The Shout of Joy

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In the narrow, rationalistic, technological, programmable world I have been talking about, we are continually required to deny the reality of our own experiences. This takes the form of a post hoc rationalisation of what we have experienced. In order for it to be significant, we are required to show that it is the outcome of a series of logical sequential steps which led to an end result. I am not here suggesting that such logical sequential steps do not have their part to play nor am I suggesting they are insignificant. I am however suggesting that they are but a tiny part of the totality of human experience. However, even in research and development laboratories where large groups of teams are working together, innovations, concepts for new ideas are still based on the insights of individuals and that those insights and ideas are the stimulus for a research and development activity or for the identification of a product which may ultimately result.

Since, however, insight like imagination and intuition is not quantifiable, is not predictable, and is not repeatable, its significance is always underplayed if not totally denied. This denial is built in at the very root of our scientific methodology, a methodology which is dominating our thinking in all fields of human endeavour. We all of us tend to construct an edifice of post hoc scientific explanation since deep down we have a fear of that uncertainty and that unpredictability which is at the root of intuition, imagination and creativity. Let us suppose for a moment that we encounter a great and acclaimed scientific thinker who has codified the laws of thought and in

doing so has laid the basis for the use of mathematics as a model of thinking. Let us suppose that this great scientific thinker has produced a philosophical and scientific framework for rationality. Let us suppose that following profound scientific and philosophical discussion, these ideas were found to be internally consistent within a logical framework. Let us further suppose that this framework was the basis for mathematical modelling of thought processes which showed that thinking could be modelled and these models could be based on mathematics. Let us then suppose that this work had been massively funded worldwide to the level of billions of dollars annually and all of this work demonstrated in its own self consistent terms that there were logical, scientific and mathematical ways of modelling thought processes. Suppose then we were to meet the originator of this huge and mathematical scientifical edifice of analysis and we asked them how they arrived at their concept of this scientific construct. We would be alarmed if they told us "I was told by an angel". Our alarm would not be lessened if they added that they were told by an angel in a dream, yet it would seem that that was exactly what did happen. On the night of November l0th 1619 Daca had a series of three dreams in which the angel of truth revealed to him a secret which "would lay the basis of a new method of understanding and a new science".

The significance of such dreams, revelations, brainwaves, insights, sparks of imagination are usually carefully omitted from post hoc analysis. It seems to be slightly more acceptable to refer to them in the context of the arts. To do so is indeed of longstanding. Socretes pointed out: "The authors of these great poems which we admire do not attain to excellence, to the rules of any art. They utter their beautiful melodies of verse in a state of inspiration as it were possessed by a spirit of their own". (*The unknown guest* p. 7)

Stephen Spender, whilst emphasising the importance of "Work" on a poem, states: "Inspiration is the beginning of a poem and it is also its final goal ... My own experience is certainly that of a line or a phase or a word or something still vague, a dim cloud of an idea which I feel must be condensed into a shower of words". He points out that Paul Valéry speaks of the "una ligna donne/e" of a poem. One line is given to the poet by God or by nature. The rest he has to discover for himself. The significance of childhood and early images is emphasised when Spender says: "All poets have this highly developed apparatus of memory and they are usually aware of experiences which happened to them at the earliest ages and which retain their pristine significance throughout their lives." One might refer to Dante's meeting with Beatrice which became the symbol around

which the devine comedy crystallised. The experiences of nature which form the subjects of Wordsworth's poetry were an extension of a childhood vision of natural presences which surrounded the boy Wordsworth. The decision in his later life to live in the Lake District was one based on the desire to live on those childhood memories which were the most important experiences in his poetry. One might cite Rilke's notion of words rising up and imposing themselves upon him and they being "the most mysterious". One might cite Mozart's famous letter, although some tend to discount it or Tchaikovsky for whom music is "a more subtle medium in which to translate the 1000 shifting moments in the mood of a soul". One might fill many moments with examples of the importance of inspiration, mood, insight, imagination and that inner creative voice which so often sparks our imagination in the most unlikely places and at the most extraordinary times. A professor of anatomy at Harvard summed it up succinctly over 100 years ago when he said: "We all of us have a double who is wiser and better than we are and who puts thoughts into our heads and words into our mouth". This double he describes as:

> "A creating and informing spirit which is with us and not of us, is recognised everywhere here and in story life. It is the Zeus that kindled the rage of Achilles; it is the muse of Homer – it is the demon of Socrates, it is the inspiration of the see-er – it is the smoking devil that whispers to Margaret as she kneels at the altar – it is the hobgoblin who cries 'Sell him, Sell him' in the ear of John Bunyan; it shaped the forms that formed the soul of Michelangelo when he saw the figure of the great law giver in the yet unhewn marble in the dome of the world's yet unbuilt Basilika against the black horizon. It comes to the least of us as a voice that will be heard; it tells us that we must believe; it frames our sentences; it lends a sudden gleam of elegance to the dummest of us all."

