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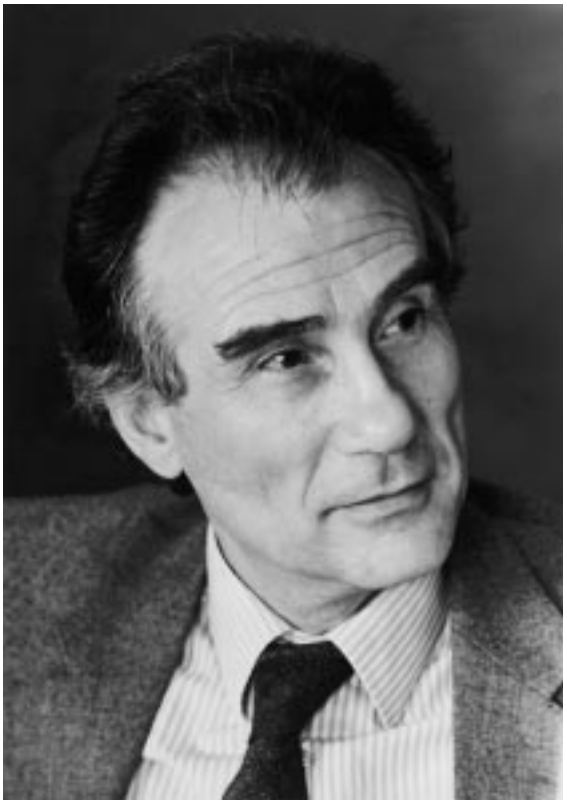

Jeffrey A. Gray, 1934–2004, BBS editor 2002–2004.

# In Memoriam: Jeffrey Gray (1934–2004)

Many strands are woven into the ideas and work of Jeffrey Gray. From a background of classical languages and a spell in military intelligence spent honing skills in languages and typing, he took two BA degrees (in modern languages and psychology) at Oxford University. He then trained as a clinical psychologist at the Institute of Psychiatry (IOP), London, capping this with a PhD on the sources of emotional behaviour.

From 1964 to 1983, Jeffrey worked at the Department of Experimental Psychology, Oxford, becoming a fellow of University College in 1965. Here he built a unique theoretical and experimental approach to the study of anxiety and septohippocampal function. Interludes (including a Medical Research Council travelling fellowship at Rockefeller University [1968–1969] and Professeur Associé at Université de Paris VI, 1979–1980) afforded Jeffrey the opportunity to reflect broadly, culminating in his ground-breaking book *The Neuropsychology of Anxiety* (Oxford University Press [OUP], 1982).

Jeffrey succeeded Hans Eysenck as Head of the Psychology Department at the IOP in 1983 and retired in 1999. At the IOP, Jeffrey's chief initiatives included analysis of schizophrenic deficits and effects of neural transplants in animal models. A fellowship at the Center for Advanced Study in the Behavioural Sciences, Stanford University (2001–2002) enabled Jeffrey to develop ideas on consciousness and magnetic resonance imaging of cognitive function, to bear fruit in the forthcoming volume on the hard problem of *Consciousness* (OUP, 2004). Sadly, Jeffrey's ongoing work in these areas as Emeritus Professor at the IOP was cut short by his death on April 30, 2004.

Jeffrey's contributions to the shape of Psychology and approaches to research are widely recognised; however, much remains to be understood and exploited. For example, low-frequency hippocampal theta activity played a key role in Jeffrey's theory of anxiety, as it was held to switch on the septohippocampal "behavioural inhibition system," which suppressed activity and increased arousal and attention. At the time, theta-driving effects on behaviour were regarded with some scepticism. However, high-frequency hippocampal stimulation has been shown to induce long-term potentiation (LTP) and improvements in learning and memory. Stimulation given synchronously at peaks of theta waves has also been found to facilitate LTP. Such findings implied links between neural mechanisms of learning and anxiety, which Gray and McNaughton explored in the revised version of *Anxiety* (OUP, 2000). Jeffrey's work has thus provided a framework for a comprehensive account of behaviour right from the molecular events described by Kandel to manipulation of neural activity in the hippocampus, leading to predictable functional outcomes.

