action centers linked in series. Photosystem 2 generates a relatively mild reductant and an oxidant that is strong enough to oxidize H_2O to O_2. Photosystem 1 generates a relatively mild oxidant and a reductant that is strong enough to reduce ferredoxin and ultimately nicotinamide adenine dinucleotide phosphate. In both cases, the initial photochemical reaction appears to be the removal of an electron from a chlorophyll complex. The nature of the primary electron acceptor in system 1 has been controversial. Optical absorbance changes and electron spin resonance (ESR) signals that occur under certain conditions suggest that the initial acceptor is a nonheme iron complex called bound ferredoxin. Other experiments implicate another acceptor, "X." It is not yet clear whether X is in the normal sequence of carriers or on a side path. M. C. W. Evans gives a well-balanced account of the experimental observations, in a chapter that emphasizes ESR studies. He favors the view that X is the primary acceptor, but concludes that more work will be needed to settle the question.

Two chapters on photosystem 2 are both extremely well written, detailed but highly readable. In one, R. Radmer and G. Cheniae focus on the mechanism of O_2 evolution. A component "S" appears to become successively more oxidized by the removal of one electron on each turnover of the photochemical apparatus. When S has accumulated four oxidizing equivalents, it reacts with H_2O, generating O_2. Radmer and Cheniae review the evidence that S involves manganese. J. Amesz and L. N. M. Duysens discuss spectrophotometric studies of the primary and secondary electron carriers on both sides of system 2. The electron acceptors appear to be plastoquinones.

The distribution of excitations from the antenna to the two photosystems is treated by W. P. Williams. He considers how the initial distribution of excitations and "spillover" of excitations from one photosystem to the other are regulated so that each can work as rapidly as possible.

Other chapters include discussions of photosystem 1 by J. R. Bolton, of delayed luminescence by S. Malkin, and of linear and circular dichroism by R. P. F. Gregory. All of these contain material of interest, although Bolton's short chapter seems superfluous in view of Evans's more extensive discussion. The chapter on delayed luminescence seems too long in relation to the importance of the topic; that on dichroism is a bit heavy on technical details about commercially available apparatus and thin on experimental results.

Overall, the book provides an up-to-date account of a rapidly moving field. It is well indexed and the chapters are thoroughly cross-referenced. It should be of considerable interest to those beginning work in photosynthesis, to seasoned investigators in the field, and to many more general readers.

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Dormant Bodies

Spore Research 1976. Papers from a meeting, Leeds, Dec. 1975. A. N. BARKER, J. WOLF, D. J. ELLAR, G. J. DRING, AND G. W. GOULD, Eds. In two volumes. Vol. 1, xviii + pp. 1–420, illus. + index. $27.35. Vol. 2, xviii + pp. 421–916, illus. + index. $31.25. Academic Press, New York, 1977.

One would think that a book summarizing research presented at a meeting in December 1975 would by now be so out of date as to be useless. In the case of *Spore Research 1976*, however, the value of the two volumes is not to be searched for in their timeliness, but rather in their breadth and in the depth in which subjects of wide interest are treated. The British Spore Group has been meeting nearly every two years since 1963. This most recent collection of papers reflects the ongoing interests of the major British and Australian spore research groups. The emphasis is on the mechanism of heat and radiation resistance, the genetics of sporulation and germination, spore structure, dormancy, and germination. Few papers deal with molecular biological approaches to understanding sporulation.

A particular strength of these volumes is that they present well-written, detailed research papers containing data of tremendous practical importance. The properties of spores that are most relevant to industrial, pharmaceutical, food, and soil microbiologists are discussed here. Moreover, toxicologists and specialists in infectious diseases will find a wealth of information concerning the production and excretion of toxic substances by a variety of *Bacillus* and *Clostridium* species, as well as analyses of the relationship of toxin production to sporulation. It is interesting to note that only a small minority of the papers describe work with the *B. subtilis* species so much favored by geneticists and molecular biologists.

Some contributions deserve special mention. In the opening chapter E. Freese argues clearly and forcefully that sporulation is not induced by starvation but rather by nutrient limitation leading to metabolic imbalance and slow growth. Freese debunks some commonly held misconceptions about sporulation and recounts the many futile efforts to identify the "repressor" of sporulation. He offers the interesting hypothesis that asymmetric septation triggered by slowness of growth is the key to the onset of sporulation-specific events.

P. Setlow's summary of his elegant work on degradation during germination of spore core proteins is well worth reading, even though the author's more recent studies, some of which have now been published, leave this account somewhat dated.

G. J. Dring and G. W. Gould, two of the editors of the volumes, present a notably lucid description of their theory of the role of water content in determining heat resistance. They have reduced a potentially confusing subject to a form understandable by the uninitiated.

Many contributions should be of interest to readers outside the spore field. Ion transport, membrane proteins, peptidoglycan biochemistry, and gene regulation are all dealt with in ways that have general applicability.

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Pheromones

Chemical Control of Insect Behavior. Theory and Application. H. H. SHOREY and JOHN J. MCKELVEY, JR., Eds. Wiley-Interscience, New York, 1977. xiv, 414 pp., illus. $19.50. Environmental Science and Technology.

Research on chemical communication in insects has reached a state where even the insider has difficulty keeping up with the subject. Since the coining of the term "pheromone" in 1959, more than 100 such substances and related natural products have been chemically characterized and additional signal compounds have been found that more or less mimic natural products. In 1975 a group of specialists in such research met at the Rockefeller Foundation conference center in Bellagio, Italy, to discuss their findings on sensory functions and behavior as well as on matters of application such as "improvements in the traditional ways of managing insect populations."