

available in the case of cotton seed will be of profound advantage to those responsible for developing these new fat resources.

Nevertheless, it is clear that for a long time to come an important proportion of our vegetable fat supplies must continue to be derived, as of yore, from seeds or nuts grown by the native peoples in Africa or elsewhere, or collected by them from the fruits of wild trees and shrubs. Thus, the oil palm plantations still yield only about one quarter at most of the total supplies of palm kernels, while groundnuts have hitherto been cultivated only in primitive fashion in India and in West Africa. Here it is of urgent importance to teach the native peoples and others concerned two simple but essential principles: oil-seeds must be gathered exactly at maturity; they must be thoroughly dried and kept dry until they reach the seed-crushing plants.

Dr. G. Scott Robertson, in his presidential address to the Agricultural Section of the British Association last September, commented upon the enormous loss of good grain by insect and mould infestation. Loss and deterioration of good edible fats in oil-seeds is undoubtedly at present proportionately far greater, owing to the retrogressive changes, especially in the fat, caused by damp conditions in storage and much accelerated by enzymes already present in the seed, as well as those introduced by mould infection. Oil from native West African groundnuts may contain 10 per cent or more of free fatty acid, in which case more than 30 per cent of the crude oil must be lost in producing a refined edible oil. Indian groundnuts usually give oil with not less than 3 per cent of free fatty acid. There is no reason why, if the principles developed in the cotton-seed industry and fully discussed in the volume reviewed in this notice are applied to groundnuts, the free acidity of crude groundnut oil should exceed 1 per cent, with corresponding improvement in its colour and general appearance. The world production of edible fats could be notably increased (by perhaps 10-15 per cent at least), without any increase in the tonnage of oil-seed crops, by insistence on these simple principles of hygiene in harvesting, storage and transport.

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CLASSIFICATION OF BACTERIA

Bergey's Manual of Determinative Bacteriology

By Robert S. Breed, E. G. D. Murray and A. Parker Hitchens. Sixth edition. Pp. xvi+1529. (London: Baillière, Tindall and Cox, 1948.) 82s. 6d.

TAXONOMY, "that branch of biology which treats of classification in accordance with a convention or law", is the neglected foster child of bacteriologists, most of whom call their pet *Bacillus* *this* or that-coccus, and for taxonomy care nothing at all. But however much classification may be neglected, nay, even be despised, it is not only the bookworm and the historian who pursue it as an armchair study; it is also a field where research is active, and there is increasing need that the newest ideas and techniques should be brought to bear on old problems of bacterial relationships. The modern approach collects strains into groups with stable characters and ignores minor differences that were once thought to be important; when the groups have proved their value in classification they are given generic and

specific names. Groups worked out according to this principle include the genus *Salmonella* and species like *Streptococcus pyogenes* and *Str. agalactiae*, all of which have a serological basis. Much of the older work has now lost its value and should be reconsidered in the light of modern findings. The need for this is seen in the section on micrococci in "Bergey's Manual"; only twenty-two species are recognized (scarcely one is well characterized), but there is an appendix of more than four hundred names of so-called micrococci. As Abd-El-Malek and Gibson said recently, "The genus *Micrococcus* provides what is probably the worst example in bacteriology of uncritical systematic work".

Most systems of classification try to show natural relationships; but what criteria—morphology, metabolic activities, pathogenicity, or antigenic structure—are required to show these is unknown. Different relationships are brought out according to the criterion of kinship used; similarity of metabolic products makes cousins of streptococci and lactobacilli, morphology makes streptococci brothers of staphylococci, a relationship supported by the sharing of common antigens. "Bergey's Manual" adopts a classification based mainly on two characters, morphology and metabolic activities (where these do not clash), uses pathogenicity (as in *Erwinia*) to a small extent, and antigenic relationships scarcely at all. Few will quarrel with the outline classification into families, but fewer in Great Britain will accept the further subdivision into genera and species. In spite of an increase in the number of genera, there are welcome signs of retraction; *Eberthella*, *Proactinomyces* and *Staphylococcus* have disappeared, and *Klebsiella* has probably appeared for the last time.

By its title "Bergey's Manual" sets itself an impossible task: to construct, from data at present available, a key by which any bacterium can be identified. If we admit that, though perfection cannot be aimed at, such a key is desirable, there are two approaches to the problem: to limit the scheme to well-characterized species, using only proved criteria in the construction of the key; or, the other choice, to include as many species as possible at the expense of having to use less stable criteria for species differentiation. In the "Manual" most writers adopt the second course; notable exceptions are the sections on *Bacillus* and *Mycobacterium*, the authors of which have shown a welcome ability to cast historic but ill-defined species into oblivion, or to show their true status as synonyms.

If all sections resembled Nathan R. Smith's treatment of the genus *Bacillus*, with descriptions based on studies by modern methods of authentic cultures, there would have been no need to repeat vague details of ill-defined species, many of which are no longer available for study. It may not be ethically correct, but it would be a sound practical move to abolish priority and afford recognition only to species the types of which are preserved in dried or other permanent form, the naming and placing of such species being supported by adequate descriptions of the organisms and comparative studies with related species and genera. The editors of the "Manual" have made a move in this direction; many species recognized in earlier editions and now mainly of historic interest are listed in appendixes.

Much effort would have been saved—and a better book produced—if writers of the different sections had recorded only species with which they were familiar from their own bench work. S. T. COWAN