

## Supplementary Material

### Robert Donald Bruce Fraser 1924–2019

*George E. Rogers*<sup>A,D</sup>, *Andrew Miller*<sup>B</sup> and *David A. D. Parry*<sup>C</sup>

<sup>A</sup>School of Biological Sciences, University of Adelaide, South Australia 5005, Australia.

<sup>B</sup>General Council Business Committee, University of Edinburgh, Charles Stewart House, 9–16 Chambers Street, Edinburgh EH1 1HT, Scotland.

<sup>C</sup>School of Fundamental Sciences, Massey University, Private Bag 11–222, Palmerston North 4442, New Zealand.

<sup>D</sup>Corresponding author. Email: [george.rogers@adelaide.edu.au](mailto:george.rogers@adelaide.edu.au)

## **OTHER HONOURS AND AWARDS NOT LISTED AT THE END OF THE TEXT**

Medical Research Council Studentship 1951-1952

Nuffield Foundation Fellowship 1957

Elected to Fellowship of the Institute of Physics 1970-1973

Guest Lecturer, European Molecular Biology Organization, Summer School on Fibrous Proteins, Oxford 1976

Visiting Professor, Department of Macromolecular Science, Case Western Reserve University 1978

Guest Lecturer, Linnaean Society of London 1978

Awarded Commonwealth Foundation Grant to visit United Kingdom 1978

Plenary Lecturer, International Symposium on Biomolecular Structure, Conformation, Function and Evolution, Madras, India 1978

Guest Lecturer, Winter School on Current Trends in Biomolecular Structure, Madras 1979

Plenary Lecturer, Society for Experimental Biology, Symposium No. 34, Leeds, England 1980

Plenary Lecturer, 7th Katzir-Katchalsky Conference, Israel 1980

Visiting Fellow, Weizmann Institute, Rehovot, Israel 1980

Guest and plenary lecturer, 6th Quinquennial International Wool Textile Research Conference, Pretoria 1981

Guest Lecturer, ACS Symposium, Washington, in honour of the 75th Birthday of Milton Harris 1981

Awarded Science Research Council Senior Fellowship for visits to Molecular Biophysics Department, Oxford University 1981

Awarded Royal Society Grant for collaborative research in the Laboratory of Molecular Biophysics, Oxford University 1984

## COMPLETE LIST of BRUCE FRASER'S PUBLICATIONS

1. Fraser R. D. B. (1950) Photographic materials for use in the ultra-violet, *Journal of Scientific Instruments*, **27**, 106-107.
2. Price W. C., Fraser R. D. B., Robinson T. S. and Longuet-Higgins H. C. (1950) The infra-red absorption spectra of boron nitrogen compounds, *Faraday Society Discussions*, **9**, 131-137.
3. Fraser R. D. B. (1950) Infra-red microspectrometry with a 0.8 N.A. reflecting microscope, *Faraday Society Discussions*, **9**, 378-383.
4. Fraser M. J. and Fraser R. D. B. (1951) Evidence of the structure of deoxyribonucleic acid from measurements with polarised infra-red radiation, *Nature*, **167**, 761-763.
5. Fraser R. D. B. and Chayen J. (1952) The detection of nucleic acid in tissues by infra-red microspectrometry, *Experimental Cell Research*, **3**, 492-493.
6. Randall J. T., Fraser R. D. B., Jackson S., Martin A. V. W. and North A. C. T. (1952) Aspects of collagen structure, *Nature*, **169**, 1029-1033.
7. Fraser R. D. B. and Price W. C. (1952) Infrared dichroism and protein structure, *Nature*, **170**, 490.
8. Fraser R. D. B. (1952) Infra-red dichroism of tobacco mosaic virus nucleoprotein, *Nature*, **170**, 491-492.
9. Fraser R. D. B. (1953) The chain configuration of wool keratin, *Biochimica Biophysica. Acta*, **12**, 482-483.
10. Price W. C. and Fraser R. D. B. (1953) Infra-red dichroism and protein structure, *Proceedings of the Royal Society*, **B141**, 66-67.
11. Randall J. T., Fraser R. D. B. and North A. C. T. (1953) The structure of collagen, *Proceedings of the Royal Society*, **B141**, 62-66.
12. Fraser R. D. B. (1953) The infra-red dichroism of nucleoproteins, *Discussions of the Faraday Society*, **13**, 284.
13. Fraser R. D. B. (1953) The infra-red spectra of biologically important molecules, *Progress in Biophysics and Biophysical Chemistry*, **3**, 47-60.
14. Fraser R. D. B. (1953) The interpretation of infra-red dichroism in fibrous protein structures, *Journal of Chemical Physics*, **21**, 1511-1515.
15. Fraser R. D. B. (1953) Birefringence and elasticity in keratin fibres, *Nature*, **172**, 675-676.
16. Fraser R. D. B. (1953) The elimination of atmospheric water vapour absorption in the Perkin-Elmer infra-red spectrometer, *Journal of the Optical Society of America*, **43**, 929.
17. Fraser R. D. B. (1953) A 0.8 N.A. reflecting microscope for infra-red absorption measurements, *Journal of the Optical Society of America*, **43**, 929-930.
18. Fraser R. D. B. and Rogers G. E. (1953) Microscopic observations on the alkaline-thioglycollate extraction of wool, *Biochimica Biophysica Acta*, **12**, 484-486.
19. Fraser R. D. B., Lindley H. and Rogers G. E. (1954) Chemical heterogeneity and cortical segmentation in wool, *Biochimica Biophysica Acta*, **13**, 295-297.
20. Fraser R. D. B. and Rogers G. E. (1954) The origin of segmentation in wool cortex, *Biochimica Biophysica Acta*, **13**, 297-298.

