Book Reviews

Galen on Sense Perception, by RUDOLPH E. SIEGEL, Basle, S. Karger, 1970, pp. xii, 216, illus., S.Fr.64, $15.35.

Few subjects are of more vital relevance to contemporary problems than that of sense perception. With the artificial extensions of vision and hearing by microscope, telescope, and the conversion of various forms of electro-magnetic into sensory energy we are confronted more poignantly than ever before with the problems of the validity of sensory information. Dr. Siegel's study of Galen's views on the subject is of great interest in bringing to the fore the penetrating thought of one of the most brilliant if controversial thinkers of ancient times.

This present work constitutes the second part of Dr. Siegel's volume, *Galen's System of Physiology and Medicine*, the first volume of which was published in 1968 (see *Med. Hist.*, 1970, **14**, 109–11). It comprises a detailed study of Galen's work on vision which occupies over half the book, and briefer consideration of his views on the problems of sound, odours, taste, touch and pain, the whole being completed in 195 pages.

To obtain a comprehensive concept of Galen's physiology of vision has always presented a very formidable task. Not only are Galen's views scattered through several of his works, but difficulties of accessibility and translation have combined to compound the obscurities. Dr. Siegel has undertaken the task of clarification; to it he has brought his linguistic skill, meticulously conscientious analysis, and modern medical knowledge. Realizing from Galen's own references that the subject could not be adequately dealt with in isolation, Dr. Siegel has given a historical background of the views on vision of Plato, Aristotle, Euclid and Ptolemy, and compared the atomist and stoic views in their relation to sensory doctrines.

With this background sketched in the reader is taken into a description of Galen's anatomy of the eye and his ambivalent approach to the problem of visual perception. For Galen never succeeded in reconciling his pneumatic concept derived from Stoic philosophy with his geometrical concept based on his knowledge of perspective and optics. This was essentially a conflict between his physiological principle whereby all activity of the nervous system depended on the flow of animal spirits, or pneuma psychicon, and the physical laws of light which govern its path through the structures of the eye. According to the first doctrine, vision was performed by the outflow of psychic power not only to the sensitive lens but through space to the object seen. According to the latter, images of the object seen flowed into the eye and following the laws of optics entered the optic nerve at the back of the eyeball.

As Dr. Siegel describes Galen's work on the anatomy of the eye he shows how all Galen's delicate dissections are interpreted in terms of his pneumatic theory. The greater one's knowledge of Galen's achievements the more amazing they become. His descriptions of the placing and shape of the lens with its capsule and its anterior flattening; of the ciliary bodies, and of the optic nerve and its retinal distribution had to await the seventeenth century for their equal. But whereas Kepler put this detailed knowledge to an optical, physical interpretation, Galen saw it all in the light of pneumatic extromission of visual power to the lens and beyond whereby the image of an object was received and carried back along the hollow optic nerve to the brain. Thus where Kepler distinguished physics from physiology Galen merged the two into

one; and when he considered the physics of light separately he could not make it fit into his physiological concept.

This dilemma is beautifully portrayed by Dr. Siegel. He also makes it clear how Galen was a child of his time in that the dilemma was not his alone but that of all classical Greek thought on the nature of perception. Only with the gradual evolution of appreciation of the different aspects of the problem through such Arab thinkers as Avicenna and Alhazen did the physical problem gradually become separated from the physiological, Kepler making the distinction in the formation of the retinal image. The relation between the physiology of vision and its psychological aspects still presents insoluble difficulties.

With regard to the ear, one is astonished to realize that Galen considered the ear-drum to have no relation to hearing. Not only this; he failed to describe all the ossicles of the middle ear. One is equally astonished to realize that he did describe the delicate structure of the inner ear in the petrous bone, and called it 'cochlea'. This he revealed by chipping away the petrous bone in thin layers. Perception of sound he attributed to the psychic pneuma being spread out over the coiling cochlear by the auditory nerve.

Smell was directly produced—according to Galen—in the extension of the brain present in the olfactory bulb by particles inhaled into it. Taste he allotted to the terminations of the glossopharyngeal nerve. Touch and temperature sense Galen attributed to moderate stimulation of the nerves to the skin, violent stimulation producing pain.

Dr. Siegel concludes his book as follows:

> It has been pointed out that Galen's studies on sense perception, especially on vision, have rarely been adequately appreciated. His studies, so rich in original observations and valuable suggestions were hardly systematically pursued. This was already the case during the time of late antiquity, and remained so during the Middle Ages and the Renaissance. To mention only one instance: Galen's detailed knowledge of the structures of the eye remained widely unknown: even Vesalius published in his *Fabrica* an anatomical sketch of the eye which would have been already obsolete in Galen's time.

That such a statement can be made about Galen; the most flattered and adulated anatomist of all time, goes to show what a large gap always lies between lip-service and true appreciation. Dr. Siegel himself in order to produce this work has repeated a number of Galen's dissections, a procedure which might well have increased the appreciation of Galen's anatomy if it had been performed some centuries ago by those who read his works.

Be that as it may, Galen emerges from Dr. Siegel's book with freshened honours as a practical experimental scientist, a role for which he should always be remembered.

KENNETH D. KEELE

Education in the History of Medicine, ed. by JOHN B. BLAKE, New York and London, Hafner, 1968, pp. 132. $7.50.

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