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Editorial

Lessons from the past

The adage that history repeats itself is a tacit acknowledgement of our poor ability to learn from the past. Looking at history with inquisitive eyes makes it not only instructive but also interesting. In medical sciences, one of the most instructive exercises is to trace the history of neurobiology. We have references to the essence of life and all senses residing in the *shira* (head) in the Charaka Samhita (1). Susruta, the doyen of Indian surgery, knew that insanity and epilepsy originated in the head. Taken together with the archaeological discovery of skulls with burr holes made during life, Susruta's statement points to some form of neurosurgery being then prevalent, perhaps for insanity and epilepsy. Aristotle (4th century B.C.) confused nerves with tendons and ligaments and Galen (2nd century A.D.) believed that nerves convey fluids. Although Charaka and Susruta's concepts seem to make more sense, and perhaps antedated Aristotle and Galen, most books ignore the ancient Indian concepts. Although many reasons can be advanced for the sorry state, the most constructive approach to it would be for Indian scholars to redouble their efforts to rediscover their glorious past and create a matching present.

Another striking feature in the history of science, including neurobiology, is the absence of any notable advance for almost 1400 years following Galen. Galen's ideas, which were bright but generally wrong, went unchallenged for centuries till rennaissance figures like Leonardo da Vinci (1452-1515) and Rene Descartes (1596-1650) began questioning the prevailing dogmas. It is difficult to believe that no intellectually gifted person was born for 14 centuries. The lesson to be drawn is that an environment which grants the freedom to disagree is just as important for the growth of science as mental abilities. Descartes, building up on Galen's theories, proposed that a vital fluid is conveyed by the nerves to muscles, making them contract. Such was the intellectual vigour of the age that very soon, Jan Swammedam in Netherlands, and Jonathan Goddard in U.K. questioned the hypothesis on the basis of similar but independent experiments (2). If vital fluids flow into contracting muscles, they argued, the volume of muscle should increase during contraction. But experimental results indicated that on the contrary, the volume of muscles decreased slightly during contraction.

However, major advances in neurobiology had to await the invention of the microscope and discovery of a suitable method for staining nervous tissue, illustrating the importance of techniques in research. The accidental discovery of the silver impregnation method by Camillo Golgi in 1873 was a revolutionary advance in neurosciences. However, light microscopy was inadequate for visualising the synaptic junction between neurons. Therefore Golgi, in line with his predecessors, continued to treat nervous tissue to be an exception to the cell

theory. But Ramon y Cajal, using Golgi's staining technique, added a little imagination to what he saw under the microscope, and could see a cellular architecture in the nervous tissues. But it took Wilhem Waldeyer to put together Cajal's interpretation, Welhem His' observations on development of nervous system, and August Forel's studies on response of nervous tissue to injury, and come up with a well formulated neuronal doctrine. Through his intellectual skill of synthesizing information from several sources, Waldayer could have his name associated with the neuronal doctrine (3). Here we have three scientists, each of whom had a few major qualities that contribute to success in science. Golgi had a mind prepared to exploit the accidental finding of staining of a slice of brain by silver nitrate. He also had the intellectual honesty and tenacity to be faithful to exactly what he saw under the microscope. He was not prepared to let speculation, however reasonable, contaminate his visual observations. Cajal had the perseverance to work feverishly for several years looking at nervous tissue from various sources, to make accurate sketches of what he saw, and to write painstaking descriptions of his observations. He also had the imagination to 'see' a little gap between the axon terminals of one neuron and the dendrites of another, thereby reconciling the architecture of nervous tissue with cell theory. But before he had the time to knit his observations into an appealing story, Waldeyer used his up-to-date reading and intellectual skills to formulate the neuronal doctrine.

It was another 60 years before electron microscopy could be applied to nervous tissue in the 1950s, which demonstrated the synaptic cleft convincingly, thereby putting the neuronal doctrine on a firm footing. Electrophysiological, neurochemical and neuropharmacological tools have improved our understanding of the brain enormously in the recent past. However, what we know is still much less than what remains to be known. Let us hope we can use the lessons of the past to make a dent in our ignorance during the decade of the brain which begins in 1991.

REFERENCES

1. Bagchi AK. Concept of neurophysiology in ancient India. In: Keswani NH, editor. The science of medicine & physiological concepts in ancient & medieval India. New Delhi: XXVI International Congress of Physiological Sciences, 1974: 99-103.

2. Brazier MAB. A history of neurophysiology in the 17th and 18th centuries. From concept to experiment. New York: Raven Press, 1984.

3. Rasmussen AT. Some trends in neuroanatomy. Dubuque, Iowa: Wm C Brown Co, 1947.