

Catalogue of the papers and correspondence of
SIR FREDERICK CHARLES FRANK Kt, OBE, FRS
(b.1911)

Compiled by Timothy E. Powell and Peter Harper

Volume II

Sections G - K

Bibliography

Index of Correspondents and Organisations

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SECTION G

CONSULTANCIES

G.1-G.130

This section contains material relating to Frank's work for British and overseas commercial organisations only. He also acted as consultant for a number of governmental agencies and departments. Material of this nature is to be found in Section F.

BRITISH AIRCRAFT CORPORATION (BAC)	G.1
BRITISH RAILWAYS (BR)	G.2-G.23
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G.1 BRITISH AIRCRAFT CORPORATION (BAC) 1964

Correspondence re offer of consultancy in Guided Weapons Division. BAC's letter of 8 May 1964 is annotated by Frank "Answered, accepting but asking for further copy of original letter, 24 July 1964".

G.2-G.23 BRITISH RAILWAYS (BR) 1949-51

Frank was invited to serve as "an independent scientific adviser" to the Water Treatment Committee, 23 September 1949, on the recommendation of R.V. Jones. This Committee was established to study the problems "in the provision and use of softened water" used in steam locomotive boilers. It first met on 2 December 1949 and held a further thirteen meetings before issuing its report in February 1951.

The Committee considered the problems and costs associated with the various systems of softening the water fed to locomotives to reduce scaling (with its deleterious effect on the costs of boiler maintenance). While allowing for regional diversity (due to differing water hardnesses and to the pre-nationalisation practices of the four great railway companies) the Committee recommended "that further extensions of water treatment should be made as far as possible by internal treatment on the locomotive" rather than by large-scale water treatment plants.

The material, predominantly committee papers and background information, is arranged in a chronological sequence.

G.2 Invitation to become a consultant and Frank's letter of acceptance; Frank's 4pp manuscript notes and references headed "Notes on water treatment", written 28 November 1949; list of committee members, sent 29 November.

G.3 "Questions for Enginemen, &c", London Midland and Scottish Railway's Handbook for Enginemen, December 1931. Sent to Frank 28 November 1949 (see covering note at G.2).

- G.4-G.8 First committee meeting, Derby, 2 December 1949. Frank was present.
- G.4 Papers and minutes of meeting. With Frank's "Memorandum to the Chairman" recording the views he expressed at the meeting, 2pp typescript.
- G.5-G.8 Reports on water treatment submitted by BR Regions. The reports are retained in their original folders.
- G.5 East and North East Region.
- G.6 London Midland Region.
- G.7 Southern Region.
- G.8 Western Region.
- G.9 Correspondence with S. Bairstow, Divisional Chemist, London Midland Region, December 1949, January 1950, re L.O. Gunderson and W.L. Denman's paper "Polyamide Foam Inhibitors - Mechanism of Foam Inhibition in Steam Generators", *Industrial and Engineering Chemistry* 40 (1948). Includes reprint of paper for ease of reference.
- G.10 Second committee meeting, Doncaster, 17 January 1950. Frank was absent.
- Agenda, papers and minutes of meeting.
- G.11 Report on "The Toton-Brent Experiment" by J.S. Hancock, January 1950. In original folder.
- Hancock was a water softening chemist with London Midland Region. He reported for the committee on the Toton-Brent experiment, designed to find whether a "continuous supply of correctly conditioned water" for locomotives on the Toton-Brent section of track resulted in "clean, corrosion-free locomotive boilers". The experiment suggested it did, but also highlighted the inefficiency of the water softening plants.