It may be accepted that this inspiration and intuition is significant in the arts but has no place within the sciences, indeed with the technocratic reductionist thinking which now dominates Western society. Little is done to provide an enviroment which stimulates the imagination and leads to creativity in its multivarious forms. Given the austere, logical, sequential, mathematical image of science, it is worth emphasising that creative scientists, with few exceptions, freely admit to the significance of intuition, insight, and imagination.

In the world of the reductionist, everything has to be made clear, specific and precise. There is no space for ambiguity, uncertainty or lack

of clarity. The history of ideas suggests it is not as straightforward as that. Frequently it is some half-baked idea, some fuzzy correlation, a smell, a sound, that triggers the imagination and produces something of significance.

In the reductionist view, everything can be explained by scientific means. This means that every aspect of human behaviour must be explored and expressed scientifically. Our innermost thoughts, our likes, our dislikes, should all be made visible and explained.

Even our dreams will now be subjected to such scrutiny. Research is now taking place into what is known as 'lucid dreaming'. The object, as with most science and technology, is to achieve control. In a lucid dream you become conscious that you are dreaming and you take control. There has been developed the dreamlight, which it is held, will help people to have lucid dreams. In the 50s, psychologists rejected that notion, when electroencephalogram revealed the faces of sleep, especially REM (rapid eye movement) sleep, during which, if you wake somebody they are likely to report that they have been dreaming. The muscles are relaxed to the point of paralysis, the brain is active but the sleeper is difficult to wake.

It was held that it would be impossible to be conscious during such a dreaming state. Development suggests that by using REM techniques, it is possible to know when one is dreaming and hence make estimates of the time of the dream.

It is said that this research will give insight into the ultimate human mystery, the brain, by identifying the range and location of its activities. It is believed that lucid dreaming will act as a bridge between the conscious and the sub-conscious, and that the work could have surgical as well as psychological benefits. It is suggested that the same parts of the brain are active in waking and sleeping. Tasks such as singing use the opposite half of the brain. Researchers have found that subjects signal from a dream that they are singing when in fact they are adding up. The same areas are active.

With the dreamlight, the eye movements are detected using personal computers which switch on flashing lights when the eye movements rapidly reach a certain point. It is hoped that eventually all the necessary circuitry will be incorporated in a pair of goggles. These are put on at bedtime and flash only when the subject is asleep and dreaming. The person can control the level of eye movements at which the light begins to flash.

Francis Crick, who won the Nobel Prize for his shared discovery of DNA, suggests there is a danger in this interfering with dreams. He

believes that the function of dreams is forgetting, in which case it might be best that they are left alone. However, researchers working on the dreamlight are adamant that "its going to help people have lucid dreams and lucid dreams are good" (*Sunday Times*, June 6th, 1990).

In considering the work of scientists, engineers and mathematicians, it may seem sacrilegious to talk about something as introverted and personal as their "spirit", yet scientists themselves would go even further. Poincaré suggests it is necessary to "see what goes on in the very soul of the mathematician". To illustrate the point, he described how he discovered a number of mathematical theorems:

> "For 15 days I strove to prove that there could not be any functions like those I have since called Fuchsian functions. I was then very ignorant. Every day I seated myself at my worktable, stayed an hour or two, tried a great number of combinations and reached no result. One evening, contrary to custom, I drank black coffee and could not sleep. Ideas rose in crowds. I felt them collide until pairs interlocked so to speak, making a stable combination. The next morning I had established the existence of a class of Fuchsian functions – those which come from the hypergeometric series. I had only to write out the results which took me but a few hours."

In extending this area of work, he likewise had further 'insights':

> "The changes of travel made me forget my mathematical work. Having reached Coutances, we entered an omnibus to go to some place or another. At the moment I put my foot on the step the idea came to me without anything in my former thoughts seeming to have paved the way for it, that the transformations I had used to define the Fuchsian functions were identical with those of non-Euclidian geometry."

And without any notion that they may be connected to his preceding researches, he states:

> "Disgusted with my failure. I spent a few days at the seaside and thought of something else. One morning walking on the bluff, the idea came to me with just the same idea of brevity, suddeness and immediate certainty, that the arithmetic transformations of intermediate, ternary quadratic forms were identical to those of non-Euclidian geometry."

I am not suggesting here that such sudden insights will come to just anybody. Clearly a deep knowledge of mathematics and the study of those subjects is a precondition for the ability to recognise such an insight when it occurs. The point I am making here, however, is that the mere possession of mathematical knowledge acquired in a systematic rule based way, is not the whole story.

