

Food Microscopy

AN ANNOTATED BIBLIOGRAPHY

by G. W. WHITE AND Miss A. J. SHENTON

(Lyons Central Laboratories, 149 Hammersmith Road, London W14 0QU)

PART I. TEXTBOOKS, REVIEWS, GENERAL PAPERS

In a previous publication,⁵² one of the authors has presented a bibliographic history of food microscopy, in which the development of the subject was traced mainly through published books and reviews. Papers on the microscopy of natural and manufactured food products are widely scattered throughout the scientific literature. The location of microscopical papers on specific foods is generally a lengthy task, and the food microscopist often does not have time for an exhaustive search of the literature. Moreover, keeping in touch with current literature is becoming much more difficult as the number of papers increases. It is thought that this bibliography of food microscopy, compiled over the last ten years, though not giving complete coverage of every paper, may save the food microscopist much time.

The bibliography is arranged in the following divisions:

I TEXTBOOKS, REVIEWS, GENERAL PAPERS

II MAJOR INGREDIENTS

- A. Cereals and Flour
- B. Starch and Gluten
- C. Eggs and Egg Products
- D. Fats and Oils
- E. Milk and Milk Powder
- F. Sugars
- G. Water

III PRODUCTS

- A. Bakery Products
- B. Beverages
- C. Confectionery
- D. Dairy Products
- E. Fat Products (Butter and Margarine)
- F. Fruit and Nuts
- G. General Kitchen Products
- H. Meat and Fish
- I. Vegetable Products

IV FOREIGN BODIES

V MISCELLANEOUS

Within each section the papers have been arranged in chronological, rather than author, order, as this brings out more clearly the developments in each field, and permits a more logical continuation of the bibliography in the future.

In any branch of applied microscopy, it is important to have, as a basis, a proper understanding of the instrument and its use, and of the techniques of specimen preparation. A good selection of general textbooks is given below. Therefore as an introduction to the subject, and in this case only, the material is arranged in alphabetical author order.

A. TEXTBOOKS ON MICROSCOPY

1. Baker, J. R., "Principles of Biological Microtechnique". Methuen, London, 1958.
2. Barer, R., "Lecture Notes on the Use of the Microscope". Blackwell, Oxford, 1956.
3. Barer, R., and Cosslett, V. E., "Advances in Optical and Electron Microscopy". 5 vols. Academic Press, London, 1966-73.
4. Barka, T., and Anderson, P. J., "Histochemistry: Theory, Practice and Bibliography". Harper and Row, New York, 1963.
5. Barron, A. L. E., "Using the Microscope". Chapman and Hall, London, 1964.
6. Beresford, W. A., "Lecture Notes on Histology". Blackwell, Oxford, 1969.
7. Chamot, E. M., and Mason, C. W., "Handbook of Chemical Microscopy". Wiley, New York, Vol. 1, 1958, Vol. 2, 1940.
8. Chayen, J., Bitensky, L., and Butcher, R., "Practical Histochemistry". Wiley, London, 1973.
9. Clayden, E. C., "Practical Section Cutting and Staining". Churchill, London, 1962.
10. Conn, H. J., Darrow, M. A., and Emmel, V. M., "Staining Procedures". Williams and Wilkins, 1960.
11. Dehoff, R. T., and Rhines, F. N., "Quantitative Microscopy". McGraw-Hill, New York, 1968.
12. Disbrey, B. D., and Rack, J. H., "Histological Laboratory Methods". Churchill Livingstone, London, 1970.
13. Gatenby, J. B., and Beams, H. W., "The Microtometist's Vade-Mecum". Churchill, London, 1950.
14. Glauert, A. M., Ed., "Practical Methods in Electron Microscopy". 3 vols. North Holland, Amsterdam, 1972.
15. Gray, F., and Gray, P., "Annotated Bibliography on Biological Microtechnique". Brown, Dubuque, Iowa, 1956.
16. Gray, P., "The Microtometist Formulary and Guide". Constable, London, 1954.
17. Gray, P., "Handbook of Basic Microtechnique". McGraw-Hill, London, 1958.
18. Gurr, E., "Methods of Analytical Histology and Histochemistry". Hill, London, 1958.
19. Gurr, E., "Encyclopedia of Microscopic Stains". Hill, London, 1960.
20. Gurr, E., "Staining Animal Tissues". Hill, London, 1962.
21. Gurr, E., "The Rational Use of Dyes in Biology". Hill, London, 1965.
22. Gurr, G. T., "Biological Staining Methods". Gurr, London, 1957.
23. Hall, C. E., "Introduction to Electron Microscopy". McGraw-Hill, New York, 1966.

