

crossbridges. Many of these papers deal with this issue, and a computer model is proposed that attempts to explain latch in terms of the properties of cycling crossbridges. This model proposes that crossbridges that are dephosphorylated while attached to myosin cycle more slowly than phosphorylated crossbridges, presumably because of a slower detachment-rate constant from actin.

The book has a few irritating features. There is a mixture of typefaces among the individual chapters, and in some cases it is difficult to determine where figure legends end and text begins. In addition, a few of the halftone figures are poorly reproduced.

Aside from these minor problems, the book is a valuable resource for investigators in this field and for researchers or students who wish to learn the current state of affairs in smooth muscle research. Perhaps its most valuable contribution lies in showing that there is still much to be learned about the regulation and mechanism of contraction of smooth muscle.

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Comparative Endocrinology

Hormones and Reproduction in Fishes, Amphibians, and Reptiles. DAVID O. NORRIS and RICHARD E. JONES, Eds. Plenum, New York, 1987. xxvi, 613 pp., illus. \$95.

As the editors of this volume indicate in their preface, there are five primary reasons for examining the reproductive endocrinology of species that most endocrinologists would regard as "exotics." These include the obvious advantages of understanding the endogenous mechanisms controlling reproduction in economically important or endangered species and the potential use of endocrine manipulation to enhance production or manage natural populations. Though these are primary incentives for much of the work currently under way in comparative reproductive endocrinology, it is basic rather than applied reproductive endocrinology that is the primary focus of this volume. The editors point out that the examination of homologous and analogous hormonal systems in diverse species can provide a clearer understanding of the evolution of reproductive control mechanisms, and the book is organized in such a way as to facilitate such analysis; the 19 chapters, all reviews written by leading researchers in the field, concentrate on major research topics rather than on any one phylogenetic group.

These topics, chosen to represent the primary areas of investigation, range from hormonal control of sexual differentiation to aging of neuroendocrine systems and include hypothalamic, pituitary, ovarian, and testicular function. Summaries are provided for rapidly emerging areas of research (structure and function of gonadotropin-releasing hormones, characterization of steroid receptors), as well as for topics of long-standing interest (hormonal control of oocyte growth, maturation, and ovulation, vitellogenesis, pineal function, sexual differentiation, reproductive behavior, seasonality, and viviparity). Some topics (male accessory ducts, stress, thyroid function, and aging) are comprehensively reviewed here for the first time in a comparative reproductive context.

Within each chapter, separate consideration is given to fishes (usually taken to include Agnatha, Chondrichthyes, and Osteichthyes), reptiles, and amphibians, with summaries of mammalian and avian findings often included as background. Consequently, the species index includes over 400 entries representing all the vertebrate classes. The danger that chapters become little more than lists of research findings by class is occasionally apparent. A major strength of the book, however, is that it reviews a broad and vigorous field of research comprehensively and coherently. Most of the chapters conclude with summaries meant to provide an evolutionary context for the assembled facts and identify the important areas of research progress.

A final rationale the editors give for comparative reproductive research is that ectotherms may in some circumstances serve as model systems for the identification and investigation of fundamental physiological processes with applications to mammals and birds. Unfortunately, an ectothermic model system that has been embraced by the endothermic research establishment is about as rare as a mammalian endocrinologist who closely follows the comparative literature. A successful example, the African clawed frog *Xenopus laevis*, which is now used extensively to study the molecular mechanisms of oocyte development, is discussed frequently throughout the book, although no more frequently than other dominant ectothermic model systems, such as salmonid and cyprinid fishes, ranid frogs, and the lizard *Anolis*. This book serves well to identify the areas of research where studies of poikilotherms are making significant contributions to our basic understanding of the endocrinology of reproduction, including neuropeptide structure-function relationships, environmental and hormonal interactions in the control of reproductive seasonality, and cellular and

molecular mechanisms of hormone action. It also identifies many gaps in our knowledge of ectotherm reproduction. Its thorough treatment of the most active area of comparative vertebrate endocrinology makes it essential to the library of any comparative endocrinologist, but it should also be valuable to any endocrinologist or reproductive biologist interested in obtaining a new perspective on a particular research problem or a broader context for interpretation of results.

