Dispersal Mechanisms

Fungal Spores. Their Liberation and Dispersal. C. T. INGOLD. Clarendon (Oxford University Press), New York, 1971. viii, 302 pp. + plates. $13.

This volume constitutes a new edition in combined form of two of the author's earlier books, *Dispersal in Fungi* and *Spore Liberation*, and it is the most comprehensive and up-to-date review of the subject available. It is the culmination of almost 40 years of the author's research in this field.

Knowledge about fungal spores and their distribution is of interest not only to students of fungi but also to pathologists, allergists, and, in fact, all of us. Fungal spores in the air rank with pollen as major causes of human respiratory allergies. Therefore it is important to learn, as one can from this book, how the quantity and quality of air spora fluctuate in accordance with time of day, season, and weather conditions.

Even many mycologists will probably be surprised at the great variety of methods of spore liberation that have evolved among fungi. Methods of forcible discharge include rounding off of turgid cells, bringing about their sudden separation; expulsion of spores from within a turgid sac (ascus); ballistospore discharge; and discharge connected with drying which results either in hygroscopic movement of structures associated with spores or in the sudden rupture of "stretched water" in a conidiophore that causes release of the conidium. A fair discussion of conflicting ideas on the ballistospore mechanism in basidiomycetes is presented.

Mechanisms of spore dispersal in which the fungi are passive involve the agencies of wind, rain, water, insects, and larger animals. One learns that no agent is more active in wide dispersal than air currents, which may carry both pathogenic and nonpathogenic spores for many miles and to great heights (up to 90,000 feet) and that the splashing effect of raindrops is more effective in dispersal than is the washing away of spores. Though fungi have obviously not evolved in relationship to insects in as many ways as have flowers, methods of dispersal by insects have evolved independently on repeated occasions. For example, the sugary nectar in rust pycnidia attracts flies and other insects, spores of the anther smut of *Lychnis* are carried by a nocturnal moth that pollinates the flowers, and the foul-smelling spore slime of the stinkhorns draws numerous flies. One of the stinkhorns (*Aseroe*) even has fruiting bodies with scarlet rays resembling the petals of a flower.

Many of Ingold's own research endeavors have centered on spore dispersal in aquatic fungi, and the chapter on this subject acquaints the reader with the variety of spore forms that have evolved in relation to dispersal and attachment in aquatic environments. One of the most common types is the tetraradiate spore, found most abundantly among aquatic hyphomycetes. Evidence is presented that such spores remain suspended longer in water and become more readily attached to their substrates than do less modified spores.

Missing is a discussion of spore dispersal in dermatophytic fungi, but this is a minor point in view of the wealth of information presented. Ingold's writing is facile and lucid and his illustrations are excellent. The book contains much information useful in mycology, and scientists in other fields as well as the educated layman could also find a great deal of interest here. The volume is an indispensable aid in mycological teaching and research.

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Bioenergetics

The Mammalian Mitochondrial Respiratory Chain. WALTER W. WAINIO. With a contribution by Alice A. Greene. Academic Press, New York, 1970. x, 500 pp. + plates. $23. Molecular Biology series.

It is a fact of life that in the absence of specific molecular information about biological phenomena the true "facts of life" remain obscure and only the behavioral "veneer" of the living system is discernible prima facie to the investigator. Yet when such molecular information is sought, we touch upon another apparent truism, which is that the overwhelming number of variables comprising life processes, regardless of how well parametered the experimental system, makes it excruciatingly difficult to obtain molecular answers to questions about mechanism.

The mitochondrion, however, whose biological *raison d'être* has been increasingly scrutinized for over 30 years, provides us with a surprisingly self-contained system, one about which we know quite a lot on the microcosmic level. From this microdynamic vantage point, the mammalian mitochondrion, the source of most cellular bioenergetics, is spread before us in awesome molecular detail by Walter W. Wainio. The individual pieces of the puzzle, collected and refined for so many years, are thrown on the table, so to speak, painstakingly assessed, and ordered by Wainio into logical agglomerates of structural as well as functional information, ultimately to be handsomely presented as a concise encyclopedia of the mitochondrion and what it does.

It is a difficult task to keep in mind and compare the sites and modes of action of the numerous respiratory inhibitors, uncouplers, and artificial electron donors and acceptors thus far employed in the study of mitochondrial oxidative phosphorylation. Then, too, one must be continually cognizant of the electron carrier cofactors themselves, each of which is capable of detailed characterization individually but when integrated into the structure of the mitochondrion manifests a distressing array of possible interactions with its environment. Understandably, no one has discovered an ideal manner of communicating such an assortment of advanced scientific minutiae. The organization of Wainio's book, which segregates the reporting of recent and past data (including brief analyses along the way) from the general narrative account of the mitochondrion, is as successful as practicality permits.

The greater part of the volume is a discussion of the molecular transactions of the mitochondrial respiratory chain components in the manner of the familiar series *Methods in Enzymology*, that is, of a well-documented review article. Before and after these sections, either through general introductions or through analyses of current mechanistic hypotheses, Wainio briefly leads us through the research history and general meaning of the reported data, with the touch of a storyteller. The opening section of the book elegantly summarizes the controversies over mitochondrial fine structure, and electron micrographs abound. A detailed methodology follows, relating the tissue from which the mitochondria were obtained to procedures for isolation and characterization. Chapters 2 through 4 present biochemical specifics on the various components of the respiratory

chain and their modes of action as individual entities. The remainder of the text discusses possible mechanisms by which mitochondria transduce energy for adenosine triphosphate synthesis, ion translocation, and the various other partial reactions experimentally noted with interest over the years.