21. Price W. C., Bradley J. E. S., Fraser R. D. B. and Quilliam J. P. (1954) The relationship between the infra-red absorption spectra of some 5:5'-substituted barbituric acids and their pharmacological activity, *Journal of Pharmacy and Pharmacology*, **6**, 522-528.
22. Fraser R. D. B. and Rogers G. E. (1954) Shadow casting in visible microscopy, *Biochimica Biophysica Acta*, **15**, 146-148.
23. Fraser R. D. B. (1955) Sidechain orientation in fibrous proteins, *Nature*, **176**, 358-359.
24. Fraser R. D. B. and Rogers G. E. (1955) The bromine Allworden reaction, *Biochimica Biophysica Acta*, **16**, 307-316.
25. Fraser R. D. B. and Rogers G. E. (1955) The surface structure of wool and its components revealed by metal shadowing, *Australian Journal of Biological Sciences*, **8**, 129-135.
26. Fraser R. D. B. and Rogers G. E. (1955) The bilateral structure of wool cortex and its relation to crimp, *Australian Journal of Biological Sciences*, **8**, 288-299.
27. Fraser R. D. B. and Rogers G. E. (1955) The structure of resistant membranes isolated from oxidized wool, *Textile Research Journal*, **XXV**, 235-241.
28. Fraser R. D. B. (1955) Molecular orientation and configuration in keratins, *Proceedings of the 1st International Wool Textile Research Conference, Australia*, **B**, 130-138.
29. Fraser R. D. B. (1955) The infra-red spectra of fibrous proteins in the 2 $\mu$  region, *Proceedings of the 1st International Wool Textile Research Conference, Australia*, **B**, 120-129.
30. Fraser R. D. B. and Rogers G. E. (1955) New aspects of the fine histology of wool, *Proceedings of the 1st International Wool Textile Research Conference, Australia*, **F**, 106-111.
31. Fraser R. D. B. and Rogers G. E. (1955) The bilateral structure of wool cortex, *Proceedings of the 1st International Wool Textile Research Conference, Australia*, **F**, 151-155.
32. Fraser R. D. B. (1956) Interpretation of infra-red dichroism in fibrous proteins – 2 micron region, *Journal of Chemical Physics*, **24**, 89-95.
33. Fraser R. D. B. and MacRae T. P. (1956) The distribution of ortho- and para-cortical cells in wool and mohair, *Textile Research Journal*, **XXVI**, 618-619.
34. Fraser R. D. B. and MacRae T. P. (1957) Molecular organization in keratins, Parts I and II, *Textile Research Journal*, **27**, 379-383; 384-389.
35. Fraser R. D. B. and MacRae T. P. (1957) Evidence of regularities in the chemical structure of  $\alpha$ -keratins, *Nature*, **179**, 732-733.
36. Fraser R. D. B., MacRae T. P. and Simmonds, D. H. (1957) Models of  $\alpha$ -keratin structure, *Biochimica Biophysica Acta*, **25**, 654-655.
37. Fraser R. D. B. and MacRae T. P. (1957) Molecular organization in keratins III. The densities of physically and chemically modified wool, *Textile Research Journal*, **27**, 867-872.
38. Fraser R. D. B. and Pressley, T. A. (1958) Felting investigations I. Potential substitutes for rabbit fur in hat felts, *Textile Research Journal*, **28**, 478-485.
39. Fraser R. D. B. and MacRae T. P. (1958) The hydrogen  $\rightarrow$  deuterium exchange reaction in  $\alpha$ -keratin, *Journal of Chemical Physics*, **28**, 1120-1125.
40. Fraser R. D. B. (1958) Interpretation of infra-red dichroism in axially oriented polymers, *Journal of Chemical Physics*, **28**, 1113-1115.