- G.12 Committee meetings 3-11, January-August 1950. Frank was absent from all these meetings.
- Minutes only.
- G.13 Letter and Frank's manuscript notes of a meeting with J.S. Hancock, S. Bairstow and T.F.B. Simpson (Committee Chairman), Derby, 24 February 1950.
- Letter to R.V. Jones complaining about BR's "complete lack of acquaintance with research", 4 April 1950.
- G.14 Memorandum on visit to France by representatives of Water Treatment Committee, April 1950. In original stiff cover binding.
- The Committee representatives (not including Frank) visited France to inspect locomotive boilers and the water treatment system on French railways.
- G.15 Twelfth committee meeting, Derby, 4 October 1950. Frank was present.
- Agenda, papers and minutes of meeting. Includes report "Water softening on the London Midland Region" by J.S. Hancock.
- G.16 Correspondence from T.F.B. Simpson re tests on the effect of dirty boilers on fuel consumption, August, October 1950.
- G.17 Thirteenth committee meeting, Derby, 9-10 January 1951. Frank was absent.
- Correspondence, agenda, papers and draft minutes of meeting.
- Fourteenth committee meeting, Derby, 20 February. Frank was present.
- Draft minutes only.

- G.18-G.20 Committee Report, completed February 1951.
- G.18 Frank's manuscript corrections to first draft of Report.
- G.19 Second "Draft Report", December 1950. With Frank's manuscript corrections and related correspondence.
- G.20 Final "Report on Treatment of Water used for Locomotive Purposes", February 1951. Frank's bound copy.
- G.21-G.23 Miscellaneous background material.
- G.21 Chief Mechanical Engineer's Department, London and North Eastern Railway, "Report on Comparative Evaporation Tests on Locomotive Boilers", August 1931. 8pp typescript plus photographs, graphs, table.
- With Frank's manuscript calculations and diagrams found with it.
- G.22 Information on T.I.A. (Traitement Interne Integral Armand) system of water treatment.
- The T.I.A. system was widely used in France and was of much interest to the Committee (see G.14). It combined external treatment of the "feed water" with dosage of water in the tender with a special alkali-tannin solution.
- G.23 Manuscript notes by Frank.
- G.24-G.99 DE BEERS 1949-86
- Frank's association with De Beers, the South African mining company, began in 1949 when, at the suggestion of F.E. (later Sir Francis) Simon, a De Beers subsidiary, Industrial Distributors Ltd., invited Frank to serve as a consultant on diamond research, initially for three years but renewed thereafter. Frank's other formal connections with De Beers were through the Diamond Conferences and the Diamond Research Committee, which the company funded, and through a series of patent cases in the early 1960s in which he gave evidence in his capacity as consultant.

According to Frank's account, given to the 1975 Diamond Dinner (G.95), the Diamond Conferences were initiated by Simon, who persuaded Sir Ernest Oppenheimer, Chairman of De Beers "that at the comparatively small cost of funding an annual conference he could be in touch with a hundred scientists, who would have cost him one or two million a year to put on his payroll." The first was held in 1950.

Shortly after Simon's death in 1956 the Diamond Research Committee was formed, under the chairmanship of the Reading physicist R.W. Ditchburn, both to organise the Diamond Conferences, and to allocate funding from De Beers for diamond research projects in the UK. Frank was a member of the committee from its foundation.

Frank's consultancy with De Beers led to his involvement in a series of cases brought against the American company General Electric's attempt to patent its method of synthesising diamond in South Africa. Frank gave affidavits for the Transvaal and Orange Free State Chamber of Mines who represented De Beers' interests.

In connection with his work for De Beers, whether as a consultant on diamonds or as a member of the Diamond Research Committee, Frank made a number of visits to South Africa.

The material is arranged as follows:

G.24-G.27	Industrial Distributors
G.28-G.55	Diamond Conferences
G.56-G.75	Diamond Research Committee
G.76-G.86	Patent Cases
	With an introductory note
G.87-G.99	Miscellaneous

Industrial Distributors

- G.24 Correspondence with F.E. Simon and Industrial Distributors, 1949-57.

Includes brief exchanges re offer of consultancy and its renewal in 1952; "Memorandum on growth of diamonds", 12pp manuscript, 16 December 1951; letter from Simon, 13 May 1954, re "continuing the contract" in view of Frank's lecture on "Tin whiskers" to the 1953 Diamond Conference (G.29) which some "thought a little remote".

