Thinking, except that in that study the concepts were largely categories, whereas in Grammarama they were sequential generative rules. The attainment of the latter concepts appears to be a task of considerably higher order of complexity.

The Psychology of Communication is written in easy, informed style. I can think of no better way to introduce the above mentioned "modern" methods in psychology to the general reader.

I would take issue with Miller's optimistic prognoses on the role of information-processing technology in human affairs. In the sixth essay (Computers, Communication, and Cognition) he easily refutes the popular apprehensions (of mass unemployment and the like). But, he does not touch upon the more serious misgivings expressed, for example, in Norbert Wiener's last book, *God and Golem, Inc.*, in which the theme is idolatry.

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A Study in Professionalization

The Mechanical Engineer in America, 1830–1910. MONTE A. CALVERT. Johns Hopkins Press, Baltimore, 1967. 314 pp., illus. $8.50.

Historians are notorious conservatives, and it is encouraging to find signs of a growing academic interest in such historically uncanonical subjects as professionalization, technology, and bureaucratization, forces which have, after all, dominated our society for more than half a century. Calvert's study makes a genuine contribution in all three of these areas. This book is characteristically "modern" not only in subject matter but in organization as well. Its author has been willing to adopt as an integral part of his conceptual and structural framework the generalized characteristics assigned by sociologists to the professions, eschewing both the traditional narrative mode of the historian and the internal subject-matter-oriented approach of historians of science and technology. Calvert has obviously sought to learn something of the nature of professional life, not simply to write about mechanical engineering. Insofar as his subject fails in many ways to fit traditional models of professional life—based as they have been upon law, medicine, and divinity—Calvert's study is all the more valuable, for it provides a series of important insights into determinants of professionalization in a context vastly different from that of the guild-conscious, consultant-oriented world of the lawyer or physician.

The author's general thesis is easily summarized. The history of mechanical engineering in America in these formative generations has to be seen, he argues, as essentially a conflict between two distinct cultures, a "shop culture" originating in the procedures and values of the 19th-century machine shop, and a newer "school culture" centered around the more formal training patterns of the engineering school. The shop-culture leaders, as Calvert sees them, were throughout the century men of good family and established social position, men who had gradually worked their way up through the successive stages of training and acclimatization in the shop, often in enterprises owned by relatives or other family connections. The comparatively small size, moreover, of individual production units in the mid-19th-century machine-tool industry meant that the shop-culture elite would in many cases have to function as businessmen as well as engineers. These engineer-entrepreneurs were naturally leaders in the establishment and in the affairs of the first generation of the American Society of Mechanical Engineers. Calvert contends that shop-culture spokesmen were, moreover, in many ways hostile to or uninterested in the more self-consciously professional stance of the educators and administrators who spoke for the school culture. They had little interest in formal academic standards or explicit ethical codes; for the status of the shop-culture elite was based not simply on their role as engineers and the respect allotted such practitioners by society, but also on their social and business status—factors, that is, extrinsic to their peculiarly engineering function. (Calvert does, however, suggest that the role of mechanical engineer might, in mid-19th century, have provided a means through which gentlemen could find an economically secure place in an increasingly materialistic society yet still maintain some of the professional's dignity and social orientation.) Most of the growing number of engineering-school graduates in the last decades of the century came from lower socioeconomic backgrounds and, Calvert argues, had far more at stake in the establishment of an assured professional status. Thus their unhappiness with the desire of shop-culture leaders to keep the ASME as something of a gentleman's private club. Thus the emphasis of school culture spokesmen upon formal academic credentials and their insistence upon the necessity for studying pure mathematics and physics, as opposed to the more intuitive, practice-oriented emphases of the shop-culture spokesmen. This polarity of values explains, for example, the surprisingly sharp turn-of-the-century conflict in the ASME over the adoption of the metric system, an innovation supported by school-culture leaders and opposed by the Society's dominant shop-culture elite, many of whom, as entrepreneurs, might have faced substantial economic costs if the merit system were universally adopted.

Such questions became increasingly unavoidable as the technological and organizational structure of American industry changed; in the late 19th and early 20th centuries it was becoming ever more apparent that the entrepreneurial model was no longer a realistic one for the mechanical engineer. The very great majority, whether trained in the schools or primarily in the shop, would have to assume more or less subordinate places in increasingly large bureaucratic aggregations (in which, ironically, engineers who hoped to occupy the highest seats of power would be those who gave up engineering and entered the managerial and decision-making echelons). The mechanical engineer, unlike the civil engineer, had never been basically an independent consultant; now he was almost always a component part of a decreasingly autonomous production function. It is in this context that Calvert makes a significant reinterpretation of Frederick W. Taylor and the other mechanical-engineering apostles of scientific management. He sees the shaping of this new discipline as an attempt by younger members of the shop-culture elite—of which Taylor was clearly a part— to create a new management role, one in which the engineer might preserve his status and decision-making autonomy, even in a large corporate entity.