41. Fraser R. D. B. and MacRae T. P. (1958) Structural implications of the equatorial X-ray diffraction pattern of  $\alpha$ -keratin, *Biochimica Biophysica Acta*, **29**, 229-239.
42. Fraser R. D. B. and MacRae T. P. (1958) Hydrogen  $\rightarrow$  deuterium exchange reaction in fibrous proteins I, *Journal of Chemical Physics*, **29**, 1024-1030.
43. Fraser R. D. B. (1958) Use of fibre specimens for infra-red absorption measurements, *Journal of the Optical Society of America*, **48**, 1017-1018.
44. Fraser R. D. B. (1958) Determination of transition moment orientation in partially oriented polymers, *Journal of Chemical Physics*, **29**, 1428-1429.
45. Fraser R. D. B., MacRae T. P. and Freeman H. C. (1959) Scattering from an infinite elliptical cylinder, *Acta Crystallographica*, **12**, 171.
46. Fraser R. D. B., MacRae T. P. and Rogers G. E. (1959) Structure of  $\alpha$ -keratin, *Nature*, **183**, 592-594.
47. Fraser R. D. B. and MacRae, T. P. (1959) Possible role of water in collagen structure, *Nature*, **183**, 179-180.
48. Bendit, E. G., Feughelman, M., Fraser, R. D. B. and MacRae, T. P. (1959) The hydrogen  $\rightarrow$  deuterium exchange reaction in stretched keratin, *Textile Research Journal*, **29**, 284-285.
49. Fraser R. D. B. and MacRae, T. P. (1959) Hydrogen  $\rightarrow$  deuterium exchange reaction in fibrous proteins II, *Journal of Chemical Physics*, **31**, 122-126.
50. Fraser R. D. B. and MacRae, T. P. (1959) Molecular organization in feather keratin, *Journal of Molecular Biology*, **1**, 387-397.
51. Fraser R. D. B. (1960) Infra-red spectra, In: 'A Laboratory Manual of Analytical Methods of Protein Chemistry' (Eds P. Alexander and R. J. Block), **2**, 285-351. (Pergamon Press, London)
52. Fraser R. D. B., MacRae, T. P. and Rogers, G. E. (1960) Recent observations on the structure of  $\alpha$ -keratin, *Proceedings of the 2nd International Wool Textile Research Conference*, Harrogate, **51**, Part I, T497 - T516.
53. Bradbury, E. M., Elliott, A. and Fraser, R. D. B. (1960) Infra-red dichroism and crystallinity in polyethylene and polyethylene suberate, *Transactions of the Faraday Society*, Part 8, **56**, 1117-1124.
54. Bradbury, E. M., Brown, L., Downie., A. R., Elliott, A., Fraser, R. D. B., Hanby, W. E. and McDonald, T. R. R. (1960) The 'cross-B' structure in polypeptides of low molecular weight, *Journal of Molecular Biology*, **2**, 276-286.
55. Fraser, R. D. B. (1961) Structural organization in wool, In: 'Structure of Wool', pp. 25-36. (Institut Textile de France)
56. Fraser R. D. B. and MacRae, T. P. (1961) The  $\alpha$ -configuration of fibrous proteins, *Nature*, **189**, 572-573.
57. Fraser R. D. B. and MacRae, T. P. (1961) The molecular configuration of  $\alpha$ -keratin, *Journal of Molecular Biology*, **3**, 640-647.
58. Bradbury, E. M., Brown, L., Downie., A. R., Elliott, A., Fraser, R. D. B. and Hanby, W. E. (1962) The structure of the  $\omega$  form of poly  $\beta$ -benzyl-L-aspartate, *Journal of Molecular Biology*, **5**, 230-247.
59. Fraser R. D. B., MacRae, T. P. and Rogers G. E. (1962) Molecular organization in  $\alpha$ -keratin, *Nature*, **193**, 1052-1055.
60. Fraser R. D. B., MacRae, T. P. and Stapleton, I. W. (1962) The  $\omega$ -helix in synthetic polypeptides, *Nature*, **193**, 573.

61. Fraser R. D. B. and Lennox, F. G. (1962) The structure of the wool fibre, *Textile Journal of Australia*, **37**, 120-124.
62. Fraser R. D. B. and MacRae, T. P. (1962) Helical models of feather keratin structure, *Nature*, **195**, 1167-1168.
63. Fraser R. D. B. and MacRae, T. P. (1962) An investigation of the structure of  $\beta$ -keratin, *Journal of Molecular Biology*, **5**, 457-466.
64. Filshie, B. F., Fraser, R. D. B., MacRae T. P. and Rogers, G. E. (1963) Lipids in keratinized tissues, *Journal of Molecular Biology*, **7**, 90-91.
65. Fraser R. D. B. and MacRae, T. P. (1963) Structural organization in feather keratin, *Journal of Molecular Biology*, **7**, 272-280.
66. Fraser R. D. B., MacRae, T. P. and Miller, A. (1962) The Fourier transform of the coiled-coil model for  $\alpha$ -keratin, *Acta Crystallographica*, **17**, 813-816.
67. Fraser R. D. B., MacRae, T. P. and Miller, A. (1964) The molecular structure of  $\alpha$ -keratin, *Nature*, **203**, 1231-1233.
68. Fraser R. D. B., MacRae, T. P. and Miller, A. (1964) The Fourier transform of an assembly of helices, *Acta Crystallographica*, **17**, 769-770.
69. Elliott, A., Fraser, R. D. B., MacRae, T. P., Stapleton, I. W., Suzuki, E. (1964) An investigation of the structure of poly-S-carbobenzoxy-L-cysteine, *Journal of Molecular Biology*, **9**, 10-16.
70. Fraser, R. D. B., MacRae, T. P., Miller, A. and Suzuki, E. (1964) The quantitative analysis of fibril packing from electron micrographs, *Journal of Molecular Biology*, **9**, 250-252.
71. Fraser, R. D. B., Inglis, A. S. and Miller, A. (1964) Automatic computation of amino acid analyses, *Analytical Biochemistry*, **7**, 247-257.
72. Fraser, R. D. B., MacRae, T. P. and Miller, A. (1964) The coiled-coil model of the structure of  $\alpha$ -keratin, *Journal of Molecular Biology*, **10**, 147-156.
73. Fraser, R. D. B. and Suzuki, E. (1964) Infra-red dichroism in  $\alpha$ -keratin, *Journal of Molecular Biology*, **9**, 829-830.
74. Fraser, R. D. B. and Suzuki, E. (1965) The use of polarized radiation with infra-red grating spectrometers, *Spectrochimica Acta*, **21**, 615-616.
75. Fraser R. D. B., MacRae, T. P., Stewart, F. H. C. and Suzuki, E. (1965) Poly-L-alanylglycine, *Journal of Molecular Biology*, **11**, 706-712.
76. Dobb M. G., Fraser R. D. B. and MacRae T. P. (1965) The structure of the keratin filament, *Proceedings of the 3<sup>rd</sup> International Wool Textile Research Conference, Paris*, **3**, 95-104.
77. Fraser R. D. B., MacRae T. P., Miller A., Stewart F. H. C. and Suzuki E. (1965) The molecular structure of  $\alpha$ -keratin, *Proceedings of the 3<sup>rd</sup> International Wool Textile Research Conference, Paris*, **3**, 85 - 93.
78. Crewther W. G., Fraser R. D. B., Lennox F. G. and Lindley H. (1965) The chemistry of keratins, *Advances in Protein Chemistry*, **20**, 191-246.
79. Fraser R. D. B., MacRae T. P. and Miller A. (1965) X-ray diffraction patterns of  $\alpha$ -fibrous proteins, *Journal of Molecular Biology*, **4**, 432-442.