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Secularization and Technology

The Restoration of Perfection. Labor and Technology in Medieval Culture. GEORGE OVITT, JR. Rutgers University Press, New Brunswick, NJ, 1987. xiv, 272 pp. \$32.

This book is not a history of labor or of technology during the Middle Ages. It is, rather, a study of the cultural context of these during the medieval period, with culture being construed in terms of dominant intellectual (that is, theological) ideas and attitudes. George Ovitt's analysis, aimed at the formulation of a perspective on the Middle Ages that permits an accurate assessment of their place in the history of Western labor and technology, confronts repeatedly some celebrated (although variously conflicting) understandings of the medieval achievement.

One of these relates to the modern idea of progress, which Ovitt traces from its 17th-century origins, beginning with Francis Bacon, to the present. Progress, within this perspective, was triggered by the repudiation of the intellectually stultifying culture of the Middle Ages (stultified by religion) and has been sustained ever since by the commitments of reason, science, and technology to the study and exploitation of nature for the benefit of man. Ovitt's reservations concerning the virtuousness of that enterprise resound throughout the book. With respect to the representation of medieval religion as necessarily inimical to progress, technological or otherwise, Ovitt suggests that the notion of progress is relative and that medieval theology did itself embrace an idea of progress. This did, to be sure, enjoin and subordinate human ingenuity and society to the workings of Providence, but that need not and did not prove a complete barrier to the development of efficient labor or of technology or to the major

medieval social and economic changes with which these came to be associated. In fact, the Church's construal of the providential design in the later Middle Ages contributed significantly to the social and attitudinal configurations that accelerated technological development.

What the medieval idea of progress did not contribute to that development is as central a concern of Ovitt's book as what it did contribute, and this strikes directly at some widely influential (although not previously unchallenged) scholarship that has undertaken not only to trace major roots of Western technological attitudes and developments back to the medieval centuries (a lineage Ovitt does not deny) but also to show that medieval theology and religious institutions provided the requisite "cultural climate" that nurtured technological growth in the first place (which Ovitt contests). Ernst Benz and Lynn White, for example, have seen medieval man's special relationship with God—God the Creator, Architect, and Craftsman, the continuance of Whose work is a form of prayer—as a license for the dominance, even exploitation, of nature for man's benefit, using technology to expedite that sanctified labor. For Jacques Le Goff, Christian doctrine did not create the conditions for the technological growth that occurred (these were social and economic), but it did respond, before the end of the medieval period, with a new theology generally cordial to man's dominance over the physical world and his utilization of technology to that end. Max Weber and Lewis Mumford (echoed by Herbert Workman and Lynn White) have argued that from the outset Benedictine monastic ideology and practices provided an effective institutional context for the pursuit of a dynamic ethic of work, invention, dominance, and exploitation.

Ovitt, essentially on the basis of his reading of Christian hexaemeral literature (dealing with the six days of creation) and of some of the formative theology and rules relating to Benedictine monasticism, does not find the license for an exploitative dominance of nature, with or without technology, in the medieval perception of God as Craftsman, of man as custodian, or of monasticism as a social instrument of God's doing. Quite to the contrary, the relevant theology exalts a morally ordered, mutually sustaining and non-exploitative relationship between man and nature before the Fall, associates such exploitative attitudes and conduct with postlapsarian sin, and by implication (indeed by regulation within the monastic community) counsels a moral and practical ordering of labor compatible with spiritual values and priorities. Nor, incidentally,

does Ovitt view the inclusion of the mechanical arts within the Christian classification of knowledge (as articulated by the mid-12th century) as a sanctification of technology (discernible, according to Lynn White, in other medieval artifacts); as reflected in the theological sources examined here, the mechanical arts remained inferior and subsidiary to theological disciplines and spiritual exercises.

