Plant derived
Leaves
Stems, stalks, straw
Identified by Chemical Name
Elements or single entity materials
Inorganic chemicals
Compounds generic
Acids
Bases

B. MISCELLANEOUS PROCESSES, UTILITY, USE, OR FUNCTION OF MATERIAL
Animal or pet food use
Antioxidant
Bleaching agent
Coating agent
Color saver
Growth promoter
Pickling
Simulated food product
Sugar substitute

C. FORM, PHYSICAL STATE, CONDITION, STATE OF MANUFACTURE OF ARTICLES OR MATERIALS, AND/OR PROCESSES FOR ATTAINING OR MAINTAINING SUCH FORM, ETC.
Packaged
Bottled
Shape, form
Shapeless mass

D. FOOD MANUFACTURES
Bakery Products
Bread
Beverages and/or beverage component
Alcoholic
Malt
Carbonated
Cocoa
Coffee
Tea

I believe the comparison makes self-evident the improved technique of searching manipulations and generic concepts as well as specific embodiments. The technology explosion has had a great impact on the Patent Office, which is at the forefront of discovery. The examining of patent applications requires a survey of all literature to determine whether the claimed invention is novel or unobvious. Our search systems must keep pace, and we accomplish this by providing for new technologies. Failing provision for such flexibility, advances in the scientific arts would not be adequately retrievable from our files. Given all this plus our efforts to add mechanized search aids, we will meet the obligations of the future.

LITERATURE CITED

(1) Development and Use of Patent Classification Systems (DUPACS), p. 8, U. S. Government Printing Office, Washington, D. C., 1966.
(2) Classification of Patents, Second Revision, p. 29, U. S. Government Printing Office, Washington, D. C., 1946; out of print.

Literature Needs of Food Scientists*

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The literature services now available to food scientists are evaluated. The need is pointed out for services of three types in the food field. These are "all inclusive" services covering all aspects of food science, particularly valuable for information retrieval and documentation; "comprehensive" services covering major segments of food technology, such as food processing, useful primarily for current awareness; and highly specialized services in individual fields, including background information as well as material strictly classifiable as food science.

The need for competent bibliographic services in the fields of food science and technology has been a matter of increasing concern for a number of years. Since the demise of *British Food Science Abstracts* in 1957, there has been no all-inclusive abstracting service available in this country devoted exclusively to food. From 1959 on, meetings have been held here and abroad to discuss food documentation. In 1962, the Institute of Food Technologists sponsored a conference at Michigan State University to survey the status of food documentation and to make recommendations. Resolutions passed at the Congress stressed the need for developing a comprehensive documentation service covering the world's literature in food science and technology. Also, in 1962, during the First International Congress of Food Science and Technology in London, a formal session and several informal meetings on documentation were held. The Congress expressed the opinion that there was an urgent need for international cooperation in producing indexing and abstracting services covering the world literature on food.

In the same year, Borgstrom, Department of Food Science, Michigan State University, brought the matter to a heat with a pair of articles.[1,2] He said, "A significant

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proportion of the publications in food science are never made available through present abstracting and indexing services. Even important journals in other languages are often not accessible in United States Research libraries. The key Russian journal, *Pischchevaya Tekhnologiya (Food Science)*, is not available even in the Library of Congress. To cover the vast field of food science, one now has to resort to at least 40 different abstracting services." A Committee on Documentation of the IFT headed by Stewart[5] a little later estimated that, of the more than 15,000 research articles, technical reviews and features, monographs, patents, etc., published each year on subjects of interest to technical personnel working with foods, fewer than 40% are indexed or abstracted by existing services.

Shortly after the Borgstrom papers appeared, Moyer[4] published results of a survey made under a grant from the National Institutes of Health to determine first of all "if the industry was interested in an information service." He attended technical meetings, contacted a number of food abstracting groups, and visited many laboratories. "There was unanimous agreement among those interviewed in industry that an information service in the form of food abstracts would be highly desirable." Growing out of the survey came a number of suggestions as to what an ideal service should include and an estimate that 8000 abstracts per year would be adequate.

Borgstrom also wrote "food science most emphatically is not microbiology, not biochemistry, not engineering, etc., but that all these areas provide material and knowledge essential to food and food processing... Only when facts and research findings in one way or another are relevant to the handling and processing of food can they be considered as being a part of food science... This gives food processing, not food, the key position, constituting the core field toward which other areas of knowledge are being related."

