

Other borrowed material includes paragraphs on the following pages: Parssinen, 86, Harding, 58; Parssinen, 87, Harding, 59; Parssinen, 88, Harding, 59. At a minimum, these errors, omissions, and borrowings raise questions about the depth of Dr Harding's research and the originality of his analysis.

Terry M. Parssinen  
Temple University

VIKTOR HAMBURGER, *The heritage of experimental embryology: Hans Spemann and the organizer*, Monographs on the History and Philosophy of Biology, New York and Oxford, Oxford University Press, 1988, 8vo, pp. xii, 196, illus., £22.50.

I came into embryology as a postdoctoral fellow in 1974, when the subject was rather unfashionable and neglected. Over my first few years I spent long hours in the library and read with fascination of an earlier "golden age" between the two World Wars. Slowly I pieced together the story of the organizer. It took time because most of the papers had to be retrieved from dusty stacks and because most were in German, a language I read poorly. How I would have loved to read Professor Hamburger's book then!

The organizer graft is a transplantation of tissue from the dorsal lip of the blastopore of an amphibian gastrula to the prospective ventral lip of another individual. When performed correctly, it yields a mirror symmetrical double dorsal embryo, rather like a pair of Siamese twins joined belly to belly. The lower half of the duplication, often called the secondary axis, consists of a notochord derived from the graft and the remainder, mainly somites and neural tube, is induced from the ventral tissues of the host. The organizer graft was first reported in a famous paper by Spemann and Mangold in 1924.

Hamburger was a graduate student in Spemann's department at Freiburg during the years that the organizer grafts were first being performed. In his book he describes the scientific background, the character of experimental work at the time, and something of the personality of the individuals involved. It is certainly sobering to be reminded of the experimental difficulties of the time. In my laboratory today we generate two or three batches of *Xenopus* eggs each week, we manipulate their developmental rate with incubators at different temperatures, and we protect our grafts and explant cultures from infection with antibiotics. During the 1920s, embryologists had to collect their eggs (usually newt eggs) from the wild during the brief breeding season in the spring. The whole year's experiments would be performed in a mad rush, with horrific mortality rates due to poor culture conditions and to infection. It is because of these difficulties that the famous organizer paper describes only six cases, of which only two show good double-dorsal duplications.

Hamburger goes on to describe the subsequent work on early amphibian development. Unfortunately the organizer, which we now regard as the source of a dorsalizing positional signal, was then seen mainly as an agent of neural induction. In 1932 three groups, all in Germany, simultaneously reported that *killed* organizer tissue had neural-inducing activity. This sparked off the famous "gold rush" for the chemical nature of the organizer, using neuralization of gastrula ectoderm as the assay. The hopelessness of such a task, with the biochemical techniques available over 50 years ago, may be assessed from the fact that we have only just succeeded in detecting a few picograms per embryo of the mesoderm-inducing factor bFGF, using affinity HPLC and ultrasensitive immunochemical methods. In fact, neural induction, particularly in newts, is a rather unspecific process and many substances can trigger it, including some synthetic chemicals which do not occur in embryos at all. This realization caused much consternation, and the high morale and sense of excitement evident in the literature of the '20s and '30s faded rapidly. The field as a whole went into eclipse during the Second World War, partly because of the failure of the gold rush, but also because of the dispersal of the German scientists whose efforts had led the way throughout this period.

The real legacy of the period was not so much the work on the organizer, which, with the benefit of hindsight can be seen as largely misdirected, but rather the formulation of a set of self-consistent concepts for the description and analysis of early development. For example, fate,

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potency, induction, competence, and regulation were widely used as categories of explanation in this period. Now, when we have the technical means to investigate the inner workings of cells, this heritage is available not as a set of explanations but as a set of problems requiring solution.

Probably no one did more in this vital task than Johannes Holtfreter, who receives extensive coverage in the second half of the book. His *in vitro* isolation experiments and his work on the regional specificity of neural induction particularly helped to define the style and standard of experimental embryology for decades to come.

Hamburger's book really finishes at the Second World War, although one or two later experiments are described. The modern era, starting with Nieuwkoop's discovery of mesoderm induction, is not covered. So this is not really a book for those who want to understand amphibian development, but rather a lucid and interesting account of a critical period in scientific history. It has a special fascination because it is written by a participant who can not only tell us what happened, but also what it felt like at the time.

Jonathan Slack  
ICRF Developmental Biology Unit, Oxford

TIMOTHY C. JACOBSON, *Making medical doctors: science and medicine at Vanderbilt since Flexner*, Tuscaloosa and London, University of Alabama Press, 1987, 8vo, pp. xiv, 349, illus., \$26.95.

Timothy Jacobson has produced a thoroughly researched and readable account of Vanderbilt University School of Medicine from its reorganization in 1925, following the Flexner Report (1910), and relocation to the University Campus, through to the present day. It examines in intricate detail the interrelationship of three men: James Kirkland, Chancellor of the University; Abraham Flexner, the catalyst and controversial revolutionary of medical education and subsequently its most prolific fund raiser; and G. Canby Robinson, its first Dean, architect, medical visionary—a man seemingly ahead of his time. We learn a great deal in the detailed biographies of these early giants in medical education, but more precisely the “nitty gritty” of building, funding, and staffing a school that had set as its goals those principles heralded by Flexner and the General Education Board—the wedding of science (research) with service (clinical practice) in an educational institution of high quality.

The appeal of this book is not only regional, but extends to those of us interested in the history of medical education, especially in the post-Flexner era. It depicts the struggle of one of the surviving thirty-seven medical schools in the aftermath of the 1910 report and its efforts to establish excellence in medical education and to start anew, using the Johns Hopkins Medical School as a model. The influence of this prototype on Flexner and Robinson is apparent not only in the selection of new faculty, but in such subtleties as the Oslerian flavour and philosophy championed by Robinson and his Hopkins élite.

Woven throughout the book is an account of the constant struggle for financial security as reflected not only in bricks and mortar, but also in the hiring of faculty, and most importantly the funding of research. Here the influence of Flexner, not the critic or inquisitor but the fund-raiser and supporter of his close friend and associate (they had neighbouring summer cottages in Ontario) Chancellor Kirkland, is brought into sharp focus. To quote Jacobson on Flexner, “He did not want to be remembered as a great thinker or a producer of knowledge, but rather more humbly as an opportunist guided by large and unselfish notions of how good could best be done”.

The book also spurs both regional and universal interest in its biographical detail of the early faculty, especially Burwell, Harrison, Morgan, Brooks, Blalock, and Goodpasteur, the latter the most renowned and capable researcher. Lastly, the book discusses in depth the modern evolution of the Vanderbilt Medical School, where the expansion of service (the hospital) has become so enormous as to seem out of place on a university campus, with its research priorities, Vanderbilt is not the only place where these commitments have come into competition.

John M. Flexner  
Vanderbilt University