Furthermore, such rule based systems do not take into account that which goes on in the subconscious. Poincaré points out: "Most striking at first is this appearance of sudden illumination, a manifestation of long unconscious prior work. The role of this unconscious work in mathematical invention appears to me incontestable, and traces of it can be found in other cases where it is less evident".

The point I wish to emphasise here is that he repeatedly points out the importance of the emotional and the feeling in the context of mathematical creativity, and that which he called privileged unconscious phenomena:

> "Those susceptible to becoming conscious are those which directly or indirectly, affect most profoundly our emotional sensibility ... It may be surprising to see emotional sensibility evoked apropos of mathematical demonstrations which it would seem can interest only the intellect. This would be to forget the feeling of mathematical beauty, of the harmony of numbers and forms, of geometric elegance. This is a true aesthetic feeling that all real mathematicians know and surely it belongs to emotional sensibility."

Computerised systems, and those which are rule-based by definition, lack this true "aesthetic feeling" and "emotional sensibility". Thus in spite of the speed, consistency and repeatability, we should not think of them in the sense of human progress and creativity, as superior to human beings but rather they should be treated as support systems and tools which support the creative emotions of human beings. Sadly, most scientists seem unwilling to admit to the significance of this emotional and subjective dimension of their work. It is perhaps a measure of the extent to which they are themselves victims of the dominant technocratic ideology. It is also surprising that a profession which prides itself on its rationality and objectivity so often seeks to deny the truth of the creative process.

They do seem to be victims of their own propoganda and determined to imply that scientific advance, the emergence of mathematical theorems and the invention of new products are based on a scientific method which involves inductive reasoning, logical sequential steps, in a word something

which is rigidly codified and leaves little space for our humanity. This in turn gives rise to the notion that scientific "training" at school and university should be based on hard facts, methods, procedures and that excitement and motivation have little place in the preparation of scientists. It means that that part of us which is the essence of our humanity has little space within the sciences and that creative people should find vent for their capabilities elsewhere.

In reality, science should be an exciting as well as a demanding area of study which has space for both the subjective and the objective, the inductive and the deductive. Scientists actually succeed in alienating potential students of their courses with the image they create of their profession. Medua points out that if one really presses a scientist, they would "Probably mumble something about induction" and "establishing the laws of nature"; but if anyone working in a laboratory professed to be trying to establish the laws of nature by induction we should begin to think that he was overdue for leave. It is most unlikely that anything more than a tiny minority of theorems were ever arrived at, "discovered" merely by the existence of deductive reasoning. Most of them entered the mind by processes of the kind vaguely called intuition. Deduction or logical derivation came later, to justify or falsify what was in the first place an inspiration or an intuitive belief. This is seldom apparent from mathematical writings because mathematicians take pains to ensure that it should not be.

I would go so far as to say there is an intellectual dishonesty amongst such professions. If they wish to be dishonest with each other, that is up to them. What is unacceptable is that their dishonesty is used as part of a wider process which is increasingly imposing on society this narrow mechanistic view of the world. Much more needs to be done by scientists themselves to have the courage to allow their inner voices to speak. On the occasions when they do, we get some of that human freshness which is almost poetic. The discoverer of insulin, Sir Frederick Banting, says that ideas come "when the imagination is allowed to run riot on the problems that block the progress of research, when the huge stones of scientific fact are turned over and fitted in so that the mosaic figure of truth, designed by mother nature long ago, may be formed from the chaos".

It is important that we freely admit to Ampere's "shout of joy" when he finally found the solution to a problem he had firstly formulated some seven years earlier. Our science and technology would be the richer, and our courses in those subjects would attract the more creative, sensitive members of society, if they included accounts of Faraday having a vision

of tubes which "rose up before him like things" or admit with Carl Gauss:

> " ... come to me when my mind was fatigued or when I was at my working table. They came particularly readily during the slow ascent of wooded hills on a sunny day."

In all of these cases, it was attributes other than just technical and scientific competence that appeared to have facilitated the 'Eureka' step. Certainly, there was a sensitivity to a problem or an issue. There is usually much fringe consiousness of the subject area but above all there is imagination and it is this which in many ways defines our humanity. Gaining the power to accumulate experience and to reason was not enough to make him man. Another quality was necessary – the great gift of imagination. "This is perhaps man's most distinctive trait for it makes possible his creativity." The dominant tendancy in our society is to deny the significance of the subjective, the imaginative and seek to replace that by the scientific and the quantifiable rather than to complemenmt it by this rational dimension.

I do believe the long term implications for our species are serious indeed. We have associated the ascent of man with imagination and creativity. It seems not unreasonable to assume that we can associate the decline of man with the lack of these attributes.