

The eighteenth-century generation game

Christopher Lawrence

Matter, Life and Generation: Eighteenth-century Embryology and the Haller-Wolff Debate. By Shirley A. Roe. Pp.214. ISBN 0-521-23540-5. (Cambridge University Press: 1981.) £16, \$32.50.

AT FIRST sight the eighteenth-century debate on the nature of generation and embryological development might appear to have been a parochial affair. The path from fertilization to birth, however, was by no means a simple scientific conundrum calling for a straightforward empirical enquiry. As Professor Roe displays so clearly in this excellent book, generation was a hinge on which turned alternative cosmologies. Different theories of development brought into conflict incommensurable universes. Professor Roe has therefore used this particular study as a case history to illustrate some more general philosophical points about the nature of scientific enquiry and explanation.

In the eighteenth century there were two possible views on generation which were scientifically respectable. Preformationists held that embryos pre-existed in either the semen or the egg and these embryos in turn, like a nest of dolls, contained intact the next generation in their germinal material, and so on. This theory, first fully articulated by Malebranche in 1674, had considerable advantages over its rivals. The scientific revolution had virtually swept the intellectual field by the late seventeenth century. It left behind only matter, motion and — after Newton — force as the fundamental explanatory principles in the cosmos. Preformationism therefore explained the puzzle of why it was that the embryo developed in the way it did, rather than crediting the possibility that matter in motion could somehow give rise to organized material.

This latter eventuality was embraced by the epigenesists, who held that the embryo developed form and parts from where there

had been neither form nor parts before. The most famous epigenesists of the eighteenth century were Maupertuis, Buffon and Needham, and in the world of belles-lettres the philosopher Denis Diderot. All of these thinkers circumvented the problem of formal development by postulating that matter was innately active and not the passive servant of other forces. The preformation-epigenesis dichotomy therefore was not a simple scientific schism. Rather, on the one hand lay the divinely formed embryo, special creation, a meaningful universe, and thus a Christian cosmology and salvation. With epigenetic development lay chance, purposelessness, Lucretianism and extinction.

In the middle of the eighteenth century this debate was rekindled by the pious, Newtonian, Professor of Anatomy at Gottingen, Albrecht von Haller and the rationalist, upstart physician, Caspar Friedrich Wolff. Haller espoused preformationism and Wolff epigenesis, and for ten years they discussed the issue in print and in private correspondence. Two factors make the debate particularly interesting. First, they both conducted a great deal of detailed empirical research on the development of the hen's egg, attempting to discover or refute whether the chicken came first so to speak. The debate thus turned on complex technical questions such as the appearance of the heart, the gut membranes or the yolk sac vessels. Second, Wolff was no ranting atheist. Rather, he too was a deeply pious Christian, but one who had begun with his feet in quite different metaphysical starting blocks to those of Haller. For Wolff, the laws of motion observed by matter had been created by God in the first place. Thus, epigenetic development was, in a way, preformationism one stage back.

Professor Roe unfurls this dialogue, or rather these two monologues, and shows clearly that, given the metaphysical corners of the protagonists, neither was going to get near enough to strike a blow. Where Wolff saw a heart developing and new bits forming, Haller saw a previously transparent structure becoming denser, coloured and demarcated from its surroundings. Professor Roe reveals these aspects of the debate with faultless precision founded on superb scholarship.

What is disappointing, however, is that she stops short at either end of the argument. At the observational end she offers no discussion as to whether Haller and Wolff were interpreting differently the same data or whether they were actually seeing the world differently. Professor Roe never says whether Haller ever disagreed with Wolff's embryological drawings and denied that they represented reality, or whether Haller only disputed the meaning

of agreed observations. Neither is it clear whether Haller produced any drawings of what he saw. At the metaphysical end of the argument, Professor Roe seems to suggest her task is over when she has related a scientific debate to more general metaphysical principles. Having shown that the world rests on the back of an elephant, she neither asks if the elephant itself rests on anything or, if not, shows why her explanation of the Haller-Wolff debate might be sufficient once the metaphysics have been invoked. The epigenesis-preformationism debate is therefore still a somewhat circumscribed area in eighteenth-century science. After this book, however, historians will need to perambulate a much extended perimeter fence. □

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Battle over bacteria

G.D. Heathcote

The Fischer-Smith Controversy: Are There Bacterial Diseases of Plants? Phytopathological Classic No.13. Translated and prepared by C. Lee Campbell. Pp.65. ISBN 0-89054-014-4. (American Phytopathological Society, 3340 Pilot Knob Rd, St Paul, Minnesota: 1981.) \$8.50.

PROBABLY few plant pathologists will make the time to read this pamphlet, which consists of little more than seven review papers published in Germany between 1897 and 1901, but the American Phytopathological Society did well to publish it. Perhaps they did so because it has a plot which could not fail to appeal to the American spirit. It tells how Erwin Smith, originally a poor farm boy from Michigan, battled (with words only of course) against the academic might of the classically trained Alfred Fischer, once an unsalaried lecturer in botany at the University of Leipzig, at the time when plant pathology was almost a German science.

The debate as to whether or not bacteria can be the direct cause of disease in plants stimulated the two protagonists into making bitter and personal attacks against each other. Smith's statement regarding part of one of Fischer's lectures: "It is seldom in a genuinely scientific book that one finds so many unwarranted assumptions and serious misstatements in the space of a single page . . ." would undoubtedly have infuriated Fischer, and attacking Smith he wrote: ". . . after experiments of that kind . . . no one will think badly of me that I had not sought further statements in the American

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Chicken development — detail from Fabricius's *De Formatione Ovi et Pulli* (*Opera Physica Anatomica*, 1625).

