



Deep science, creative science: Patient brooding versus evidence-reason-based techniques

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It may seem odd to assert that patient brooding and waiting for imaginative validation is the proper way of doing science; after all, most professional scientists and philosophers believe that the essence of science is 'evidence' derived from observations and experiments, synthesized by some kind of logical and rational method. But personal experience, history and theoretical considerations all suggest that a prolonged state of 'patient brooding' is the hallmark and prerequisite of 'deep science'; a practical necessity for the most creative and significant breakthroughs.

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Looking back over the thirty years since I published my first papers; it is clear that there are a few publications that I regard as *deep science* (that is significant, creative and valid science) – and these were the product of what I would term 'patient brooding' and an intuitive-imaginative validation. These writings continue to please me, seem to be valuable, and are a source of personal satisfaction.

However, on the other hand, there are publications that – while honest, in a negative sense of not being dishonest – seem to have been 'manufactured' (or 'squeezed-out') by the mere application of technique ('scientific method'). These include things like summaries of data that I had collected and didn't want to 'waste' – and which I vaguely hoped 'might be useful' to someone-or-other, sooner-or-later; ideas that I regarded as potentially 'stimulating'; favours to colleagues; and theories that had been assembled (like a mosaic) from cited bits and pieces of other people's evidence and ideas... These publications I am retrospectively not so pleased with. At best I regard them as part of a learning process, stepping stones to something valid that came later; but sometimes they were merely careerist place-holders or tokens.

It may seem odd to assert that patient brooding and waiting for imaginative validation is the proper way of doing science – or at least deep science; after all, most professional scientists and philosophers believe that the essence of science is 'evidence' derived from observations and experiments; synthesized by some kind of logical and rational process. Even those 'Popperians' (followers of philosopher Karl Popper: 1902-1994) who regard science as driven by hypotheses, tend to emphasise that the crucial aspect is the 'testing' of hypotheses; with this process being conceptualised as a matter of stating clear predictions and performing rigorous evaluations; with prior criteria (preferably quantitatively defined) set-out for passing or failing each test. Some regard this as the 'scientific method' – and infer that if the method is not followed, then the activity is not really science...

Nonetheless, from personal experience I have concluded something very different, and almost the opposite; which is that in practice – and inevitably – evidence is so slippery and contextual a phenomenon as to be at best controversial and at worst almost worthless when taken in isolation; and much the same applies to what are regarded as the 'proper' processes of logic or reason. In sum; evidence and logic are not 'objective'; and when regarded as such they become profoundly misleading.

More is needed.

The problem, if it is really a problem, is that science does not and cannot *itself* validate science. Science is inevitably based-on a restricted, partial and biased set of assumptions – that is its strength, but it is also an unavoidable constraint. Science is therefore embedded in a larger world; and the validity of science depends utterly on relating science to that larger world. So any assertion about how science *ought* to be conducted must be taken from *outside* of science – and such assertions are ‘metaphysical’ in nature.

That science is based on metaphysical assumptions has been denied by theory since the days of the ‘logical positivists’ about a century ago (who regarded metaphysics as strictly non-sense), and is denied in practice by many or most practising scientists, who typically refuse to acknowledge any non-scientific assumptions, or fundamental constraints to the validity and applicability of science (and who regard metaphysics as sheer nonsense).

I don’t propose to go into the specifics of the wide-ranging metaphysical assumptions of science; indeed, I do not think these assumptions are well understood, neither are they easy to summarise, and certainly they are not widely agreed-upon. But rather I want to suggest that in the practical life of a scientist they have their impact in the activity I have dubbed ‘patient brooding’. In particular, I propose that patient brooding is the hallmark and necessity of pretty much all significant *creative* science.

I will analyse the phenomenon of ‘patient brooding’. Firstly ‘patient’. This word is intended to convey that the pace of insight *cannot be forced*. The scientist must wait for imaginative validation of his work and ideas; and he must be prepared to wait for as long as it takes. This is necessary, because it is only in the imagination that ‘the whole person’ is brought to bear on the matter in hand. I regard the imagination as the most complete form of cognition; since imagination includes the emotional and the implicit, as well as the rational and factual.

