

## Creativity, problem solving and innovative science: Insights from history, cognitive psychology and neuroscience

Carol R. Aldous  
Flinders University [carol.aldous@flinders.edu.au](mailto:carol.aldous@flinders.edu.au)

*This paper examines the intersection between creativity, problem solving, cognitive psychology and neuroscience in a discussion surrounding the genesis of new ideas and innovative science. Three creative activities are considered. These are (a) the interaction between visual-spatial and analytical or verbal reasoning, (b) attending to feeling in listening to the 'self', and (c) the interaction between conscious and non-conscious reasoning. Evidence for the importance of each of these activities to the creative process is drawn from (a) historical and introspective accounts of novel problem solving by noted scientists and mathematicians; (b) cognitive psychology and neuroscience; and (c) a recent empirical study of novel mathematics problem solving. An explanation of these activities is given in terms of cognitive neuroscience. A conceptual framework connecting each of these activities is presented and the implications for learning and teaching considered.*

Creativity, problem solving, cognitive psychology, neuroscience

### INTRODUCTION

The questions 'From where do new ideas come?', 'How do they arise?', and 'Do feeling and intuition play a role?' continue to fascinate scholars and lay people alike. Over the centuries, answers to such questions have varied. Five hundred years ago, in English and European culture, the answer quite simply, was that new ideas come from God (Pawson, 2003). In the period of rationalism that followed, the prevailing answer was that new ideas arose through reason alone (Lacey, 1996). In the reactionary romantic period that ensued, the answer was to be found in 'a way of feeling', 'an intuition' or 'an imagination' (Horowitz, 2004). In the present day climate of relativism the answer supposedly is to be found in the relative nature of experience and culture (Swoyer, 2003).

While none of these perspectives on its own offers complete and efficacious answers to our questions it seems likely that all have some merit and that the way forward must involve a synthesis of elements from the past and ideas from the present. Identifying some of these elements as well as describing the way in which these elements may interact in a cognitive explanation of the origin of new ideas, underlies the purpose of the research documented in this paper.

In particular, elements relating to different kinds of reasoning (indicative of the rationalist period) together with those of feeling and intuition (indicative of the romantic period) are discussed. Further it is argued that creativity may arise from the interactions occurring between each of these elements both cognitive (thinking and reasoning) and non-cognitive (feeling and intuition). This is done within the context of novel problem solving as it relates to scientific and mathematical experience.