Review
Creativity and the Brain

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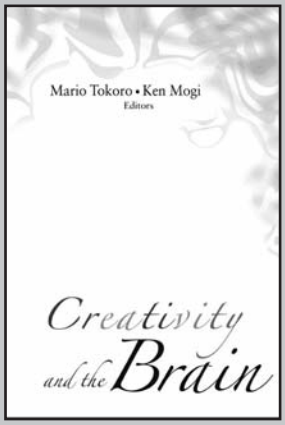

The Preface to this intriguing book begins as follows:

> 'Until recently, human creativity had been treated as a mysterious process of brain activity, since we had neither the tools to measure brain activity precisely nor the theories to analyse and synthesise creativity. However, the quick advancement of brain science these days – thanks largely to the development of various measurement tools such as electroencephalography (EEG), electromyography (EMG) and functional magnetic resonance imaging (fMRI) and to new attitudes which view the brain as a system – has enabled us to discuss creativity in the context of science. Hence we organised a workshop for the exchange of ideas among distinguished scholars who have been contributing to the understanding of creativity in different fields and from different viewpoints'
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> (2007: v)

Inevitably perhaps, this overstates the case a little, in that after reading this book I was still of the view that human creativity should be treated as mysterious process of brain activity, on which measurements had only shed a little light, but do not let that stop you reading it. Some fascinating theoretical positions are put forward by the scholars who took part in the workshop, and the book provides some all too rare, interdisciplinary perspectives. Creativity has been discussed in the context of science for decades, but the development of new measuring tools has certainly added impetus to the debates, which this book reflects.

The workshop was held in April 2004 and the associated book is organised around seven presentations; four of the presentations were given by distinguished academics and three by researchers from Sony Computer Science Laboratories (Sony CSL). The scientific concepts being presented are comparatively complex and the editors strive to improve their accessibility by writing short introductions to the authors and their ideas, and providing cartoon style images. The intention of this presentational style is clear enough, but I was not completely convinced and found some of the drawings more of a distraction.

In the first chapter, with its introduction 'A Genius Within', Professor Allan Snyder (Director, Centre for the Mind, Australia) discusses 'Learning and Creativity – Accelerated by Suppressing or Circumventing Certain Brain Regions'. He presents the notion of the "mindset" as composed of an individual's past experiences. The discussion moves on to explore the way in which humans see what they know through templates, which constitute useful expertise, but blind us to novelty. Creativity is seen as stemming from breaking away from routine interpretations. Professor Snyder is seeking to make a 'creativity machine', and one effective (and apparently safe) approach to this is turning off the left temporal lobe using pulsed transcranial magnetic stimulation (TMS). Interesting evidence is presented of the effect of TMS on drawing ability and there are observable positive effects. So magnetic "thinking caps" could be on their way.

In the second chapter, with its introduction 'A Story or Brain Clocks', Professor Ernst Poeppel (Ludwig-Maximlians University, Germany) discusses 'Complementarity and Creativity in Brain Sciences'. He presents the concept of the complementarity of chance and meaning, by arguing that meaning is constructed out of something that has just happened. He goes on to explain how the 'brain machinery' works before returning to the discussion of complementarity and creativity. In exploring the brain machinery, he discusses two phenomena (of which I was not previously aware). Firstly the need for information inputs to be separated by at least 30 milliseconds in order for the brain to tell which information came first. So, in

effect, 'information that comes within the time window of 30 milliseconds is treated as cotemporal' (p29). Secondly, he describes evidence suggesting that the brain 'refreshes' itself every three seconds in much the same manner as a computer screen, and hence 'creates processing units, or "windows of integration" which have a duration of two to three seconds' (p32). He draws evidence from a range of scientific areas, and when discussing the Shakespearean sonnet..."Shall I compare thee to a summer's day'...writes as follows:

> 'Each spoken line lasts approximately three seconds. Next the duration of music motif is used as an example. If you listen to Beethoven's Fifth Symphony, the famous motif lasts about three seconds. Likewise, if you go to a Noh play in Japan, the drama is segmented with a three-second time structure'. (p34)

These are suggested as mechanisms that the brain has developed to simplify, or enable, information processing. Hence it is complementarity that is the (creative) generative principle. For example, the complementarity of sensory data (chaos) and elementary units (complexity reduction), or the complementarity of bottom-up (details) an top-down (schemata). It is argued that the lesson of evolution is that it is within these complementarities that creativity processes lie. If the case is accepted, then the pedagogical implications are intriguing.

In the third chapter, with its introduction 'In Search of Achilles' Heel', Dr Hiroaki Kitano (Director, Sony CSL, Tokyo) explores 'Robustness in Biological Sciences'. He discusses how interesting phenomena occur on the border of stability and instability, and the way in which a complex system must have some fragility in order to be robust. He discusses these ideas in relation to complex body systems associated with cancer treatment, but suggests that similar arguments apply to the brain system and creativity.

In the fourth chapter, with its introduction 'Do Infants Dream of Baby Sheep', Professor Phillippe Rochat (Emory University, USA) discusses 'Creativity in the Infant's World'. He explains the developmental stages of the infant brain and describes the onset of self-awareness and the beginnings of social awareness in relation to some fascinating experimental evidence. Red dots are placed unobtrusively on children's foreheads and then they are provided with a mirror so that they can see themselves. 'It is observed that, at about 14 months, children do touch or try to remove the sticker. This seems to be quite universal across cultures'. (p61) From about 18 months the children showed evidence of embarrassment and hid their faces, unless everyone else in the room also had a red dot. He suggests that creativity emerges when people stop worrying about what other people think and stop trying to align themselves with others. He concludes as follows:

> '...self-awareness – the bottleneck to creativity – is not the awareness of the body, the ecological self, or what is situated on the world. It is essentially the "coawareness" or the awareness of the self as seen through the eyes of others.'

The remaining chapters are no less fascinating. In the fifth chapter, with its introduction 'Baby Talk', Professor Nobuo Masataka (Kyoto University, Japan) discusses 'The Onset of Language and Creativity'. In the sixth chapter, with its introduction 'Dr Jekyl, Mr Hyde, and Qualia', Professor Ken Mogi (Senior Researcher, Sony CSL) discusses 'What is the Difference Between Your Brain and a Computer'. In the seventh chapter, 'Computer and Creativity', Dr Luc Steels (Director, Sony CSL, Paris) discusses 'Geniuses and People Around Them: The 'Dark Side' of Science?'

So, in the true spirit of interdisciplinary engagement, a range of perspectives on creativity and the brain are provided by this book. There are no direct implications for the development of pedagogy, but there are many clues and insights that would be worth exploring in an educational context.

It is perhaps appropriate to end this review, by returning to the Preface. This is how it concludes:

> 'This book is part of a long-term effort, initiated by Mario Tokoro, to weave a web of researchers and practitioners that are dedicated to advance the quality of education in the 21st century. The initiative intends to stimulate multidisciplinary discussions, which contribute to improving education and learning for children and adults of all ages everywhere in the world, based on an improved understanding, methodology, and policy for education and human learning'. (p vii)

It is the third book in the series, which has clearly ambitious targets that would attract broad-based support. This book does make a contribution towards these aims, but they represent, of course, a very long journey and a path that is also being travelled by many educationalists and researchers. There are insights and ideas within the book that are well worth sharing amongst co-travellers who are looking for new directions.