientists resides in the experimental results, it is far from the only one. Also of great importance is the dynamic that comes from being a part of a collective enterprise, undertaken by large numbers of coworkers operating in the same domain. As with all group activities, a sense of belonging sustains motivation for all members, particular when they feel themselves to be playing a part in a enterprise that is flourishing in terms of experimental outcomes.

There is no reason to suppose that the situation of the artists is any different. As with the scientists, they work as communities engaged in common enterprises. Even the most humble of the members of a community is making a contribution. Nor do the members of the group have to work in close proximity. Van Gogh, Emile Bernard and Toulouse-Lautrec befriended each other as students the studio of Cormon, but soon went their separate ways. However, they kept in touch and, as time went by the circle, widened to include Gauguin and through him the Nabis and the Fauves. All were influenced by the *Impression*-

²⁹ See also *Chapter 3: The science/art debate*

³⁰ John Waller, 2006, Fabulous Science, OUP.

ists and by Seurat and Cézanne.

Nor should it be forgotten that they were also part of a wider group which included Symbolist poets, *Avant Garde* composers of music and mould-breaking scientists of visual perception. It was in the ferment and cross-fertilisation of multidisciplinary ideas that they found the context for their individual creativity.

EIGHTH AND LAST ENDING : THE GOOSE IN THE BOTTLE

Finally, as promised in the *Preface* and other places, we come the goose in the bottle, and how this highly constrained bird features in a brief story which has stood the test of time. I have chosen to bring my series of four volumes to a conclusion with this particular story for a number of reasons. One of these is that, the experience of my head bursting with the multitude of ideas that stubbornly resist organising themselves satisfactorily on the page has often seemed a bit like the seemingly insoluble problem around which the story of the "goose in a bottle" revolves. Another is that, despite the frustratingly long time it has taken to bring my texts to what I feel to be approaching the best I can do, the process of writing them has been characterised by a drip feed of deeply rewarding moments.

But perhaps the main reason for choosing this particular story for my final ending is that, since the process of writing these volumes has necessitated a review of so many different strands of my life's journey, it seems appropriate to finish with something that has proved to be of special, personal significance, and the mind-opening implications of the story of the *goose in the bottle* have been sustaining me since I was a teenager. It comes from the literature of *Zen Buddhism*. Some readers may know it already. If so, I hope they will enjoy another telling:

Books on Zen are full of examples of Masters confronting searchers after enlightenment with silly puzzles (known as "*koans*") like, "*What is the sound of one hand clapping*?" Thus, the searcher in this story will not have been too taken aback by the *koan* of the goose in the bottle:

"If you place a goose chick in a spherical glass bottle with narrow neck and feed it with rice grains and other tidbits until its body fills the sphere and its neck fills its neck, how can you then get the now fullgrown bird out of the bottle without breaking the glass or killing the goose?" Nor will our searcher have expected to find an easy solution. The evidence provided by his predecessors will have forewarned him that his personal mindteaser might resist all his best efforts at finding a solution for a number of years: maybe two, three, five or even ten. Accordingly, when he went back to his daily chores of hulling rice, raking the garden and doing the washing up, he will have been obsessively turning his "*insoluble*" problem over and over in his head, using every mental resource to work out how on earth it could be connected with the enlightenment which he so ardently seeks.

Almost immediately, he would have abandoned, not only the logical approach of finding ways of distorting either the bottle or the goose but also cheap trick solutions like waiting patiently until the goose died of natural causes and decomposed in the way of all living things. He knew from the start that the Master had something more profound in mind and also that there would be no short cut. His determination and, perhaps, his pride were such that he battled on for day upon day, week upon week, month upon month and year upon year.

All was not negative, for our searcher's obsessive daily cogitations led him to realise many thing of deep personal significance. Although encouraged on this score, he remained baffled by his *koan*. However, as long as he was not prepared to admit defeat, he saw no alternative but to persevere.

Nevertheless, it turned out, even our searcher's determination had its limits and, after nine years, still finding himself unable to escape from his mental *cul de sac*, he gave up on his attempts to solve his *koan* and returned "*defeated*" to the Master.

The Master, recognising that his mind was at a tipping point, quietly asked him to sit down. After a few moments of silence, he bowed his head slightly before indicating an unexpectedly simple resolution to the *koan*, which can also be taken as the universal solution of the theoretically insoluble problem of knowing how to go beyond knowledge and, thereby, liberate the creativity that lies within us all. His mind and life-transforming words were simply:

"There, its out..."