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literature when I wrote my lecture”.

Fischer was convinced that bacteria are only saprophytic upon tissues already broken down and that they cannot penetrate undamaged cells. Smith quoted experiments showing how bacteria can dissolve cell walls and that they can enter undamaged tissues, for example pear blight bacteria can penetrate through nectaries. In the end nobody won as such. Smith died in 1927 after a long and distinguished career, and although Fischer eventually suffered from depression and committed suicide in 1913 his professional stature was not diminished by the controversy.

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Erwin Smith, farm boy turned plant pathologist. In 1899 he wrote of Fischer “. . . he garbles and misrepresents, charging other men with being stupid blunderers . . .”.

Nonetheless, the debate proved to be a significant event in plant pathology. Smith's view became accepted, and plant pathologists began to work seriously on bacterial diseases. Today between 180 and 200 species of plant pathogenic bacteria are recognized, causing serious economic loss throughout the world. They are unable to penetrate the plant cuticle and many require wounds to gain entry into the host plant but some enter through natural openings. Many are windblown or disseminated by splashing water, and at least 60 species can be carried by insects, for example fire blight of apples and related species is carried by honey bees.

The statements some of us make today are usually shorter but they are no more reasonable than those made by our predecessors. I can well remember the disbelief when it was first suggested that nematodes can carry virus diseases, and some of the diseases I thought to be caused by the viruses have been shown to be caused by mycoplasma-like organisms. Like so many controversies of the past, the Fischer-Smith debate repeats the lesson that in plant pathology, as in all of science, dogmatism is dangerous. □

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Test tube to womb: ethics and politics

R.V. Short

From Chance to Purpose: An Appraisal of External Human Fertilization. By Clifford Grobstein. Pp.207. ISBN 0-201-04585-0. (Addison-Wesley: 1981.) \$17.50, £11.50.

IN THIS book Dr Grobstein, Professor of Biological Science and Public Policy at the University of California, San Diego, seeks to describe for the general reader the technical procedures involved in human *in vitro* fertilization, and the social and political implications of this work. We are told that Dr Grobstein is internationally known for his research in developmental biology, and so we are entitled to expect a good read, and a penetrating analysis of present developments and future prospects.

The book turns out to be little more than an annotated commentary on the report of the US Ethics Advisory Board on Research Involving Human In Vitro Fertilization and Embryo Transfer, which was published in 1979. Fortunately this report is reprinted as an appendix, and for those not already familiar with it, it will form by far the most interesting part of Grobstein's book. Joseph Califano, the former Secretary of Health, Education and Welfare in the Carter administration, deserves considerable credit for setting up the Ethics Advisory Board, alas now disbanded, and charging such a distinguished group of scientists, lawyers, theologians, clinicians, ethicists and administrators with an in-depth investigation of the whole subject of *in vitro* fertilization. The way the Board went about this task was commendable. They commissioned manuscripts from leading experts known to have views on the matter, and held public hearings around the United States, with live radio and television coverage, to which anyone could give testimony, and at which the experts were cross-questioned by the Board. All the written evidence was then published, together with the incisive, common-sense judgements of the Board, who must have been greatly indebted to their chairman, a lawyer, James C. Gaither, for producing a consensus report from a Board that itself embraced such widely divergent views. The conclusions were neither remarkable nor controversial. The human embryo is entitled to profound respect, but this does not necessarily encompass the full legal and moral rights attributed to an adult individual. Therefore, a broad prohibition of research involving human *in vitro* fertilization is neither justified nor wise. Federal support for such work would be ethically acceptable, and there is a need for more research in order to assess the risks to mother and offspring.

The Board managed to steer a course between the Scylla of those such as the President of the Massachusetts Council of

Rabbis, who thundered that “Further *in vitro* experimentation could tend to eliminate the need for the human family and turn humanity into a zoo of fertilized and fertilizing animals”, and the Charybdis of the brothers Seed (*sic*) who offered to buy fertilized eggs flushed from the uteri of women donors, and transfer them to the uteri of infertile recipients — at a price. Nevertheless, the publication of the Board's findings in the Federal Register on June 19th 1979 produced a storm of written protest from, one suspects, the Right to Life group. Secretary Califano took no action on the Report's recommendations, and shortly thereafter resigned. The Ethics Advisory Board was then disbanded because Congress established a new “President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research”, that does not seem to have addressed itself to the problem, and America changed Presidents.

Since that time, nothing more has been heard of the Board's report. It seems to have sunk without trace, presumably too hot for a right-wing administration to handle. But thereby went an honest attempt to reach a consensus view by public debate of a contentious issue, and much time and money was wasted in the process. It is sobering for scientists to realize that even if an issue is scientifically, socially and ethically acceptable, it will receive no governmental support unless it is politically expedient. But Everyman will have the last say; new clinics are opening up around the world, and the number of successful births following *in vitro* fertilization is now into the teens. Even the President of the United States cannot halt such progress, although the paucity of governmental funding for the back-up research that is so urgently needed can significantly delay it. The success rate of the procedure is still very low, and research could surely improve it to the point where we might expect a 25 per cent chance of pregnancy following embryo transfer, which is the probability that a fertile woman has of conceiving in an ordinary menstrual cycle.

But all of these comments relate to the appendix. What of the book itself? It has little to add that is new, much that could have been discussed is missing, and several statements are factually incorrect. As for its good points, it is sensible to suggest that we should re-name *in vitro* fertilization “external fertilization”, a term that is infinitely preferable to “test-tube baby”, which has alas probably come to stay. Grobstein also has an interesting chapter on “Becoming a Person”, in which he propounds the common-sense view that “neither life nor the human quality begins in any generation. Human life, like that of all species, descends without break from