The imagination of a scientist (after – it goes without saying - sufficient and appropriate education and experience) contains not just the evidence which he knows he knows; but imagination (over time, and with attention) brings forward especially that evidence that he most needs and values; discarding that which is irrelevant and unreliable (this happening, to the extent of his personal scientific ability and judgment).

This ‘trained-imagination’ of a scientist is not just logical and rational, but includes all kinds and types of thinking – such as emotions of euphoria or well-being, angst or despondency; gut-feelings; the discernment of the heart and so on – these being the kind of ‘sensations’ that creative people report experiencing as evaluations of their own performance.

In sum, patient imagination, over time, will bring to bear *the total scientist* upon his subject. =

What then of ‘brooding’? What do I mean by that?

By ‘brooding’ I intend to convey that *creative* science is about reflecting on relatively broad themes – and not about answering very specific and pre-defined questions. This breadth is necessary because a highly specific question will nearly-always pre-judge the answer too narrowly to include the valid answer. The brooding means that the creative scientist is seeking the correct *question*, at the same time as he is seeking the correct answer – and the valid question and the valid answer *both come at the same time*.

What happens while patiently brooding? This is surely unpredictable, and must vary case-by-case, person-by-person. But as the most extreme example of my experience, I spent some 15-20 years brooding on the twin questions: What is the cause of melancholia (or endogenous depression)? And why are antidepressants effective? During that long time (during which I worked at many other things) the pieces of the jigsaw making-up what eventually became the answer came gradually, a piece at a time. (This was published as The malaise theory of depression in Medical Hypotheses, 2000; 54: 126-

130.)

For instance, I learned of the depressant effect of glandular fever from my own experience as a student; about the pain relieving effects of antidepressant from my medical training; I met patients with disseminated cancer and autoimmune disease who had depressive symptoms while a junior physician; I encountered depressed patients who complained of 'feeling ill' while I was a trainee psychiatrist; I read of the immune abnormalities in depression during my doctoral studies; I read the idea that recovering from depression was similar to recovering from influenza in a book I found in a second-hand shop on holiday; while studying evolutionary psychology I encountered the theories of Antonio Damasio concerning the nature of emotion; and so forth...

Because I was alert and interested, these and other clues were noticed and remembered, until they crystallised in a particular 'eureka moment' in 1999 – after which I spent some further brooding time checking the predictions and implications, and my own state of conviction; before proceeding to publication.

Another term I have used above is 'intuition'. This simply means introspection, looking-within – and taking it seriously. A creative scientist who (after patience) is rewarded by an insight, then needs to develop the ability to look within himself, and to become aware of the content of his own imagination. To become aware of this imagination in an explicit form is one step, the next is to take what is perceived and make it into a linguistic form which can be communicated to other people. Communication may be in such forms as a conversation, seminar, lecture, letter, paper, monograph, a textbook...

Patient brooding cannot be faked, forced or contrived; although deliberate it is a spontaneous consequence of strong and sustained inner motivation. In sum, it is the antithesis of expediency and careerism – and the apotheosis of dedication to truth and knowledge. It is a personal vocation from within; not just 'a job', to which you are allocated.

But – having said that evidence and logic are inadequate - why should patient brooding be regarded as a valid method of seeking truth in science, or indeed in any other domain of human activity?

In answering this, firstly it must be made clear there is absolutely no guarantee that patient brooding *will* yield deep science. It is not a 'truth-machine' – and its value depends on the individual scientist's capability, circumstances, efforts and luck.

Secondly, patient brooding ought to *include* science and logical, rational thinking – they certainly are a part of the 'recipe' for valid science.

Following on; thirdly, the special quality of patient brooding is that it recognises that creative science does not know exactly where it is going, nor how. We do not know in advance what evidence is important, nor what evidence is false, misleading or fake; we do not know how to set-about formulating an answer nor what kind of an answer needs formulating.

And fourthly, the idea of patient brooding places the individual scientist at the heart of science. One reason that creative science cannot be captured in an algorithm is that it is done by people, not computers. Computers may be patient, but they cannot 'brood'.

From surveying the history of human achievement, it looks as if every significant breakthrough in knowledge about which details are known – whether in science or any other difficult human activity – seems to have been preceded by a prolonged search, and this search is relatively wide-ranging with respect to subject and methods. In a sense patient brooding is the opposite of a 'method' – but if there is any consistent *psychological strategy* to deep science, then it is probably patient brooding.