24. Hallimond, A. F., "The Polarising Microscope". Vickers, York, 1970.
25. Hartshorne, N. H., and Stuart, A., "Practical Optical Crystallography". Arnold, London, 1969.
26. Hartshorne, N. H., and Stuart, A., "Crystals and the Polarising Microscope". Arnold, London, 1970.
27. Hearle, J. W. S., Sparrow, J. T., and Cross, P. M., "The Use of the Scanning Electron Microscope". Pergamon, Oxford, 1972.
28. Johansen, D. A., "Plant Microtechnique". McGraw-Hill, New York, 1940.
29. Juniper, B. E., Cox, G. C., Gilchrist, A. J., and Williams, P. R., "Techniques for Plant Electron Microscopy". Blackwell, Oxford, 1970.
30. Kay, D. H., Ed., "Techniques for Electron Microscopy". Blackwell, Oxford, 1965.
31. Lawson, D., "Photomicrography". Academic Press, London, 1972.
32. Loveland, R. P., "Photomicrography". 2 vols. Wiley, New York, 1970.
33. McCrone, W. C., "Fusion Methods in Chemical Microscopy". Interscience, New York, 1957.
34. Meek, G. A., "Practical Electron Microscopy for Biologists". Wiley, Chichester, 1970.
35. Oatley, C. W., "The Scanning Electron Microscope". Camb. Univ. Press, 1973.
36. Peacock, H. A., "Elementary Microtechnique". Arnold, London, 1966.
37. Pearse, A. G. E., "Histochemistry, Theoretical and Applied". 2 vols. Churchill, London, 1968, 1972.
38. Richards, O. W., "The Effective Use and Proper Care of the Microtome". American Optical Co., New York, 1949.
39. Richards, O. W., "The Effective Use and Proper Care of the Microscope". American Optical Co., New York, 1958.
40. Schaeffer, H. F., "Microscopy for Chemists". Dover, New York, 1968.
41. Shillaber, C. P., "Photomicrography in Theory and Practice". Wiley, New York, 1944.
42. Steedman, H. F., "Section Cutting in Microscopy". Blackwell, Oxford, 1960.
43. Tupholme, C. H. S., "Colour Photomicrography with a 35 mm Camera". Faber, London, 1961.
44. White, G. W., "Introduction to Microscopy". Butterworth, London, 1966.

B. REVIEWS, SYMPOSIA

A major source of information on the techniques of light and electron microscopy are the biennial reviews published in *Analytical Chemistry*. The available books on food microscopy have been reviewed in a publication cited below.⁵² Two books which form a valuable starting point are the four volumes by Winton and Winton⁴⁵ and the book by Wallis⁵¹. Reviews on food microscopy were published over the period 1933-35 by Butcher⁴⁶ (10 papers), and over the period 1956-59 by Essex and Shelton⁴⁹ (42 papers). Following a symposium on the microscopy of foods⁴⁷ organised in 1936 by the Food Group of the Society of Chemical Industry and the Royal Microscopical Society, at which three papers were presented, there followed a long gap in meetings, broken recently by symposia on food microscopy organised by the Institute of Food Technologists (1971)⁵³ and the Food Research Association (1972).⁵⁵

45. Winton, A. L., and Winton, K. B., "The Structure and Composition of Foods". 4 vols. Wiley, New York, 1932-39.
46. Butcher, C. H., "The Microscopy of Food Products". *Food*, 1933, 3, 11, 99. 1934, 3, 140, 176, 244, 341, 415. 1935, 4, 169, 210, 276.

47. Editorial, "Food and the Microscope". *Food*, 1936, **5**, 257.
48. Various authors. "Chemical Microscopy". *Anal. Chem. (Analytical Reviews)*, 1949-72.
49. (a) Essex, C. D., and Shelton, J. H., "Food Microscopy". *Food* 1956, **25**, 3, 55, 101, 138, 184, 225, 226, 307, 345, 381, 428, 469.
(b) *Ibid.*, 1957, **26**, 28, 70, 111, 152, 194, 233, 274, 315, 358, 400, 447, 481.
(c) *Ibid.*, 1958, **27**, 28, 70, 111, 151, 192, 231, 273, 317, 356, 438, 476.
(d) *Ibid.*, 1959, **28**, 25, 67, 146, 187, 228, 269, 311.
50. Various authors, "Electron Microscopy". *Anal. Chem. (Analytical Reviews)*, 1964-72.
51. Wallis, T. E., "Analytical Microscopy". Churchill, London, 1965.
52. White, G. W., "A Bibliographic History of Food Microscopy". *J. Assoc. Publ. Analysts*, 1970, **8**, 74.
53. Anon., "Microscopy in Foods (An IFT Symposium)". *Food Trade Rev.*, 1971, **41** (5), 30.
54. Articles of interest to microscopists, from the cumulative index of the *Journal of the Biological Photographic Association* (1932-70)., *Microscope*, 1971, **19**, 446.
55. Anon., "The Light Microscope in the Food Industry". Food Res. Assoc. Symposium Proceedings No. 21, 1972, Leatherhead.

C. GENERAL PAPERS

References to a number of general papers on specimen preparation are given below. There are also many papers which deal generally with food microscopy. The topics covered include the use of the microscope by food chemists and the search for diagnostic structures, general microscopical techniques and section cutting, the application of histological and histochemical methods, fluorescence microscopy of food, the microscopical examination of the effects of freezing on tissues and the structure of frozen produce, the study of the process of freeze-drying, and the microscopy of aerated products.