80. Fraser R. D. B., Harrap B. S., MacRae T. P., Stewart F. H. C. and Suzuki E. (1965) Sequential polypeptides containing S-benzyl-L-cysteinyl and  $\gamma$ -ethyl-L-glutamyl residues, *Journal of Molecular Biology*, **14**, 423–431.
81. Fraser R. D. B., Harrap B. S., MacRae T. P., Stewart F. H. C. and Suzuki E. (1965) Sequential polypeptides containing L-valyl and  $\gamma$ -methyl-L-glutamyl residues, *Journal of Molecular Biology*, **12**, 482–489.
82. Fraser R. D. B., MacRae T. P. and Stewart F. H. C. (1965) The  $\alpha$ -helical conformation in a sequential polypeptide, *Journal of Molecular Biology*, **13**, 949-951.
83. Fraser R. D. B. and Suzuki E. (1965) Polypeptide chain conformation in feather keratin, *Journal of Molecular Biology*, **14**, 279–282.
84. Fraser R. D. B., MacRae T. P. and Miller A. (1965) The Fourier transform of the coiled-coil model for  $\alpha$ -keratin. A Correction, *Acta Crystallographica*, **18**, 1087.
85. Elliott A., Fraser R. D. B. and MacRae T. P. (1965) The X-ray diffraction patterns of poly- $\gamma$ -benzyl-glutamate, *Journal of Molecular Biology*, **11**, 821-828.
86. Fraser R. D. B., MacRae T. P. and Stewart F. H. C. (1966) Poly-L-alanyl-glycyl-L-alanyl-glycyl-L-seryl-glycine: A model for the crystalline regions of silk fibroin, *Journal of Molecular Biology* **19**, 580-582.
87. Fraser R. D. B. and Suzuki E. (1966) Resolution of overlapping absorption bands by least-squares procedures, *Analytical Chemistry*, **38**, 1770-1773.
88. Dobb M. G., Fraser R. D. B. and MacRae T. P. (1967) The fine structure of silk fibroin, *Journal of Cell Biology*, **32**, 289-295.
89. Fraser R. D. B., Harrap B. S., MacRae T. P., Stewart F. H. C. and Suzuki E. (1967) The effect of glycyl residues on the stability of the  $\alpha$ -helix, *Biopolymers*, **5**, 251-255.
90. Fraser R. D. B., Harrap B. S., Ledger R., MacRae T. P., Stewart F. H. C. and Suzuki E. (1967) Stability of the  $\alpha$ -helix in poly- $\gamma$ -benzyl L-glutamate and related polymers, *Biopolymers*, **5**, 797-807.
91. Fraser R. D. B., MacRae T. P., Parry D. A. D. and Suzuki E. (1968) The structure of beta keratin, In: 'Symposium on Fibrous Proteins Australia 1967' (ed W.G. Crewther) Butterworths, Australia, 42–44.
92. Fraser R. D. B., Harrap B. S., Ledger T., MacRae T. P., Stewart F. H. C. and Suzuki E. (1968) Stability of alpha helices in proteins and polypeptides, In: 'Symposium on Fibrous Proteins Australia 1967' (Ed W. G. Crewther) pp. 57–68. (Butterworths, Australia)
93. Fraser R. D. B., MacRae T. P. and Parry D. A. D. (1968) Substructure of the alpha keratin microfibril, In: 'Symposium on Fibrous Proteins Australia 1967' (Ed W.G. Crewther) pp 279–286. (Butterworths, Australia)
94. Fraser R. D. B. and MacRae T. P. (1969) In: 'X-ray methods: Physical principles and techniques of protein chemistry Part A', (Ed S. J. Leach) Chap 2, pp. 59–100. (Academic Press, New York and London)
95. Fraser R. D. B. (1969) Keratins, *Scientific American*, **221**, 86-96.
96. Fraser R. D. B. and Suzuki E. (1969) Resolution of overlapping bands: Functions for simulating band shapes, *Analytical Chemistry*, **41**, 37-39.
97. Fraser R. D. B. and Suzuki E. (1969) Correction. Resolution of overlapping bands: Functions for simulating band shapes, *Analytical Chemistry*, **41**, 935.