- G.25 Brief correspondence, July 1954, with P. Grodzinski of Industrial Distributors' Diamond Research Department re paper "Über die synthese des Diamanten" by A. Neuhaus.

Includes "original" typescript draft of Neuhaus's paper with Frank's manuscript notes on Grodzinski's translation of Part III of the paper.

G.26 Correspondence, 1957-60.

Includes correspondence re diamonds required for research at Bristol University, 1957-60; typescript record of cable sent to J.F.H. Custers, Director of Research, 24 November 1959, congratulating him on the successful synthesis of diamond; press-cutting recording Frank's condemnation of apartheid in South African universities.

G.27 Visit to South Africa, 1961.

Frank was invited to help Industrial Distributors' Adamant (later Diamond) Research Laboratory, Johannesburg, "start a programme aiming at the production of synthetic diamonds considerably larger than the ones we now make every day".

The invitation mentions the success of General Electric in this field and expresses the hope that Frank's work on diamonds for G.E. will not prevent his assisting Industrial Distributors.

Invitation; memorabilia.

Diamond Conferences

Further material relating to the organisation of the conferences may be found under the Diamond Research Committee, G.56-G.75.

G.28 Oxford, July 1952.

Frank's manuscript notes on proceedings.

G.29 Oxford, 9-11 July 1953. Frank spoke on "An explanation of the formation of tin whiskers" (see G.25).

Correspondence re arrangements; lecture list; manuscript notes on proceedings; manuscript notes on "Whiskers".

G.30 Caius College Cambridge, 1-3 July 1954. Frank spoke on "Necessary conditions for the growth of diamonds".

Provisional programme; manuscript notes on proceedings.

G.31 Oxford, 30 June - 2 July 1955. Frank spoke on "Martensitic transformations".

Provisional lecture list; manuscript notes on proceedings.

- G.32 Reading, 18-19 July 1961. Frank had recently returned from South Africa (G.27) and did not feel able to give a paper.
- Brief correspondence; annotated provisional programme; list of participants.
- G.33 Cambridge, 25-26 June 1962.
- Annotated programme and list of participants.
- Reading, July 1965.
- Includes Frank's after-dinner "words of thanks".
- Cambridge, 10-11 July 1967.
- Lists of participants.
- G.34 Bristol, 8-9 July 1968. Frank helped organise the conference and presented a paper jointly with M. Moore and A.R. Lang on "Simulation of solution forms of diamond".
- Letter re arrangements.
- G.35 Reading, 24-27 September 1969.
- List of participants; letter from E. Gerryts, 19 September, with "Comment on 'Defect in Diamond'" by D.R. Grantham. Before his death Grantham sent Gerryts this "Comment" on a paper delivered by Frank at the 1966 International Industrial Diamond Conference (G.90-G.92), asking that it be submitted to the Reading conference.
- G.36, G.37 Brasenose College Oxford, 12-15 July 1970.
- G.36 Correspondence re Soviet participation; lists of participants and papers; manuscript notes on proceedings etc.
- G.37 Guidebook for "A Kimberlite Exhibition" organised by J.W. Harris and H.J. Milledge.

- G.38 Cambridge, 14-17 July 1971.
Correspondence re arrangements, including correspondence from R.W. Ditchburn re Soviet participation; list of participants; heavily annotated programme; brief manuscript notes.
- G.39 Bristol, 13-15 July 1972. Frank spoke on "Kinematic theory of dissolution shapes".
Correspondence re arrangements; annotated lists of papers.
- G.40 Reading, 15-18 July 1973.
Lists of papers submitted and participants.
- G.41 Oxford, 3-6 July 1974.
Correspondence re Soviet participation; lists of participants.
- G.42 Churchill College Cambridge, 6-9 July 1975.
List of participants; miscellaneous correspondence including letter from the Industrial Diamond Information Bureau inviting Frank to write on the future of diamond research for *Diamond Research*, and typescript draft of Frank's contribution.
- G.43 Kimberlite Symposium, St. John's College Cambridge, 10-11 July 1975. This was held immediately following the Diamond Conference.
Invitation; information; lists of participants; provisional programme.
- G.44 Bristol, 12-14 July 1976.
Includes brief manuscript notes on programme for 1976 and finance for 1977 conference.
- G.45 Reading, 6-9 July 1977.
Information; list of participants; programme; Frank's manuscript notes on proceedings.