As I hope to have suggested, Calvert's study is novel and inherently interesting in its subject matter and in some ways broadly suggestive in its implications. Its method, however, raises a number of questions. Most obviously, the author's decision to rely in only

a very general way upon chronology for organization—in a book covering almost a century of rapidly changing history—inevitably blurs the precise dimensions of a number of the changes he is most concerned to illuminate. Perhaps most important, this inattention to chronology also blurs the process by which cumulative innovation, both technological and institutional, was gradually restructuring mechanical engineering. (For it seems apparent that it was such larger societal forces, rather than programmatic statements, that played the essential role in reshaping the profession.) Thus, a case study of the engineer in a particular industry might have served to illustrate and clarify the manner in which a changing technology and market structure ultimately and impersonally created new institutional conditions and made new intellectual demands upon mechanical engineers. Such a discussion might, for example, similarly have shed light on the question of how much the educational demands of school-culture spokesmen were simply realistic appraisals of a changing technology and how much a formalistic prop for professional strivings. This point implies another organizational problem: a study emphasizing the sociological determinants of professionalization inevitably displays a certain arbitrariness of structure, in that it emphasizes formal statements and intra-guild issues, such as ethics, at the expense of a more "organic" treatment of the profession as a whole (a problem exacerbated by the comparative ease of locating and evaluating formal programmatic statements, the difficulty of locating and analyzing the individual and corporate records which provide the bases for an understanding of the functional anatomy of the profession). To put it another way, this is perhaps too much a study of conflicting ideologies, too little a description of a specific group performing a task. Thus, for example, it is never made precisely clear how the school-culture leadership developed, and similarly there is no really satisfying discussion of the social infrastructure of the machine shop—or a machine shop. But the answering of such questions—if they could be answered—would, of course, have meant the writing of a far different and perhaps less sharply focused study; such reflections aside, this is an important and clearly argued book, and, one hopes, a harbinger of increasing concern for such problems among academic historians.

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Phenomena of Development

Current Topics in Developmental Biology. Vol. 1. A. A. MOSCONA and ALBERTO MONROY, Eds. Academic Press, New York, 1966. 317 pp., illus. $12.50.

One ought to welcome the introduction of graphic, lively language into the drab and sometimes monotonous literature of scientific reports. Molecular biologists can be credited for enlivening their writings with such words as *transcription, translation, degeneracy,* and *mRNA,* for example. Sometimes, though, descriptive terms transcend the limits of fact and convey an impression which is misleading. *"Masked" mRNA* is such a term, conceptually attractive, but unfortunate because it seems to have received uncritical acceptance by many.

The introductory review paper in this first volume of *Current Topics in Developmental Biology* is called On "Masked" Forms of Messenger RNA in Early Embryogenesis and in Other Differentiating Systems. The prominence given the article in the collection and the concept in the title underscore the importance of the metaphor even though evidence for the existence of masked mRNA is still tenuous. The case developed by the author of this paper, A. S. Spirin, rests primarily on the concept that the unfertilized egg is synthetically inactive, which if true would make the demonstration of post-fertilization protein synthesis in the absence of RNA synthesis a strong argument in favor of stored (specifically protected = masked?) mRNA, or mRNA held in reserve for future use. Recent work has shown, however, that the relatively impermeable mature unfertilized egg is metabolically active, though not as active in protein synthesis as the fertilized egg. The pivot of the problem, then, is whether any of the proteins made after fertilization are different from those made before fertilization. If they are not, the case for "masked" mRNA is considerably weakened by the equally valid conclusions that at least some messages may be translated at one rate before fertilization and at a faster rate after fertilization or that use of mRNA in the unfertilized egg is limited by available energy, the number of usable ribosomes, or some other relevant factor. A translational-level regulation of the use of long-lived mRNA would be suggested rather than "masked" or unavailable mRNA and its corollary consequence, "unmasking" at the time of fertilization. Recent reports call also for a hard look at the existence of masked polysomes, several times suggested but never proven to occur. Spirin's discussion of mRNA in transit is a critical and useful brief review, but it too would profit by explicit reservations. In the absence of identification of mRNA by functional criteria, the message content of post-ribosomal particles should be viewed with more concern.

The editors of the series have taken advantage of their opportunity to bring into focus in readily accessible reviews topics of current interest in the burgeoning field of development, and their choices reflect their astuteness. The two reviews on erythroid cell differentiation, one stressing regulation through hormonal control and the other regulation at the level of synthesis of a specific protein product, complement one another well.

The identification of an enzyme, UDP galactose polysaccharide transferase, which appears and disappears in the course of slime-mold differentiation has provided a convenient point of departure for studying protein synthesis and its regulation in relation to specific morphogenetic changes. Sussman has written a thorough review telling of work based on the application of the techniques and the reasoning of molecular biology to the problem.

The article on mosaics in the eye of *Drosophila* is a welcome review of a classical subject of limited vogue still being fruitfully explored. In examining a potentially genetically identifiable change which affects a specific character of an eye cell and its descendants, Becker seems to be pursuing a useful approach to the problem of cell lineage. If somatic cell genetics is still to be developed as a tool of analysis for differentiation, *Drosophila* may be the organism with which to do it.

A few reviews would have benefited by editorial severity. The now well-