

Tribute to an astonishing man: Francis Crick

The mere mention of the name Crick immediately brings to mind the wonderful double helix, even to a layperson. The details of how Crick and Watson arrived at the beautiful structure of DNA are well known. Equally well appreciated are the consequences of this double helical structure for the transmission of genetic information from one generation to the next.

What is perhaps not so generally known is that in the last two or three decades, Crick had embarked on a totally different project, even more challenging, if not more crucial for the advancement of knowledge. What is consciousness? How did consciousness originate? Why did Nature take the trouble to evolve conscious brains if non-sentient 'automaton' brains like cerebella would have done just as well? For a long time, consciousness was not considered a proper subject for scientific investigations. That attitude changed only when Francis Crick turned his attention to the problem in the late 1980s and early 90s. Crick and his associate, Koch, transformed consciousness from a philosophical mystery to an empirical problem. Since then, intense efforts of several neuroscientists have been focused on understanding what happens in the brain during perception.

It is obvious that consciousness in some sense requires the activity of neurons. Perhaps it is correlated with some special type of activity of selected neurons in the cortical system. Where are these neurons located? Are they of any particular type? What is special about their connections? Or what is special about the way they are firing?

In exploring consciousness using the scientific approach, one does not try to construct, right at the beginning, an all-embracing theory that purports to explain all aspects of consciousness. Rather, one initially develops a set of theoretical ideas which may have to be modified or discarded in the light of new experimental discoveries. This is then followed by the selection of the most favourable system

for the study of consciousness. Detailed investigation follows, from as many aspects as possible, in order to validate the theory.

In a classical reductionist approach, Crick and Koch decided to concentrate on the form of consciousness that appears most amenable to experimental research, especially in animals, viz. visual awareness. The advantage here is that the visual systems of higher primates appears to be similar to that of humans. The underlying assumption is that all the different aspects of consciousness (e.g. pain, vision, etc.) employ a common neuronal mechanism.

The objective of the new research undertaken by Crick was to discover the neural correlates of vision. In order to understand how the brain works, one has to develop theoretical models that describe how sets of neurons interact with each other during the process of 'seeing'. Seeing is not a simple process. It is not enough if one particular set of cells in the brain records the details of the light intensity coming in. The brain must produce a symbolic (not real!) description, a 'representation'. The visual scene has to be interpreted at many levels of the brain in order to arrive at this representation. In this effort, the brain has to draw upon its past experience as a guide. Memory thus plays an important role in the mechanism of consciousness.

The working hypothesis of Crick was the following: It is likely that during the process of seeing, a particular object in the visual field is represented by the firing of a set of neurons. These may be located in many different visual areas of the brain, for the processing of form, colour, motion, etc. But somehow, the brain 'binds' all these neurons together in a mutually coherent manner and arrives at a 'perception' of the object, including its size, shape, texture, colour, movement, etc. This 'binding' has to be reversible, not permanent. Crick strongly felt that the synchronized firing of the con-

cerned neurons might constitute this 'binding' mechanism and might therefore be considered to be the neural correlate of visual awareness.

Crick was convinced that the 'mind' consisted of only the higher levels of the neo-cortex. He refused to believe in the existence of an incorporeal 'mind' controlling the thoughts and actions arising in the brain. He thus belonged to the 'identity' school of materialistic philosophy. Materialists, without exception, insist that the physical world is a closed, self-contained system. Supernatural forces and incorporeal substances find no place in this philosophy. In Feigl's elaboration of Spinoza's idea, mental processes are real; they are however, conjectured to be identical with certain physical processes that occur in our brains. The mental processes of which we have a 'knowledge by acquaintance' (subjective experience) are supposed to be identical with a kind of physical process of which we may obtain only a 'knowledge by description'. The objects which the brain physiologist describe in theoretical terms turn out empirically to be, in part, our subjective experiences.

The most emphatic statement of the identity theory comes from the opening sentence of Crick in his book *The Astonishing Hypothesis*: 'You, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules'.

Some of us might disagree with this philosophy; but none will dispute that Francis Crick was an intellectual giant and an objective scientist in the real sense.

SRINIVASACHARI RAJAPPA

*B-1, Melody Apartments,
12, ICS Colony,
Pune 411 007, India
e-mail: p_rajappa@vsnl.com*