- G.46 St. Catharine's College Oxford, 9-12 July 1978.
Letter from R.W. Ditchburn re Soviet participation; programme; list of participants.
- G.47 Newnham College Cambridge, 8-11 July 1979.
Conference information; abstracts; "Diamond: properties and definitions" by J.E. Field compiled for the conference.
- G.48 Kimberlite Symposium II, Cambridge, 11-14 July 1979. This was held immediately following the Diamond Conference.
Brief correspondence arising from a discussion in which Frank participated; "summary" of discussion.
- G.49 Bristol, 7-9 July 1980.
Programme; list of participants.

Reading, 8-11 July 1981.
Brief correspondence only.
- G.50 Oxford, 5-7 July 1982.
Includes annotated programme.
- G.51 Newnham College Cambridge, 6-9 July 1983. Frank led a discussion.
Conference information; abstracts; programme; list of participants.
- G.52 Bristol, 9-11 July 1984. Frank led a discussion.
Annotated programme; list of participants.
- G.53 Reading, 10-13 July 1985. Frank led a discussion.
Programme; list of participants; abstract.

- G.54 Royal Holloway and Bedford New College London, 7-9 July 1986.
Brief correspondence including reference to current unrest in South Africa.
- G.55 Oxford, nd. Frank spoke on "Plastic deformation in diamond".
Lecture list; manuscript and typescript drafts on plastic deformation; manuscript notes on proceedings.

Diamond Research Committee

The material is principally papers for Committee meetings to consider research proposals, half yearly reports on research, and correspondence, chiefly with R.W. Ditchburn, re diamond conferences, research proposals and patenting.

R.W. Ditchburn was chairman of the Committee until July 1982 when he was succeeded by E.W.J. Mitchell.

20 folders.

G.56	1964-66	G.66	1979
G.57	1967-68	G.67	1980
G.58	1969	G.68	1981
G.59	1970-71	G.69	1982
G.60	1972	G.70	1983
G.61	1973	G.71	1984 (1)
G.62	1974	G.72	1984 (2)
G.63	1975	G.73	1985 (1)
G.64	1976-77	G.74	1985 (2)
G.65	1978	G.75	1986

Patent Cases

In February 1955 the American company General Electric (GE) announced it had found a method of synthesising diamonds. This was immediately placed under a US government secrecy order as it was judged to be of strategic significance.

The order was lifted on 8 September 1959 and the next day GE filed five patent applications in South Africa to protect its inventions. Three were opposed by the Transvaal and Orange Free State Chamber of Mines, on behalf of De Beers (3550/59, 3551/59 and 3547/59). A further patent application was made on 7 December (4878/59) and this too was challenged. Frank was asked by the lawyers acting for the Chamber of Mines to provide affidavits on its behalf.

As GE also occasionally employed Frank as a consultant, there was a potential clash of interests. This was resolved by GE providing a contract in which work on diamonds was excluded from its provisions (see G.110). Frank duly testified for the objector.

The basic patent (3550) was for a method of synthesising non-diamond carbon into diamond by subjecting it to a pressure of 80,000-110,000 atmospheres and a temperature of 1400-1800°C in the presence of a metallic solvent or catalyst. The molten metal dissolves the carbon which is distributed through the metal until saturated. Upon cooling the solution becomes super-saturated and carbon is shed as solid crystals - diamonds. The other patents referred to improvements on this process. 3551 related to using an alloy as the catalyst (lowering the temperature and, more importantly, the pressure required for the conversion of carbon to diamond), 3547 to a way of eliminating the need to determine the temperature at which conversion occurs by providing a method of observing changes in electrical resistance, and 4878 to a method of creating better artificial diamonds by arranging the carbon and catalyst in alternate laminae or layers.