98. Fraser R. D. B., MacRae T. P. and Millward G. R. (1969) The structure of  $\alpha$ -keratin microfibrils, *Journal of the Textile Institute*, **60**, 343-346.
99. Fraser R. D. B., MacRae T. P., Parry D. A. D. and Suzuki E. (1969) The structure of  $\beta$ -keratin, *Polymer*, **10**, 810-826.
100. Fraser R. D. B., MacRae T. P. and Millward G. R. (1969) Fact and artefact, *Journal of the Textile Institute*, **60**, 498-501.
101. Fraser R. D. B. and Suzuki E. (1970) Biological applications, In: *Spectral Analysis: Methods and Techniques* (ed J. A. Blackburn), Chap 5, pp 171-211. (Marcel Dekker, New York)
102. Fraser R. D. B. and Suzuki E. (1970) Infrared methods, In: 'The Physical Principles and Techniques of Protein Chemistry', (ed. S. J. Leach) Part B, pp 213-273. (Elsevier)
103. Fraser R. D. B. and Suzuki E. (1970) A quantitative study of the amide I vibrations in the infra-red spectrum of  $\alpha$ -keratin, *Spectrochimica Acta*, **26A**, 423-425.
104. Fraser R. D. B. and Millward G. R. (1970) Image averaging by optical filtering, *Journal of Ultrastructural Research*, **31**, 203-211.
105. Fraser R. D. B., MacRae T. P., Millward G. R., Parry D. A. D., Suzuki E. and Tulloch P. A. (1970) The molecular structure of keratins, *Applied Polymer Symposium 1971*, 65-83.
106. Fraser R. D. B. and MacRae T. P. (1971) Structure of  $\alpha$ -keratin, *Nature*, **233**, 138-140.
107. Fraser R. D. B., MacRae T. P., Parry D. A. D. and Suzuki E. (1971) The structure of feather keratin, *Polymer*, **12**, 35-56.
108. Fraser R. D. B., MacRae T. P. and Rogers G. E. (1972) 'Keratins. Their composition, structure and biosynthesis', Charles C Thomas: Springfield, III.
109. Fraser R. D. B. and MacRae T. P. (1973) The structure of  $\alpha$ -keratin, *Polymer*, **14**, 61-67.
110. Suzuki E., Crewther W. G., Fraser R. D. B., MacRae T. P. and McKern N. M. (1973) X-ray diffraction and infrared studies of an  $\alpha$ -helical fragment from  $\alpha$ -keratin, *Journal of Molecular Biology*, **73**, 275-278.
111. Fraser R. D. B. and MacRae T. P. (1973) 'Conformation in Fibrous Proteins and Related Synthetic Polypeptides' (Academic Press, New York and London.)
112. Fraser R. D. B. and Suzuki E. (1973) The use of least-squares in data analysis, In: 'Physical Principles and Techniques of Protein Chemistry, Part C' (ed Leach S.J.) Chap 21, pp. 301-355. (Academic Press, New York and London)
113. Fraser R. D. B., Gillespie J. M. and MacRae T. P. (1973) Tyrosine-rich proteins in keratins, *Comparative Biochemistry and Physiology*, **44B**, 943-947.
114. Suzuki E. and Fraser R. D. B. (1974) Ordered water in collagen, In: 'Peptides, Polypeptides and Proteins (Proceedings of the Rehovot Symposium on Poly (Amino Acids), Polypeptides, and Proteins and Their Biological Implications, Israel, May 1974', (Eds E. R. Blout, F. A. Bovey, M. Goodman and N. Lotan), pp. 449-458. (John Wiley and Sons, New York)
115. Fraser R. D. B., Miller A. and Parry D. A. D. (1974) Packing of microfibrils in collagen, *Journal of Molecular Biology*, **83**, 281-283.
116. Fraser R. D. B., MacRae T. P., Miller A. and Rowlands R. J. (1976) Digital processing of fibre diffraction patterns, *Journal of Applied Crystallography*, **9**, 81-91.



117. Fraser R. D. B. and Suzuki E. (1976) (Appendix) Approximate Relationships between  $I_s(D, \underline{g}_0)$  and  $I_p(D, \underline{g}_0)$ , *Journal of Applied Crystallography*, **9**, 91–94.
118. Fraser R. D. B. and Gillespie J. M. (1976) Wool structure and biosynthesis, *Nature*, **261**, 650–654.
119. Fraser R. D. B. and MacRae T. P. (1976) The molecular structure of feather keratin, In: ‘Proceedings of the 16<sup>th</sup> International Ornithological Congress, August 1974’, pp. 443–451. (Australian Academy of Sciences, Canberra ACT)
120. Fraser R. D. B., MacRae T. P. and Suzuki E. (1976) Structure of the  $\alpha$ -keratin microfibril, *Journal of Molecular Biology*, **108**, 435–452.
121. Fraser R. D. B., MacRae T. P., Suzuki E. and Davey C. L. (1976) Image processing of electron micrographs of deformed filaments, *Journal of Microscopy*, **108**, 343–348.
122. Fraser R. D. B., MacRae T. P., Rowlands R. J. and Tulloch P. A. (1976) Molecular structure of keratin, *Proceedings of the 5<sup>th</sup> International Wool Textile Research Conference, Aachen*, **2**, pp.80–89. (Deutsches Wollforschungsinstitut)
123. Fraser R. D. B., Jones L. N., MacRae T. P., Rowlands R. J. and Tulloch P. A. (1976) Studies on microfibrils isolated from  $\alpha$ -keratin, *Proceedings of the 5<sup>th</sup> International Wool Textile Research Conference, Aachen*, **2**, pp. 130–138. (Deutsches Wollforschungsinstitut)
124. Fraser R. D. B. (1977) The structure of fibrous proteins, In: ‘Proceedings of the First Cleveland Symposium on Macromolecules. Structure and Properties of Biopolymers’ (Ed A. G. Walton) pp. 1–21. (Elsevier Scientific Publishing Company, Amsterdam)
125. Fraser R. D. B., MacRae T. P., Suzuki E. and Tulloch P. A. (1977) An automated procedure for the correction of background due to inelastic scattering in electron diffraction patterns, *Journal of Applied Crystallography*, **10**, 64–66.
126. Parry D. A. D., Crewther W. G., Fraser R. D. B. and MacRae T. P. (1977) Structure of  $\alpha$ -keratin: Structural implications of the amino acid sequences of the Type I and Type II chain segments, *Journal of Molecular Biology*, **113**, 449–454.
127. Fraser R. D. B., MacRae T. P. and Suzuki E. (1978) An improved method for calculating the contribution of solvent to the X-ray diffraction pattern of biological molecules, *Journal of Applied Crystallography*, **11**, 693–694.
128. Fraser R. D. B. and MacRae T. P. (1979) The crystalline structure of collagen fibrils in tendon, *Journal of Molecular Biology*, **127**, 129–133.
129. Fraser R. D. B., MacRae T. P. and Suzuki E. (1979) Chain conformation in the collagen molecule, *Journal of Molecular Biology*, **129**, 463–481.
130. Hunt S., Fraser R. D. B., MacRae T. P. and Suzuki E. (1979) Molecular organisation in molluscan operculae, *Journal of Molecular Biology*, **129**, 149–153.
131. Parry D. A. D., Fraser R. D. B. and MacRae T. P. (1979) Repeating patterns of amino acid residues in the sequences of some high sulphur proteins from  $\alpha$ -keratin, *Biopolymers* **1**, 17–22.
132. Fraser R. D. B., MacRae T. P., Suzuki E. and Tulloch P. A. (1979) Coiled coils in fibrous proteins, *Polymer Preprints, American Chemical Society, Division of Polymers*, Ch 20, 43–46.
133. Fraser R. D. B., MacRae T. P. and Suzuki E. (1980) The molecular and fibrillar structure of collagen, In: ‘Fibrous Proteins: Scientific, Industrial and Medical Aspects’ (eds D. A. D. Parry and Creamer L. K.) **1**, pp. 179–206. (Academic Press, London)