In Ovitt's view, the conditions that nurtured the gradual technological, economic, and social changes that did occur in medieval Europe, the accumulative effects of which were profoundly evident by the 12th century (as is reliably documented here), were formatively energized by secular forces and not by theology (in any direct or formal way). Official theological and ecclesiastical dispositions of the 12th and 13th centuries, viewed as consonant with providential design, did, however, contribute decisively to the new dynamism of medieval civilization. These did not amount to the elevation at last (compare Le Goff) of technology and its associated activities (production, profit, and so on) to a higher theological status, much less to a doctrinal sanction of Church involvement in secular affairs (early experiences of that sort quickly revealed their spiritually compromising impact). To preserve its spiritual integrity and superiority, and with the effect of demonstrating its moral and social force, the Church (including its great monastic institutions) withdrew from the mundane world and, in its major doctrinal formulations, assigned that world and its activities to a providentially structured secular society. A significant element in this, for Ovitt, was what he calls "the secularization of labor." Nor did the Church thereby condemn all the world except itself to Hell. Secular life, even when successful, did not necessarily preclude salvation; indeed, newly constituted mendicant orders dispatched friars bearing salvatory assurances and remedies.

The implications for labor and technology thus consigned to the secular realm and increasingly free of moral restraint (a morality still valued by the Church but largely in terms of its own internal life) were enormous. One might rejoice in the new impetus to technological inventiveness and industrial expansion provided from then onward by secular entrepreneurial forces, but Ovitt himself is not inclined to do so. His overriding concern—a grave one, which pervades the book from its title to its conclusion—is what he perceives to be, concurrent with Western technological and economic developments ever since the later Middle Ages, the persistent failure to restore a lost perfection. This perfection refers to that harmony

among man, labor, and nature and to that balance of physical, intellectual, and spiritual work which Genesis describes, which medieval theology prescribes (although at the end largely for the Church itself), and which, to some degree, our early medieval ancestors may have possessed, or at least valued. The secularizing processes, clearly evident by the later Middle Ages, have extended to subject the majority of men and women (Ovitt is expansive in his inclusion of women and the special effects of change upon them) to impersonal political and economic forces; to separate people from the products of their labor; to vitiate the power of labor to restore and sustain spiritual and moral vigor; and to unleash upon nature a relentless and destructive technological assault.

Whether one prefers to detect and value Judeo-Christian, or Marxian, or purely idiosyncratic overtones in Ovitt's plaint, it deserves to be taken seriously by anyone who recognizes something less than perfect, and yet perhaps not irremediable, in the social and ecological realities of our world. With respect to medieval technology itself, Ovitt, with his own battery of cultural evidence, mounts an intriguing rebuttal of the argument of Lynn White and others that cultural factors constituted the primary causal or catalytic conditions for growth. He does not appreciably describe or account for the specific secular ingredients which must, then, have nurtured the original energy, inventiveness, and initiatives, but he does not claim to do so. Ovitt's perception of a theologically sanctioned assignment of the conduct and control of labor and technology to the secular realm, with all its implications, is a masterful intellectual achievement and, subject to inevitable scholarly testing, an important contribution to an understanding of our medieval heritage.

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Books Received

Accretion Processes in Astrophysics. J. Audouze and J. Trân Thanh Vân, Eds. Editions Frontières, Gif sur Yvette, France, 1986. x, 215 pp., illus. \$30. From a meeting, Les Arcs, France, March 1986.

Acromegaly. A Century of Scientific and Clinical Progress. Richard J. Robbins and Shlomo Melmed, Eds. Plenum, New York, 1987. xii, 290 pp., illus. \$59.50. Sero Symposium, USA (San Francisco, CA, July 1986).

Alice Hamilton. A Life in Letters. Barbara Sicherman. Harvard University Press, Cambridge, MA, 1987. xvi, 460 pp. + plates. Paper, \$9.95. Reprint, 1984 edition.

Aquatic Plants for Water Treatment and Resource Recovery. K. R. Reddy and W. H. Smith, Eds. Magnolia, Orlando, FL, 1987. xxiv, 1032 pp., illus. \$120. From a conference, Orlando, FL, July 1986.

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