scientific papers and on rather dubious historical accounts. Instead of documenting how meteorologists established their theories and why they reacted to criticism as they did, she infers thought processes and imputes motives. Not surprisingly, many of the resulting accounts are misleading; indeed, some are erroneous. Kutzbach does not allow for a multiplicity of problem interests on the part of the meteorologists in question or for any significant role of forecasting concerns and practices in the evolution of meteorological thought. All meteorologists are made to appear, falsely, to have had an overriding concern with the thermal theory of cyclones. These weaknesses preclude an understanding of the Bergen school's achievements and their relationship to past accomplishments.

Bergen meteorologists, such as Bjerknes and his son, Jacob, Solberg, and Bergeron, did not arrive at their new models through contemplation in the peace of a university milieu. Rather, they brought about their transformation of meteorological thought while constructing a weather service intended to aid Norway in time of economic and social crisis. Kutzbach's assumption that theory begets theory misses the point, as does her characterization of the Bergen meteorology solely as theory. Bergen meteorologists constructed their models over a period of time partly as a consequence of changes in forecasting methods and partly in conjunction with their efforts to forge new forecasting techniques to meet challenges arising from agriculture, aviation, and fishery. Physical reasoning and theoretical deliberation were involved in this process, but not in the way Kutzbach assumes. Her discussion of alleged precursors and supposed unacknowledged influences, such as Dove, Helmholtz, Margules, and Shaw, reveals a lack of appreciation for the nature and historical significance of those scientists' work as well as of the Bergen school's.

Much of the confusion originates from uncritical reading of the historical statements written by meteorologists, both opponents and adherents of the Bergen school. The historical literature on which Kutzbach builds her argument stems from a struggle for power and authority within the meteorological discipline. When international scientific cooperation resumed after World War I, German and Austrian meteorologists, who had been at the center of the discipline, found themselves at the periphery. Moreover, Bjerknes, who had left Leipzig University during the war, was now attempting to establish a new international capital for meteorology in Bergen. Understandably, some embittered German and Austrian meteorologists refused to concede any novelty in the Bergen school's work. Turning to the past, these scientists conjured a multitude of examples that allegedly showed the unoriginality of the new meteorology. The Bergen investigators also sought assistance from the past. In their efforts to make their ideas and methods more appealing to the discipline, they tended to link their work with the thoughts of great scientists who had preceded them. Interestingly, the names invoked generally changed with the audience being addressed and with the severity of the priority debate. Behind the attempts at finding historical continuities lay a recognition that a significant discontinuity had occurred. When von Ficker, one of the leading Austrian meteorologists, explained to Bjerknes his hostility, he succinctly noted, "The Norwegian school . . . has broken the Austrian school's hegemony in meteorology" (quoted by Bjerknes in a letter to C. W. Oseen, Oseen Papers, Kungliga Vetenskaps Akademien, Stockholm, 16 July 1929). The accomplishments of the Bergen group do not diminish the significance of 19th-century meteorology. To appreciate the work of pre-Bergen meteorologists, however, it should be analyzed in the context of their own time and not in the light of later events.

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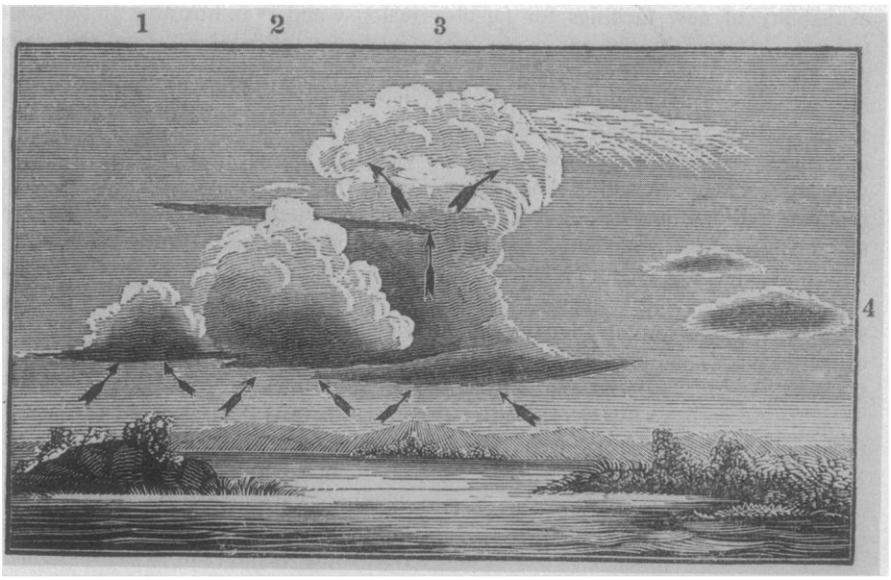

Formation of cumulus clouds by convection, from James Pollard Espy's *The Philosophy of Storms* (Boston, 1841). On the basis of measurements of the amount of water vapor in saturated air (made with the nepheloscope, an instrument he devised) and the data then available on specific heats and latent heat, Espy reached the conclusion that when a cloud is of great height above its base its top must be much warmer and consequently much lighter than the atmosphere at that height. "Condensation of water vapor thus enhanced the rising of air, i.e., thermal convection and therefore cloud growth. . . . This explanation of Espy's stood in outright contradiction with traditional teaching. Customarily it had been assumed that 'when a portion of atmospheric vapor is condensed into cloud, the air in the cloud becomes specifically heavier than it was before,' because the density of water vapor is less than that of air. Accordingly, condensation of water vapor appeared to inhibit convection of air. . . . Scientists . . . quickly realized that Espy's explanation of condensation and rain was superior to the prevalent mixing theory of rain by the Scottish geologist James Hutton." [From *The Thermal Theory of Cyclones*]

A Plant Family

The Biology and Taxonomy of the Solanaceae. Papers from a symposium, Birmingham, England, July 1976. J. G. HAWKES, R. N. LESTER, and A. D. SKELDING, Eds. Published for the Linnean Society of London by Academic Press, New York, 1979. xviii, 738 pp., illus. + plates. $93.25. Linnean Society Symposium Series, No. 7.

