the theory and data that have accumulated since Piaget on the growth of cognitive skills and conceptual understanding early in human development. Cognitive competences more systematic than was previously expected have been found in young children in such domains of knowledge and skill as first language proficiency, general spatial knowledge and related perceptual abilities, elementary concepts of number, causal thinking, and classification. The proficiencies involved appear to be acquired on the basis of interaction between the increasing organization of knowledge and the kinds of cognitive processes described in Sternberg's componential theory.

Beyond IQ is a challenge to further experiment and theory. It also gives evidence that the scientific study of intelligence has moved beyond the stage of measuring undefined entities to a stage of investigating cognitive abilities so that intellectual proficiency can be understood and enhanced.

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A System of Academies

Science Reorganized. Scientific Societies in the Eighteenth Century. JAMES E. MCCLELLAN III. Columbia University Press, New York, 1985. xxxii, 413 pp., illus. $45.

Scientific societies were the leading institutions supporting natural philosophy in the 17th and 18th centuries. They united natural philosophers in common endeavor, disseminated research through correspondence and the first scientific journals, and provided limited support for research in the form of salaries, laboratories, and access to state scientific employment. They have been celebrated since their earliest foundation by historians, who, however, have generally focused on 17th-century institutions or on the history of individual academies. McClellan's *Science Reorganized: Scientific Societies in the Eighteenth Century* is, to my knowledge, the first monograph to offer a comprehensive survey of the scientific societies during the century of their greatest significance.

McClellan covers all the more important societies and numerous lesser ones, giving a brief history of each and noting its sources of support, internal organization, publications, physical plant, sponsorship of prize competitions, and other activities. In the course of this survey he rightly traces what he calls a "scientific society movement" (p. 41), in which the numbers of societies grew exponentially. McClellan divides this movement into three periods. The Royal Society of London and the Académie Royale des Sciences at Paris were the only significant and permanent foundations prior to 1700. After 1700 the movement "began to pick up steam" (p. 67), and by 1750 all the major European academies were founded—those at Berlin, St. Petersburg, Stockholm, and Bologna and in several of the French provinces. The last period, 1750–1790, enjoyed "the full flowering of the scientific society system" (p. 68), including several attempts at unification among societies. By the late 18th century every European state either possessed an academy or had felt the stirrings of the movement. The entire system collapsed, however, in the chaos of the French revolutionary era; when they revived after the Restoration, the academies faced tough competition from universities and specialized scientific societies. The "age of academies" had ended.

Except for two chapters on the international relations among societies, McClellan does not base his account on original research. But he has gathered information on a very large subject and systematized it in a useful way. A taxonomy of scientific societies in the first chapter sets forth distinctions regarding modes of patronage, organization, and activities, and two appendixes list all the academies with relevant information in summary form. The narrative sections of the book, the appendixes, and a substantial bibliography offer an excellent overview of the scientific societies of the 18th century.

The book is less strong in its conclusions. Having established the strength of the scientific society movement, McClellan emphasizes that it "was a real thing" (pp. 54, 68). On the other hand he overstates his case in claiming that the movement's importance was "equaled only perhaps by the emergence of medieval universities in the twelfth and thirteenth centuries" (p. 140). Such a conclusion requires some evaluation of the societies' contributions to the institutionalization and content of science; but McClellan has here laid out only the parameters of their existence. Likewise overstated is the argument for an international network of cooperating institutions, for which McClellan offers as evidence little more than their exchange of correspondence and publications. McClellan makes too much of their coordination and exchange of observations on the occasions of several well-known astronomical and geodesic expeditions—those to Lapland and Peru in 1735 and to observe the transits of Venus in 1761 and 1769. Far from being triumphs of international cooperation, these expeditions were nationalistic undertakings.

Several lines of investigation might have led to more substantial conclusions than are offered here. Comparisons might be drawn among the academies in such respects as size, sources of support, and organization and the results set in the larger history of the Enlightenment. A study of prize competitions, the importance of which McClellan recognizes, would establish the extent of their influence on research. Finally, English usage could be much improved, in particular, the use of "cartology" in preference to "cartography" (p. 119 and passim). Attention to any of these matters would have substantially increased the value of this work.

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Gauge Theories

Progress in Gauge Field Theory. G. 'T HOOFT, A. JAFFE, H. LEHMANN, P. K. MITTER, I. M. SINGER, and R. STORA, Eds. Plenum, New York, 1984. x, 608 pp., illus. $89.50. NATO ASI Series B, vol. 115. From an institute, Cargèse, Corsica, France, Sept. 1983.

Gauge theories have dominated theoretical elementary particle physics for the last 15 years, and they have played an important role in other fields of theoretical and mathematical physics. Based on the "gauge principle" of invariance of physical laws under local symmetry transformations, which first appeared in 1918 in H. Weyl's almost-forgotten attempt to unify electromagnetism with gravity and was generalized to non-Abelian symmetry groups by Yang and Mills in 1954, gauge theories have been the key to the successful unification of weak and electromagnetic forces as well as to the generally accepted description of strong interactions by quantum chromodynamics (QCD) and a large number of attempts to further unify the electroweak and strong forces in a so-called grand unified theory (GUT).

Lately, however, there are signs that the era of the dominance of gauge theories may be over and that the so-called