the evidence of the chapter devoted to this topic, these techniques were only just approaching the stage of giving definitive results for the liquid surface at the time of writing, though progress has been made since. The situation resembles that for bulk liquids some 20 years ago. There is no doubt that computer simulation can likewise transform our understanding of the molecular properties of surfaces.

Computer simulation, however, will not solve the deeper statistical mechanics problems of co-existing phases of real fluids, such as the conditions for phase separation and critical behaviour. For these, one needs the full, modern apparatus of renormalization group and nucleation theory, but such considerations are outside the scope of this book. □

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The iris as history

J.C. Dean Hart

The Iris in Eighteenth-century Physiology. By Renato G. Mazzolini. Pp.193. ISBN 3-456-81022-9. (Hans Huber, Bern: 1980.) Flexi SwFr. 36, DM 39.

RECENT reviews of the historical aspects of iris musculature, notably that of Loewenfeld 1957, when dealing with the eighteenth century use as their first definitive reference the report by Albrecht von Haller, Professor of Anatomy at Göttingen, who in 1753 stated that the iris did not contain muscles. This opinion flatly contradicted the contemporary view that an antagonistic set of muscles was present in the iris, one for constriction of the pupil, the other for dilation. However, no recent author has made mention of the persons or person responsible for initiating the muscular concept or of how it became widely disseminated. Here, in an erudite piece of historical investigation, Mazzolini has tracked down the source of the muscular theory and convincingly demonstrated reasons as to why it became so readily accepted by most authorities on the Continent and as far away as Scotland. He has set out to provide an historical analysis of the statement by Haller that "all muscles are irritable — the iris has no irritability", and has attempted to answer three questions: was this remark original; to what extent did Haller's comments alter views of students on the subject; and how did this change previously held ideas? It would, however, be unfair in this review to reveal all the details of Mazzolini's research, as his is an excellent piece of detection.

Haller began to have serious doubts about the presence of muscles in the iris as early as 1743, since, unlike earlier researchers, he was quite unable to see any such structures. In 1753, his major work was published, *De partibus corporis humani sensilibus et irritabilus*, in which an entirely new concept of physiological thinking was set out based solely on the twin pillars of experimentation and observation. His novel proposal was that the body could be divided into three types of tissue depending on how they reacted to cutting, burning or the application of noxious fluids: those showing irritability (contractability) were muscles; those demonstrating sensibility, nerves; the remainder, having neither of these attributes, were called tela cellularis.

This work proved to be a landmark since it introduced a radical alternative to the earlier scientific approach based on the Galenic tradition of analogy and reason. The case for iris muscles had been argued previously in the form of a syllogism as follows: structures that contain muscles contract; the iris contracts; therefore this tissue contains muscles. Haller, however, believed that analogy was a source of great error and that it was not necessary to devise fabrics which could not be observed. Since irritability of the iris was not detectable in experimental animals when this tissue was cut or after the application of oil of vitreol — and supported by his earlier observation that muscles could not be seen — he felt that the idea of a muscular mechanism of iris movement had to be abandoned. True to the tradition that he had created, Haller proposed instead that the blood vessels of the iris, which could be readily identified using wax injection techniques, became dilated or constricted, thus permitting blood to flow in and out and inducing movements similar to the type known to occur in the erection of the penis. The erectile theory continued to be predominant for the next 70 years or so; only when improved microscopes became available and tissues could be sectioned and suitably stained, in the 1820s, was the sphincter muscle finally identified beyond all reasonable doubt. In the case of the dilator muscle, however, a fierce controversy was only quelled in the early part of the twentieth century when embryological studies revealed that both the dilator and constrictor muscles were derived from neural ectoderm.

In this book, Mazzolini has accomplished the task which he set himself; Haller's hypothesis does appear to have been original and to have radically influenced contemporary views. However, there are a few aspects in the text where further elaboration might have been helpful. Mazzolini has attempted by experimentation and using techniques similar to those employed by eighteenth century anatomists to determine how a number of ideas concerning iris movements were derived, but he has not sought to question the truth of Haller's statement — "the iris is not irritable". This is unfortunate as one gains the impression that Haller's concept remains correct. Modern ophthalmologists would agree that in the Hallerian sense the human iris does in fact exhibit irritability, since if it is accidentally photocoagulated or subjected to excessive manipulation — for example, during cataract surgery — changes in the size of the pupil may occur, albeit quite slowly.

Also, throughout the book, philosophical concepts prevailing during the eighteenth century are discussed which the author believes may have had an influence on attitudes on various workers on reaching their conclusions. But, particularly in the last chapter on *Naturphilosophen*, such theories have not been sufficiently well described for anyone who is not well versed in continental ideologies of the period to achieve an adequate understanding of a number of rather complex propositions. It likewise seems unnecessary to contemplate whether the Scotsman, Robert Whytt (1714–1766) was an unorthodox Stahlian or not, irrespective of Haller's views on this subject, since his reasoning on the nature of the pupillary responses to alterations of illumination is of the very highest quality in his work *An essay on the vital and other involuntary movements of animals*, published in 1751. The fact that he considered the soul or sentient spirit developed an awareness that the retina had become uneasy if too much light impinged upon it and responded by causing pupillary constriction, could be explained equally well on the basis that Whytt, in trying to describe the concept of a reflex, might have been attempting to avoid rousing the animosity of the powerful national religious orthodoxy of the period. Whytt's views were temporarily discredited, not so much because he believed in animism, but because there was insufficient experimental data to support his supposition in terms of Haller's new physiology.

The eighteenth century was a period of profound importance in the development of the medical sciences; it was during this time that the use of experimentation became widely respectable and the mists of archaic speculation began to melt away. Mazzolini is to be congratulated on providing a clear and eminently readable exposition of a period of the history of the iris which has recently suffered almost total neglect. Although speculations relating to the mechanics of the iris might appear to be a somewhat esoteric subject, we are given a clear indication of the wider aspects of physiological investigations that were being pursued during this period, which included the first steps as to how the fundus might be examined *in vivo* and the role of the retina as a light-sensitive tissue. □

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