Various grounds for objection were raised but only two were used in court, the "obviousness" and the "inutility" of the alleged inventions. The first maintained that no inventive step was required beyond what was common knowledge in the area, the second that within the terms of the patent application the invention would not necessarily work. Frank's affidavits mainly supported the objection of "obviousness" and the related "lack of novelty" charge (which was, however, dropped, partly because as Frank himself stated GE were correct in claiming the natural processes for the formation of diamond were "not assuredly known").

The first judgement, delivered on 30 November 1964 by the Commissioner for Patents Sir John Clayden, dismissed the objections. The chief "inutility" argument, based on whether the GE term "carboneous material" might not also refer to forms of carbon for which the process would be ineffective, was rejected because the objectors could not come up with any reasonable such material for which the process would not work. Frank had in fact argued against another objection on these grounds, which claimed that the patent specification included metals which would not melt at the temperatures specified, and felt that the "inutility" case was rather weak. The "obviousness" case was also dismissed. According to Clayden the "common knowledge in the art at the effective date of the application" did not include the precise forms of the carbon and catalyst to be used in the GE process, or the right pressure and temperature required. He ruled that it was not common knowledge that graphite would be the form of carbon used, and that following K. Lonsdale's analysis of the GE diamonds it would be assumed Nickel (or a Nickel-based substance) must be the catalyst.

Most importantly the judge found that an attempt to create synthetic diamonds by the GE method in September 1959 would have failed because of mistakes in the calculation of pressure. In their work GE had relied upon experiment to determine the pressures and temperatures needed for success, but soon afterwards R. Berman and Sir Francis Simon produced their "curve" which became accepted as the theoretical guide to the correct thermodynamic conditions for diamond synthesis. The accepted Bridgman Electrical Resistance method of calibrating pressure, however, which Clayden ruled was "common

knowledge" in 1959, was faulty. In 1961 it was found to be 30% out at high pressures. Therefore in 1959 anyone following the Berman-Simon curve to reach the right pressure and temperature to create diamonds by the GE method would fail, they would not be calculating pressure accurately.

Frank criticised the judgement noting "The odd outcome is the following: GE placed too much reliance on Bridgman. This is taken as cogent evidence that everyone would place too much reliance on Bridgman ... so that GE succeeds because of this mistake on its part." He felt that there were "good grounds" for challenging this judgement.

The Chamber of Mines went to the Court of Appeal. Here too, on 16 June 1966, the "inutility" arguments were rejected. But that on the grounds of "obviousness" was sustained. J. Galgut presiding found that GE itself had revealed most of the facts behind the processes and the rest were "obvious" to any competent diamond-synthesiser. As Frank had stated in his affidavit, the only novelty with the GE process was its "excellent apparatus" which could sustain the high pressures and temperatures which were commonly known to be required.

According to Galgut Graphite was obviously the most likely form of carbon to be used (being easily obtained in a pure form which could be broken down). Furthermore, it was not likely that Nickel would be thought of as the only catalyst. Frank had argued that it was well-known that a number of molten metals from group VIII of the periodic table (and not just Nickel, which has a high melting point) would "dissolve substantial quantities of carbon in an atomically dispersed form", including iron. Finally he rejected the ruling that the undetected flaw in the Bridgman Electrical Resistance calculation of pressure would have effectively prevented synthesis, pointing out that the alternative (and accurate) Bridgman volume method was well-known, and that using the Berman-Simon curve with the uncorrected electrical resistance calculation of pressure, it was possible to achieve diamond synthesis.

In 1961 GE applied for two more related patents, 2117/61, which was for the "production of electrically conductive diamonds" by adding boron or aluminium to the melt, and 1218/61 referring to the etching of diamond surfaces. Both were contested, Frank producing affidavits to the effect that in both cases the process was obvious and no more than an imitation of known natural occurrences.