An extensive bibliography, including that of the last section of the text, on recent advances, brings our knowledge to mid-1970, making the book a valuable secondary source for students and active workers who require the reportorial detail of the journal.

Wainio's writing style is rather straightforward and understandable. Occasional passages do much to reveal the often not too evident reality that the test tubes and apparatus that yield the data are indeed manipulated by men and women. The opening segment of chapter 2 ("NADH oxidase and succinate oxidase systems") is just such a passage, didactically excellent and an example of the more readable science available in this area of biochemistry.

Nondogmatically and thoroughly, Wainio has furnished us with a widely useful compendium on the mitochondrion. Despite the experimental frustrations that induce him to remind us that "even the sequence of electron carriers is somewhat uncertain, while the hypotheses of oxidative phosphorylation are no more than guesses," this book serves to imbue this specialized field of bioenergetics with the "to be continued" aura characteristic of all vital areas of inquiry.

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Institutes

Think Tanks. PAUL DICKSON. Atheneum, New York, 1971. xii, 370 pp. $10.

Journalists often leap in where scholars fear to tread—and the public is better off for it. Paul Dickson, a young free-lance writer, has here opened to public view the work of some 28 of an ill-defined number (600, by his shaky estimate) of "think tanks" which "perform research on matters relating to policy and the application of technology" and "act as a bridge between knowledge and power and between science/technology and policy-making."

Eight are nonprofit organizations spawned by the Defense Department, including RAND, the Institute for Defense Analyses, HumRRO, and MITRE; three, the Urban Institute and two educational policy research centers, are contract progeny of civilian agencies; two, the Army's Institute for Land Combat and the transitory White House National Goals Research Staff, are in-house elements of the Executive. Ten are a motley assortment of privately engendered nonprofit organizations, including Herman Kahn's Hudson Institute, the new-left Institute for Policy Studies, the old-centrist Brookings Institution, Robert Hutchins's Center for the Study of Democratic Institutions, Ralph Nader's activist Center for the Study of Responsive Law, and the "research à go-go" Stanford Research Institute; two, the System Development Corporation and Arthur D. Little, Inc., are for-profit companies; and three are foreign-area research groups affiliated, respectively, with the University of Pennsylvania, Stanford, and Georgetown University.

Would a sociological Linnaeus regard these diverse creatures as members of the same genus, let alone species? Dickson should have dropped government units and paid more attention to the little-known for-profit firms, which, on his own reckoning, constitute half of all "think tanks"; he is weak on operating problems and the political and economic habitat in which institutes struggle for survival; and he is wrong on a good many points. For example, most of the "highly classified" area handbooks of SORO (Special Operations Research Office) were published, quite innocuous ventures in secondary-source anthropology; Congress's control of Defense contract centers has been far from "illusory"; the government generally *does* approve center directors and their salaries; the centers are *not* "allowed to compete for non-government business"; they are *not* "legally quite free" to go for-profit without special approval and measures of restitution; RAND staff *cannot* take honoraria from other Defense centers; the not-for-profits have *not* "normally" paid taxes on their income from proprietary work; and so forth.

No matter. Dickson is good at describing the work and very good at capturing the special character of each institute, and his judgments can be refreshingly direct. Thus, A. D. Little staff have a "sense of cohesion" and "an appealing egotism," the Stanford Research Institute is "the research equivalent of the oriental bazaar," and Brookings "has restrained itself to the point of dullness." RAND's "costly weapons game[s] . . . seem paradoxically logical and absurd at the same time"; a Hudson Institute scheme is "preposterous"; "few [rightist think tanks] show Rightward bias as blatantly as Hudson does"; the list of Defense contract centers is "a fraud"; two Cambridge Institute affiliates "seem, frankly, to be a hypocritical dodge . . . to accept the federal money which the parent group rejects"; the Center for Strategic and International Studies "has become a center for policy research for the oil interests"; the National Goals Research Staff report was "at once forgettable, innocuous, dull, and dishonest."

Despite such passages and a five-page recital of evidently foolish, unnecessary, or unused projects, Dickson burnishes the tarnished mystique of "R & D," overvaluing its significance and the power of its practitioners. He depicts the institutes, and especially the Defense centers, as a virtual "shadow government" of "faceless," unaccountable men whose thinking is "profound," whose influence is "deep and fundamental," and who exercise in secret an "awesome" power "seldom challenged or questioned." This makes more of these men than most of them make of themselves. It mistakes occasional for constant influence; a confidentiality characteristic of Executive deliberations and private consulting for a perfidious secrecy peculiar to these hirelings of the Executive; and the servants for the wielders of power. Nonetheless, the book can be heartily recommended as a lively and engrossing contribution to our knowledge of policy research institutes. It may provide solace to many professionals in these days of their discomfiture.

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Personages

American Entomologists. ARNOLD MALLIS. Rutgers University Press, New Brunswick, N.J., 1971. xviii, 554 pp., illus. $15.

The popular image of an entomologist as a wild-eyed, net-swinging eccentric may be a caricature, but in fact entomology seems to have attracted more than its share of colorful personages. Asa Fitch, for example, is said to have collected specimens by putting them in his tall silk hat, and William T. Davis, when racing to catch a train, is