Taking our cue from the emphasis by Borgstrom on food processing as the cornerstone of food science, we began publication of *Food Processing Abstracts* in 1963. The officers of the Institute of Food Technologists were most friendly to us and said they were glad to see us attempt something in this field.

In 1965, we held discussions of the literature in the field of food service with the Society for the Advancement of Food Service Research. This society had been seeking to set up an information retrieval system. With their encouragement, in 1966 we began publication of *Food Service Research Abstracts*. These complement *Food Processing Abstracts* by covering the second of Borgstrom's major subdivisions of food science, food handling. Both of these services have been published successfully, without subsidy.

Our five years' experience in abstracting on food subjects has led us to rather definite conclusions regarding present food literature services and the information needs of food scientists.

We would distinguish three types of bibliographical services in the field of foods. These are, first of all, the "all-inclusive" services which, within their scope, acknowledge no limitations. Then there are what we term the "comprehensive" services, each of which covers a broad area in foods, but not the whole range of food technology. In the third category are the "specialized" services which cover narrow fields intensively. We believe that each of these types of service has its own specific functions and that the coexistence of services of all three types is desirable.

Of the all-inclusive services, *Chemical Abstracts* is of course the Bible of the abstracting world. In regard to the chemical aspects of food (and in this service, chemical is given a pretty wide interpretation), it is unrivalled. Moreover, it is superbly indexed and references to specific topics are not hard to find. Still, as Moyer states, the section on foods "does not contain all the information needed and reference must be made to many other sections." This is true, for example, when such topics as vitamins, pesticides, or food additives are being pursued. In fact, one authority casually remarked that *Chemical Abstracts* had more references of interest to food scientists outside the food section than in it.

In the all-inclusive class, and also of high quality, are the abstracts published by the British Food Manufacturers Research Association. They are not, however, generally available in this country. *Nutrition Abstracts and Reviews* is all-inclusive in its field and covers the nutritional aspects of food superbly. *Biological Abstracts*, another all-inclusive service, contains many references to food. The *Bibliography of Agriculture* is the most complete American reference work on foods, including food production. It gives only citations, however, with some annotations but no abstracts. It covers, of course, not only agricultural aspects of food production, food processing, and food handling, but also many phases of agriculture such as rural sociology and forestry which have no direct bearing on food science.

In the Russian literature, there is an all-inclusive abstract journal, *Referativnyi Zhurnal*, which has a section on food and related subjects. Its coverage, even of Russian work, is however not thorough, and its coverage of literature published outside of Russia is quite sketchy. In addition, its publication is so slow that the abstracts are quite stale by the time they reach the reader.

Services of the second class, comprehensive services, each cover a large segment of food technology and are not restricted to any one kind of commodity. Our services, *Food Processing Abstracts* and *Food Service Research Abstracts*, are examples of this type. While the all-inclusive services are primarily valuable for exhaustive documentation, the comprehensive services are aimed at current awareness, though the abstracts are also coded for retrieval. The justification for the comprehensive services is that while there is, strictly speaking, no such thing as the food industry, there are a vast number of food industries, and they have much in common. As Borgstrom pointed out "most knowledge and technique cross artificial boundaries of individual commodities." A processing technique, for example, will often be of interest with respect to not one but many commodities.

The present teaching of food science points up the need for comprehensive abstracting services. Traditionally, an agricultural school had a department of dairy technology, a poultry department, and other highly specialized groups, but no department which took up food science as a single entity. Now we have departments of food science, gathering to themselves in specialized disciplines of all types of food and the common elements in their

processing and handling. These departments and their graduates need over-all as well as specialized food literature abstracting.

The comprehensive services confine themselves to new developments, particularly research and very sparingly cover articles on technique unless the subject matter is really novel. Editorial selection should be exercised so that the volume of each comprehensive service is kept within the comprehension of a single individual. Because of their use for current awareness, promptness of these services is very important. One type of material we consider important to include in a comprehensive food service is papers presented at technical meetings. Particularly for current awareness, we believe these papers are of vital importance. There is often a delay of two to three years in journal publication of meeting papers, and it is estimated that at least 50% of them are never published. By abstracting them, there is facilitated a kind of information exchange that is recognized as extremely important—direct communication among specialists.