134. Fraser R. D. B. and MacRae T. P. (1980) Molecular structure and the mechanical properties of keratins, In: 'The Mechanical Properties of Biological Materials' (Eds J. F. V. Vincent and J. D. Currey) XXXIV, pp. 211–246. (Cambridge University Press)
135. Suzuki, E., Fraser R. D. B., MacRae T. P. and Rowlands R. J. (1980) Simulation of fiber diffraction patterns, In: 'Fiber Diffraction Methods' (Eds A.D. French and K.H. Gardner) American Chemical Society Symposium Series, No 141, pp. 61-67. (American Chemical Society)
136. Fraser R. D. B., MacRae T. P. and Suzuki E. (1980) The role of hydroxyproline in the stabilization of the collagen molecule via water molecules, *International Journal of Biological Macromolecules*, **2**, 54–56.
137. Fraser R. D. B. and MacRae T. P. (1980) Current views on the keratin complex, In: 'The Skin of Vertebrates' (eds R.I.C. Spearman and P.A. Riley) Symposium Series No 9, pp. 67–83. (Linnæus Society)
138. Fraser R. D. B., Jones L. N., MacRae T. P., Suzuki E. and Tulloch P. A. (1980) The fine structure of the wool fibre, *Proceedings of the 6<sup>th</sup> International Wool Textile Research Conference, Pretoria*, **1**, 1–34.
139. Fraser R. D. B., MacRae T. P. and Suzuki E. (1981) Diffraction by fibrous materials, In: 'Structural Aspects of Biomolecules I. X-Ray Diffraction and Related Methods' (ed R. Srinivasan and V. Pattahhi) pp. 154–167. (Macmillan)
140. Fraser R. D. B., MacRae T. P., Suzuki E. and Tulloch P. A. (1981) Ordered assemblies in fibrous proteins, In: 'Structural Aspects of Recognition and Assembly in Biological Macromolecules', (ed. M. Balaban) pp. 327–340. (Rehovot)
141. Fraser R. D. B. and MacRae T. P. (1981) Unit cell and molecular connectivity in tendon collagen, *International Journal of Biological Macromolecules*, **3**, 193–200.
142. Fraser R. D. B., Suzuki E. and MacRae T. P. (1984) Computer analysis of X-ray diffraction patterns, In: 'The Structure of Crystalline Polymers' (ed I.H. Hall), pp. 1–37. (Applied Science Publishers, London)
143. Fraser R. D. B. and MacRae T. P. (1982) The fine structure of keratin fibers, In: 'Milton Harris: Chemist, Innovator, and Entrepreneur', (ed. M. Breuer) pp 109-137. (American Chemical Society)
144. Fraser R. D. B., Jones L. N., MacRae T. P., Suzuki E. and Tulloch P. A. (1981) The structure and assembly of fibrous proteins, In: 'Biomolecular Structure, Conformation, Function, and Evolution' (Eds R. Srinivasan, E. Subramanian and N. Yathindra) **1**, pp 133-152. (Pergamon, London)
145. Fraser R. D. B., MacRae T. P., Miller A. and Suzuki E. (1983) Molecular conformation and packing in collagen fibrils, *Journal of Molecular Biology*, **167**, 497-521.
146. Fraser R. D. B., Suzuki E. and MacRae T. P. (1983) The structure of the  $\alpha$ -keratin microfibril, *Bioscience Reports* **3**, 517-525.
147. Parry D. A. D. and Fraser R. D. B. (1985) Intermediate filament structure: Analysis of IF protein sequence data, *International Journal of Biological Macromolecules*, **7**, 203-213.
148. Fraser R. D. B. and MacRae T. P. (1985) Intermediate filament structure, *Bioscience Reports* **5**, 573–579.
149. Fraser R. D. B., MacRae T. P., Suzuki E. and Parry D. A. D. (1985) Intermediate filament structure: 2. Molecular interactions in the filament, *International Journal of Biological Macromolecules*, **7**, 257–274.
150. Miller A., Bradshaw J., Jones E. Y., Fraser R. D. B., MacRae, T. P. and Suzuki, E. (1985) The structure of collagen, In: 'Chemische Industrie Basel Foundation Symposium No 114 *Fibrosis*', (Eds D. Evered and J. Whelan) pp. 65–79. (Churchill)
151. Jones E. Y., Miller A., Fraser R. D. B., MacRae T. P. and Suzuki E. (1985) Structural studies on Type I collagen fibrils, In: 'Extracellular Matrix: Structure and Function', (Ed. H. Reddi) pp. 359–365. (A.R. Liss New York)