56. More, A., "The Use of the Microscope for Food Chemists". *Chem. and Ind.*, 1936, **55**, 376.
57. Wallis, T. E., "The Search for Diagnostic Structures". *Chem. and Ind.*, 1936, **55**, 377.
58. Adamstone, F. B., and Taylor, A. B., "The Rapid Preparation of Frozen Tissue Sections". *Stain Technol.*, 1948, **23**, 109.
59. Hohl, L. A., "Possible Practical Applications of Histological Research to Food Processing". *Food Technol.*, 1948, **2**, 158.
60. King, J., and Weston, R. E., "Fluorescence Microscopy as an aid to Food and Drug Analysis". *Analyst*, 1950, **75**, 397.
61. Radley, J. A., "Ultraviolet Radiation in the Food Industry (Fluorescence Microscopy)". *Food*, 1951, **20**, 11, 66, 84, 132.
62. Singer, M., "Factors which control the Staining of Tissue Sections with Acid and Basic Dyes". *Internat. Rev. Cytol.*, 1952, **1**, 211.
63. Lillie, R. D., Zirkle, C., Dempsey, E. W., and Greco, J. P., "Final Report of the Committee on Histological Mounting Media". *Stain Technol.*, 1953, **28**, 57.
64. Armstrong, J., and Hyde, G., "Basic Elements of Histological Technique". *Lab. Practice*, 1953, **2**, 537, 604, 649. 1954, **3**, 20, 63, 106, 159.
65. Armstrong, J., and Hyde, G., "Some New Methods of Histological Research". *Lab. Practice*, 1954, **3**, 410, 451, 501.
66. Charlett, S. M., "Notes on the Use of Alcohol in Histology". *Lab. Practice*, 1954, **3**, 458. 1955, **4**, 32, 171.

67. Charlett, S. M., "Dehydrating Agents for Histology". *Lab. Practice*, 1955, **4**, 419.
68. Charlett, S. M., "Microscopical Technique for the Food Analyst". *Food Manuf.*, 1956, **31**, 114, 199.
69. Boxall, F. F. H., "The Preparation of Sections by the Paraffin Wax Process". *J. Quekett Micr. Club*, 1956, **4**, 229.
70. Thornburg, W., and Mengers, P. E., "An Analysis of Frozen Section Techniques". *J. Histochem. Cytochem.*, 1957, **5**, 47.
71. Charlett, S. M., "Microscopy for the Food Technologist (Sections and Section Cutting)". *Food Manuf.*, 1961, **36**, 366, 428.
72. Hanssen, E., "Microscopy and Food Product Technology". *Deut. Lebens. Rundschau*, 1962, **58**, 277.
73. Horne, R. W., "Laboratory Technique for the Study of Proteins. Electron Microscopy". *Recent Adv. in Food Sci.*, 1963, **3**, 79.
74. Pearse, A. G. E., "Rapid Freeze-Drying of Biological Tissues with a Thermoelectric Unit". *J. Sci. Instr.*, 1963, **40**, 176.
75. Lacourt, A., and Delande, N., "Thermo Micro-Identification of Amino Acids: Refractive Index". *Mikrochim. & Ichnoanal. Acta.*, 1964, **2-4**, 547.
76. Hulle, G. V., Fennema, O., and Powrie, W. D., "A Comparison of Methods for the Microscopic Examination of Frozen Tissue". *J. Food Sci.*, 1965, **30**, 601.
77. Pearse, A. G. E., and Bancroft, J. D., "Controlled Temperature Cold Microtomy". *J.R. Micr. Soc.*, 1966, **85**, 385.
78. Nguyen, V. X., and Ulrich, R., "Influence of the Method of Freezing on the Microscopic Structure of Frozen Produce". *Proc. 12th Int. Congr. Refrigeration (Madrid)*, 1967, **3**, 273.
79. Quackenbush, D. W., "A Simplified Technique for sharpening Steel Microtome Knives". *Microscope*, 1969, **17**, 55.
80. Torley, D., "Histochemical Testing Methods in Food Science". *Élelmezési Ipar*, 1970, **24** (4), 111.
81. White, G. W., "A Survey of Refractive Indices". *Microscopy*, 1970, **31**, 257.
82. Cook, C. J., "A Survey of Commercially Available Microtomes, Ultra microtomes and Cryostats". *Lab. Practice*, 1971, **20** (8), i-xvi.
83. Jewell, G. G., "Electron Microscopy of Aerated Products". BFMIRA Symposium Proceedings, 1972, No. 14. Leatherhead.
84. Gore, L. F., "Cryotomy Practice". *Lab. Practice*, 1973, **22**, 358.
85. Flink, J. M., Gejl-Hansen, F., and Karel, M., "Microscopic Investigations of the Freeze-Drying of Flavour-Containing Model Food Solutions". *J. Food Sci.*, 1973.