One discovery we made in connection with *Food Service Research Abstracts* is that there is relatively little publication in this field of what should properly be termed research. This is a condition which we hope the increasing interest in food service will tend to correct.

Another comprehensive service of excellent quality is the *RPC Food Science Abstracts* which recently began publication under the auspices of the New Brunswick Research and Productivity Council. This service is limited in journal coverage and restricted to subjects of particular interest to its part of the country. It emphasizes fish and shellfish for example, and almost neglects meat.

The 40 abstracting services mentioned by Borgstrom belong largely to the third class of food literature services—highly specialized abstracting. Good examples are *Dairy Science Abstracts* published in England, *Sugar Abstracts*, also British, *Fisheries Abstracts*, *Wheat Abstracts*, and *Meat Science Abstracts*.

The specialized services are unique both in manner of abstracting and in depth of coverage. For readers in a single branch in the food industry, an abstract should pick up details not important to the food technologist not associated with that particular specialty. Moreover, a specialized service should go deeper, particularly into the agricultural aspects of food, than even the all-inclusive service is justified in doing. Processors are interested in the production of the raw material they use. The pea canner is interested in the kind of peas grown and how they are cultivated. The poultry processor is interested in how his birds are produced and indeed he often finances their production. *Dairy Science Abstracts* is a good example of this abstracting in depth. It covers husbandry, economics, and physiology as well as topics strictly related to food and may include as many as 5000 abstracts in a single year.

Even these three classes of abstracting services do not include all the abstracting currently done in the food field. Worthy of mention is the abstracting of meeting papers by such organizations as the American Chemical Society, the American Oil Chemists Society, the Institute of Food Technologists, and the American Association of Cereal Chemists. And there is also what might be called national or fragmentary abstracting, usually limited by geographical boundaries. Many specialized European journals include abstracts on food subjects particularly the English, German, and French journals. In general, the German journals cover, besides German, Hungarian, Czechoslovakian, and Yugoslavian literature. The French journals report on Polish, Rumanian, and Bulgarian sources. Many national academies publish abstracts on food topics, including the academies in Poland, Rumania, Hungary, and Japan.

The most important all-inclusive food abstracting service in prospect is the exciting international service being developed by the Institute of Food Technology in cooperation with the Commonwealth Agricultural Bureaux and the Institut für Document-Wesen (Frankfurt). It expects to publish 12,000 abstracts per year and include all important aspects of food science and technology. This estimate of number is based on a survey by Mann[3] who studied slightly more than 2000 journals, of which over 1000 contained in one year articles on food. In these he found a total of 12,077 food papers. However, he said, "I estimate that this figure represents only about 70% of the total world literature since about 20% is published in nonperiodical literature form such as bulletins, patents, annual reports, etc., and we probably missed a further 10% of the literature in the course of our survey because it proved difficult to obtain copies of some of the more obscure journals."

Our opinion is that in the organization of this all-inclusive food service, every effort should be made to include the elusive 30% of the literature omitted in Mann's survey. Appearance in an obscure journal that rarely published food articles does not, per se, condemn it as without significance.

There is one further question which we believe is worth raising. When the international consortium has its all-inclusive abstracting service in full operation, will this service eliminate the need for most or all other food bibliographical services? Our opinion is that it will not. All-inclusive services are unexcelled for documentation. The comprehensive services, because they are prompt, report only new material and are limited in size by editorial selection, will still be needed for current awareness in broad phases of food technology. The specialized services, by reason of the focusing of their abstracting on the needs of specialists and their emphasis not only on food science but also on food production, will, we believe, still have their place.

There has been a hope expressed in the National Federation of Abstracting and Indexing Societies for example that the so-called project-oriented services could be made up from material assembled for an all-inclusive service. But we believe their specialized functions make at least some independent operation of the three types of services desirable. This is not inefficiency, but a way of increasing the effectiveness of literature coverage.

LITERATURE CITED

(1) Borgstrom, G., *Food Technol.* **16** (10), 37 (1962).
(2) Borgstrom, G., *Food Technol.* **16** (11), 45 (1962).
(3) Mann, E. J., *Dairy Sci. Abstr.* **28** (12), 603 (1966).
(4) Moyer, J. C., *Food Technol.* **17** (1), 32 (1963).
(5) Stewart, J. S., Prospectus for a Documentation Service, Institute of Food Technologists, distributed privately, 1965.