The material is chiefly copies of the affidavits and other evidence presented at the hearings, together with copies of the two judgements, correspondence from Spoor & Fisher representing the Chamber of Mines, and manuscript drafts of Frank's affidavits. There are also copies of affidavits presented in respect of a rival De Beers patent application (3974/58) to which GE objected. The applicants claimed that whereas the GE process for synthesising diamond operated, according to their application, by catalytic process, theirs operated purely by a "solvent" process. As it was accepted in the cases brought against GE that, if broadly defined, a "catalyst could also be a solvent", case 3974 was dropped in 1962.

- G.76 Correspondence with Spoor & Fisher and notes re the case, chiefly on diamond synthesis, 1962.
- G.77 Correspondence with Spoor & Fisher, Frank's notes on the case etc., 1963.
- G.78 "Summarised Report on Experimental Work Carried Out at Adamant Research Laboratory in Connection with General Electric Company Affidavits", 12 June 1963, 11pp duplicated typescript and table. With two envelopes of photographs inscribed "Diamonds grown in metal" (9 photographs) and "Diamond dissolution by metals" (7 photographs).
- G.79 Correspondence with Spoor & Fisher 1964. Includes manuscript draft of Frank's letter, dated 19 December, criticising Sir John Clayden's Judgement (G.82).
- G.80 Frank's manuscript draft affidavits.
- G.81 Frank's manuscript draft "Replies to Applicant's evidence".
- G.82 Original Judgement, 30 November 1964.
- G.83 Appeal Court Judgement, 16 June 1966.
- G.84-G.86 Evidence presented.
3 boxes.
- G.84 Box 1 Patent applications, letters of demands and notices of opposition; memorandum on evidence; exhibits.
- G.85 Box 2 Affidavits for 3550/59.
- G.86 Box 3 Affidavits for 3974/58, 3547/59, 3551/59, 4878/59, 1218/61 and 2117/61.

Miscellaneous

- G.87 Visit to South Africa, 1959. Frank was invited to South Africa by the Students' Visiting Lecturers Trust Fund of the University of the Witwatersrand, at the suggestion of F.R.N. Nabarro.
- Invitation; letters from W.F. Cotty of the Diamond Producers Association London Committee introducing Frank to the Secretary and the Chief Diamond Valuator of De Beers.
- G.88 Report by E.W.J. Mitchell on High Pressure Conference, Le Creusot, France, 2-6 August 1965, with reference to the implications for diamond research.
- G.89 Visit to South Africa, August-September 1965. Frank was invited by the Students' Visiting Lecturers Trust Fund Committee of the University of Natal, 12 June 1964. While in South Africa Frank visited the universities of Port Elizabeth and the Witwatersrand and worked at the Diamond Research Laboratory.
- Invitation; correspondence re arrangements.
- G.90-G.92 International Industrial Diamond Conference, Oxford, 19-22 September 1966. Frank spoke on "Defects in diamonds" (*Bibliog.* 91). The conference was sponsored by De Beers.
- G.90 Conference brochure; background information etc.
- G.91 33pp manuscript and 28pp typescript drafts of Frank's contribution; 1p manuscript list of references. D.R. Grantham's comments on Frank's contribution were submitted to the 1969 Diamond Conference. See G.35.
- G.92 Manuscript diagrams of lattices and diamonds found with the preceding.
- G.93 De Beers Industrial Diamond Division One Day Conference on Recent Developments in Production Grinding with Diamond, London, 2 July 1968.
- Invitation only.

- G.94 Correspondence, signed menu from colleagues attending dinner in honour of W.F. Cotty's promotion to Technical and Diamond Consultant with De Beers' Industrial Diamond Division, 17 March 1971. Frank was unable to attend, having to undergo an operation and the letters express the hope that he will make a swift recovery.
- G.95 Diamond Dinner, 21 March 1975.