152. Fraser R. D. B., MacRae T. P., Parry D. A. D. and Suzuki E. (1986) Intermediate filaments in  $\alpha$ -keratins, *Proceedings of the National Academy of Sciences United States of America*, **83**, 1179–1183.
153. Fraser R. D. B. and Trus B. L. (1986) Molecular mobility in the gap regions of Type 1 collagen fibrils, *Bioscience Reports*, **6**, 221–226.
154. Parry D. A. D., Fraser R. D. B., MacRae T. P. and Suzuki E. (1986) Intermediate filaments, In: 'Fibrous Protein Structure' (eds J.M. Squire and P. Vibert) Chap 8, 193–214. (Academic Press, London)
155. Fraser R. D. B., MacRae T. P., Chew M. and Squire J. M. (1986) Collagen and elastin, In: 'Fibrous Protein Structure' (eds J.M. Squire and P. Vibert) Chap 7, 173–191. (Academic Press, London)
156. Fraser R. D. B., MacRae T. P. and Parry D. A. D. (1986) The three-dimensional structure of IF, In: 'Intermediate Filaments' (eds R.D. Goldman and P.M. Steinert) pp. 205–231. (Plenum Press, New York)
157. Fraser R. D. B., MacRae T. P. and Miller A. (1987) Molecular packing in Type I collagen fibrils, *Journal of Molecular Biology*, **193**, 115–125.
158. Fraser R. D. B., Steinert P. M. and Steven A. C. (1987) Focus on intermediate filaments, *Trends in Biochemical Sciences*, **12**, 43–45.
159. Fraser R. D. B., MacRae T. P., Parry D. A. D. and Sparrow L. G. (1988) Disulphide bonding in  $\alpha$ -keratin, *International Journal of Biological Macromolecules* **10**, 106–112.
160. Fraser R. D. B. and MacRae T. P. (1988) The surface lattice in  $\alpha$ -keratin filaments, *International Journal of Biological Macromolecules* **10**, 178–184.
161. Conway J. F., Fraser R. D. B., MacRae T. P. and Parry D. A. D. (1988) Protein chains in wool and epidermal keratin IF: structural features and spatial arrangement, In: 'The Biology of Wool and Hair' (Eds G.E. Rogers, P. J. Reis, K. A. Ward and R. C. Marshall), **9**, pp. 127–144. (Chapman and Hall, London)
162. Fraser R. D. B., Furlong D. B., Trus B. L., Nibert M. L., Fields B. N. and Steven A. C. (1990) Molecular structure of the cell-attachment protein of reovirus: correlation of computer processed electron micrographs with sequence-based predictions, *Journal of Virology*, **64**, 2990–3000.
163. Fraser R. D. B., MacRae T. P. and Parry D. A. D. (1990) The three-dimensional structure of IF, In: 'Cellular and Molecular Biology of Intermediate Filaments' (Eds R. D. Goldman and P. M. Steinert) pp. 205–227. (Plenum Press, London)
164. Steinert P. M., Marekov L. N., Fraser R. D. B. and Parry D. A. D. (1993) Keratin intermediate filament structure: crosslinking studies yield quantitative information on molecular dimensions and mechanisms of assembly, *Journal of Molecular Biology*, **230**, 436–452.
165. Fraser R. D. B. and Parry D. A. D. (1996) The molecular structure of reptilian keratin, *International Journal of Biological Macromolecules*, **19**, 207–211.
166. Fraser R. D. B. and Fraser S. E. (2000) Breast cancer diagnosis using scattered X-rays, *International Union of Crystallography Newsletter* **8**, 8.
167. Fraser R. D. B., Steinert P. M. and Parry D. A. D. (2003) Structural changes in trichocyte keratin intermediate filaments during keratinization, *Journal of Structural Biology*, **142**, 266–271.
168. Fraser R. D. B. and Parry D. A. D. (2003) Macrofibril assembly in trichocyte (hard- $\alpha$ ) keratins, *Journal of Structural Biology*, **142**, 319–325.
169. Fraser R. D. B., Rogers G. E. and Parry D. A. D. (2003) Nucleation and growth of macrofibrils in trichocyte (hard- $\alpha$ ) keratins, *Journal of Structural Biology*, **143**, 85–93.