This is another contribution to a series of volumes that has been published in recent years dealing with the biology and chemistry of large flowering-plant families. Its predecessors covered the Cruciferae, Leguminosae, and Compositae. In the preface, the editors point out that of the "really large" families of flowering plants the Solanaceae, or nightshade family, is perhaps one of the least well

understood. They go on to point out that the family contains some of the most "benign" plants, such as potatoes, tomatoes, and peppers, as well as some of the most "sinister," such as mandrake, henbane, and tobacco. The family thus is clearly of more than ordinary interest. While this volume makes a substantial contribution toward an overview of the family, it is far from being as comprehensive as its title suggests and it is uneven in breadth and level of coverage.

The first section of the volume considers the taxonomy and floristics of the Solanaceae. It presents a synoptic classification of the family that recognizes three subfamilies, whereas in the chapter concerned with the South American members of the family that immediately follows only two subfamilies are recognized. These chapters are followed by accounts of Solanaceae that occur in India, Nigeria, and Australia, though it is not clear why these regions are singled out over others. The account of New World ethnobotany is limited to solanaceous hallucinogens; that of the Old World omits uses of the family as food. Seven chapters are concerned with alkaloids and four with various other classes of chemical compounds. Most of these deal with specific chemical compounds or with individual genera or species; again, an overview of the family is lacking. Two sections are concerned with anatomy and morphology, though the component chapters are concerned mostly with taxa below the familial level. Twelve of the 19 chapters devoted to "biosystematics" of genera and sections are concerned with *Solanum* alone.

Some papers in this volume present reviews of their topics, but the majority are original research publications which, in many instances, utilize members of the Solanaceae only incidentally as research objects. Many of these papers will be of little interest to biologists who are entranced by the Solanaceae per se. On the other hand, many of the papers concerned with such topics as floral biology, speciation, incompatibility, and numerical taxonomy will be of interest to those with little affection for nightshades and their kin. These latter papers deserve wider attention than they may receive having been published in a volume whose title does not convey the diversity of the papers included in it.

Clearly, one cannot fault editors for not producing a volume that they did not intend to produce. The audience of this publication, however, would have been broadened considerably if each section had included a prefatory review placing the component chapters in perspective or an extensive introduction providing the bridges between the "eclectic mixture of unrelated facts" that the editors have tried to avoid with questionable success.

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Binocularity

Stereoscopic Vision. Papers from a meeting, London, March 1978. The Royal Society, London, 1979. Pp. 377-518, illus. Paper, £6.10. Proceedings of the Royal Society of London, vol. 204, No. 1157.

The two eyes have slightly different views of the world. From a comparison of those views, the visual nervous system extracts information about the three-dimensional location of objects. The Royal Society in 1838 published Wheatstone's first formal demonstration of this visual capacity, and it is fitting that 141 years later it should give us a fascinating, if incomplete, progress report, in the form of ten papers from a meeting.

The topics range widely over the physiology, psychology, and development of binocular visual function. The papers vary from theoretical syntheses to summary reviews to research reports. They deal with experiments and data from cats, monkeys, people, sheep, and owls. The methodologies are those of electrophysiology, psychophysics, and neurology. It is not surprising that no great impression of unity emerges.

Nonetheless, there is much of interest here. Perhaps the most impressive recent contribution to our understanding of binocular vision has been the discovery and analysis, in the visual areas of the cerebral cortex, of single nerve cells that are sensitive to variations in retinal disparity, the difference between the positions of features in the two retinal images of a three-dimensional scene. The properties and development of these neurons are the concern of many of the papers. B. Fischer and G. F. Poggio provide a review of their elegant studies of the binocular properties of neurons in the cortex of awake behaving monkeys, and S. M. Zeki and D. Regan and his colleagues present some of the accumulating evidence that the brain contains specialized cells used for the analysis not simply of depth but of motion in depth. Two of the pioneers in this physiological arena, P. O. Bishop and C. Blakemore, give more theoretical reviews of the neuronal connectivity and developmental plasticity of binocular interaction. Bishop proposes subtle local disorder in the otherwise highly organized structure of connections in the cortex as the basis for neural depth processing, and Blakemore considers the likely role of the early visual environment in establishing the precise parameters of that disorder. Another pioneer, J. D. Pettigrew, in the outstanding paper in the book, supplies a detailed description of binocular processing in the brain of the owl. In this species there exist neural mechanisms that are apparently identical to those seen in mammals, yet the two evolutionary lines diverged long before these mechanisms evolved.

The rest of the collection seems a little spotty, probably for lack of a contribution by Bela Julesz (the major figure in recent advances in the psychology of stereopsis) and for lack of significant representation of modern theoretical treatments. And the various contributions certainly lack unity of style. But after all this is not the final story, only a progress report. As such, it contains much that merits the close attention of anyone with two eyes and an interest in why.

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Books Received

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