At a review of research at the IOP, Trevor Robbins commented, "what Jeffrey did for anxiety he is now doing for schizophrenia." In collaboration with David Hemsley, Jeffrey developed the key and highly cited notion that schizophrenia involves the weakening of links between present and past associations. Schizophrenics are overly receptive to incoming in-

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formation, which they find hard to interpret in the light of past experience. Paradigms such as latent and prepulse inhibition, applicable to both humans and animals, have confirmed Jeffrey's proposals for linking the neural basis of psychosis to its symptoms by showing that increased dopaminergic transmission augments aberrant assignment of salience to external stimuli.

Jeffrey identified neural transplantation as a key research initiative for the Psychology Department at the IOP. His group showed that there were differences in the mechanisms underlying positive effects of primary foetal grafts on learning and memory, according to whether brain damage was diffuse – as with cholinergic denervation – or localised following discrete hippocampal damage. When work on stem cell grafts was still novel, Jeffrey persuaded John Sinden to patent conditionally immortal Maudsley Hippocampal (MHP) lines developed from Jat's transgenic mouse, in which a temperature sensitive oncogene switched off grafted stem cell division to prevent tumour formation. The success of the MHP36 cell line in promoting functional recovery – coupled with Jeffrey's entrepreneurial know-how gained from founding the cognitive therapy company "Psychology at Work" – encouraged Jeffrey and colleagues to found ReNeuron, a biotechnology company supported by Merlin Ventures, which is developing a range of conditionally immortal human stem cell lines for clinical use.

Jeffrey produced over 450 papers, five books, and two edited volumes, making it impossible to encapsulate his scientific contributions. Only his concepts of anxiety, schizophrenia, and neural graft mechanisms have been highlighted here; others might equally well have singled out analyses of associative learning, reward mechanisms, personality dimensions, synaesthesia, or consciousness.

Jeffrey had other areas of enjoyment and expertise apart from his academic interests – notably languages, a passion for skiing, and a deep interest in the arts. His wife Venus described how, even when desperately ill, Jeffrey managed a couple of visits to the ballet and translated a couple more poems from his beloved Mallarmé. This breadth of experience, courage, critical acumen, and ability to link divergent concepts made Jeffrey invaluable as a PhD supervisor, as head of a multifaceted department, and in situations where conflicts of interest required novel solutions.

Jeffrey's hunger for discovery could make him something of a gadfly, as he knew full well. He was always coming up with research proposals that were well beyond the means and remit of his fledgling biotech company or a struggling PhD student. Equally, when things went wrong, he was strongly supportive – particularly of students – and creative in rethinking hypotheseses and in adjusting grants to fund further work. Jeffrey is irreplaceable; he will be greatly missed by his friends and colleagues, especially by his family.

Helen Hodges,
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Jeffrey Gray was one of the great behavioral and brain scientists of 20th century. He was a four-time target-article author (3,4) in *Behavioral and Brain Sciences,* a 25-year BBS Associate Editor, and – alas very briefly – a one-time BBS Co-Editor. He was also a dear friend, who presided at my Inaugural at Southampton, shamed me into renting a tuxedo to attend a Royal Society reception ("You could wear a suit: Such things are overlooked in non-Britons"), hosted me on a whirlwind speaking tour of the British Isles in the late 1980s, debated with me – multiply, in conferences and in writing – about the problem of consciousness (on which subject his last book's scheduled publication date, 29 April 2004, proved to coincide almost exactly with the day of his passing), and provided invaluable support and counsel for BBS in troubled times. And now he has left – for all of us – an inexpressible void.

Stevan Harnad
*Founding Editor*

Though we only had the privilege of working with Jeffrey Gray for a short time, the breadth of his interests and the intensity of his intellect were easily apparent. He coupled intellectual liberality with intransigence on questions of English style, excellent qualities in an editor. Readers of BBS should be certain that we will work to be sure the domains of expertise he best represented will remain central.

Barbara L. Finlay
Paul Bloom


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