170. Fraser R. D. B. (2004) The structure of deoxyribose nucleic acid, *Journal of Structural Biology*, **145**, 184–186.
171. Fraser R. D. B. and Parry D. A. D. (2005) The three-dimensional structure of trichocyte (hard  $\alpha$ -) keratin intermediate filaments: features of the molecular packing deduced from the sites of induced crosslinks, *Journal of Structural Biology*, **151**, 171–181.
172. Fraser R. D. B. and Parry D. A. D. (2006) The three-dimensional structure of trichocyte (hard  $\alpha$ -) keratin intermediate filaments: the nature of the repeating unit, *Journal of Structural Biology*, **155**, 375-378.
173. Fraser R. D. B. and Parry D. A. D. (2007) Structural changes in the trichocyte intermediate filaments accompanying the transition from the reduced to the oxidized form, *Journal of Structural Biology*, **159**, 36-45.
174. Fraser R. D. B. and Parry D. A. D. (2008) Molecular packing in the feather keratin filament, *Journal of Structural Biology*, **162**, 1-13.
175. Parry D. A. D., Fraser R. D. B. and Squire J. M. (2008) Fifty years of coiled coils and  $\alpha$ -helix bundles: a close relationship between sequence and structure, *Journal of Structural Biology*, **163**, 258-269.
176. Fraser R. D. B. and Parry D. A. D. (2009) The role of  $\beta$ -sheets in the structure and assembly of keratins, *Biophysical Reviews*, **1**, 27–35.
177. Fraser R. D. B. (2010) A tribute to the memory of Tom MacRae, *Journal of Structural Biology*, **170**, 182–183.
178. Fraser R. D. B. and Parry D. A. D. (2011) The structural basis of the filament-matrix texture in the avian/reptilian group of hard  $\beta$ -keratins, *Journal of Structural Biology*, **173**, 391–405.
179. Fraser R. D. B. and Parry D. A. D. (2011) The structural basis of the two-dimensional net pattern observed in the X-ray diffraction pattern of avian keratin, *Journal of Structural Biology*, **176**, 340-349.
180. Fraser R. D. B. and Parry D. A. D. (2012) The role of disulfide bond formation in the structural transition observed in the intermediate filaments of developing hair, *Journal of Structural Biology*, **180**, 117-124.
181. Fraser R. D. B. and Parry D. A. D. (2014) Keratin intermediate filaments: differences in the sequences of the type I and type II chains explain the origin of the stability of an enzyme-resistant four-chain fragment, *Journal of Structural Biology*, **185**, 317-326.
182. Fraser R. D. B. and Parry D. A. D. (2014) Amino acid sequence homologies in the hard keratins of birds and reptiles, and their implications for molecular structure and physical properties, *Journal of Structural Biology*, **188**, 213-224.
183. Fraser R. D. B. and Parry D. A. D. (2015) The molecular structure of the silk fibers from Hymenoptera aculeata (bees, wasps, ants), *Journal of Structural Biology*, **192**, 528–538.
184. Fraser, R. D. B. and Parry, D. A. D. (2017) Structural transition of trichocyte keratin intermediate filaments during development in the hair follicle, In: ‘Subcellular Biochemistry: Fibrous Proteins: Structures and Mechanisms’ (Eds Parry, D. A. D. and Squire, J. M.) **82**, pp. 131-149 (Springer International Publishing Switzerland)
185. Fraser, R. D. B. and Parry, D. A. D. (2017) Filamentous structure of hard  $\beta$ -keratin in the epidermal appendages of birds and reptiles, In: ‘Subcellular Biochemistry: Fibrous Proteins: Structures and Mechanisms’ (Eds D. A. D. Parry and J. M. Squire **82**, pp. 231-252 (Springer International Publishing Switzerland)
186. Fraser, R. D. B. and Parry, D. A. D. (2017) Intermediate filament structure in fully differentiated (oxidised) trichocyte, *Journal of Structural Biology*, **200**, 45-53.

187. Fraser, R. D. B. and Parry, D. A. D. (2018) Structural hierarchy of trichocyte keratin intermediate filaments, In: 'The Hair Fibre: Proteins, Structure and Development: Advances in Experimental Medical Biology', (eds J. Plowman, D. Harland and S. Deb-Choudhury) **1054**, pp. 57-70 (Springer)
188. Fraser, R. D. B. and Parry, D. A. D. (2018) Trichocyte keratin-associated proteins, In: 'The Hair Fibre: Proteins, Structure and Development: Advances in Experimental Medical Biology', (Eds J. Plowman, D. Harland and S. Deb-Choudhury) **1054**, pp. 71-86 (Springer)
189. Fraser, R. D. B. and Parry, D. A. D. (2018) Direct evidence supporting the existence of a helical dislocation in protofilament packing in the intermediate filaments of oxidized trichocyte keratin, *Journal of Structural Biology*, **204**, 491-497.
190. Parry, D. A. D., Fraser, R. D. B., Alibardi, L., Rutherford, K. M. and Gemmell, N. (2019) Molecular structure of sauropsid  $\beta$ -keratins from tuatara (*Sphenodon punctatus*), *Journal of Structural Biology*, **207**, 21-28.
191. Fraser, R. D. B. and Parry, D. A. D. (2020) Lepidosaur  $\beta$ -keratin chains with four 34-residue repeats: Modelling reveals a potential filament-crosslinking role, *Journal of Structural Biology*, **209**, 107413.

#### BOOKS

1. Fraser R.D.B. , MacRae T.P. and Rogers G.E., (1972) Keratins, Their Composition, Structure and Biosynthesis, Charles C. Thomas , Springfield, Illinois. pp.1-304.
2. Fraser R.D.B. and MacRae T.P. (1973) Conformation in Fibrous Proteins and Related Synthetic Polypeptides, Academic Press, New York. pp.1-628.