Invitation; Frank's speech recalling the establishment of the Diamond Conferences and early participants.
- G.96 Visit to South Africa, October-November 1977. Frank was invited by the University of the Witwatersrand in conjunction with De Beers.

Invitation and correspondence re arrangements; programme for visit to Kimberley, 9-10 November.
- G.97 Photocopy of article on natural diamond by D.N. Robinson, annotated by Frank, 2 July 1979.
- G.98 Photograph of "man made platelets in diamonds", signed and dated "Trevor Evans 6/5/80".

Invitation to visit Diamond Research Laboratory in January or February 1987 to discuss the results of a study on the "morphology and growth mechanism" of large synthetic diamonds.
- G.99 Note by Frank beginning "What is the magnitude of the absorption coeff[icient] of Diamond betw[een] 2000A and 3000A", 1p manuscript, nd.

"Cutting action, wear and fracture of rounded diamond", 15pp typescript, nd. (latest bibliographical reference 1966). Author not named.

G.100-G.113 GENERAL ELECTRIC (GE) 1951-62

Frank served as occasional consultant in the Metallurgy and Ceramics Research Department of GE's Research Laboratory, Schenectady, NY, under flexible contracts that allowed him scope to attend conferences and visit colleagues in other research establishments. His 1956 consultancy specified he was an advisor on "physics of solids". Exclusion of consulting about diamonds had been informally agreed from the beginning, but in 1962 in view of the South African patents dispute between GE and de Beers, this exclusion was explicitly written into the contract (see G.76-G.86 and G.110).

"There was no formal end to this consultancy. It was put to me that it would be tactful if I deferred my next summer vacation visit (which I had been making every second year) by a year, by which time the patents dispute between GE and de Beers would doubtless be concluded. However, the dispute dragged on and by the time it was over my principal friends at Schenectady, with whom details of the next visit would have been arranged, had moved elsewhere. I did make several visits of one or two days subsequently, at which I was consulted on various scientific questions (one of which might have led to something patentable, but didn't) but never for long enough to receive payment." (F.C.F., private communication, 9 September 1989).

G.100, G.101 1956 May-September.

During this extensive consultancy with GE Frank attended a number of conferences in North America (see H.26, H.27).

G.100 Copy of consultancy contract; notice of special seminar on "Liquid crystals : (3)" given by Frank, 11 July; brief correspondence re patent for Magnetic Annealing in Rotating Magnetic Field.

G.101 Miscellaneous memorabilia. For photographs of Frank and colleagues at GE, see A.95.

G.102-G.108 1958.

As in 1956 Frank was able to combine a lengthy consultancy with GE with attendance at a number of conferences and seminars in America (see H.29-H.31).

G.102 Brief correspondence; copy of consultancy contract; notices of GE Research Laboratory seminars and colloquia etc. Frank gave seminars on 5 and 11 September on "Kinematic theory of crystal dissolution and growth" and "Coincidence Lattices - sub-boundaries and Kronberg-Wilson relationships".

- G.103 Memorabilia.
- G.104-G.108 Miscellaneous manuscript and typescript drafts and notes by Frank found with material re 1958 consultancy.
- G.104 "Layering in the higher coordination structures", 11pp typescript with manuscript corrections plus figures.
- G.105 "The geometrical basis of structures of intermetallic compounds", 2pp typescript plus figures.
- "Detailed geometry of the four special coordination shells", 5pp manuscript and 3pp typescript drafts.
- G.106 "Some definitions relating to coordination", 5pp manuscript and 2pp typescript drafts.
- "Properties of regular solids", 1p duplicated typescript plus tables.
- G.107, G.108 Manuscript notes and diagrams chiefly re lattices.
- G.109 1960.
- Correspondence from J.H. Hollomon, 1960 re possibility of Frank visiting Schenectady laboratories, etc.
- G.110-G.113 1962.
- G.110 Letter re "Consulting Agreement Between General Electric Company and F.C. Frank", 9 August 1962.
- To avoid a conflict of interests between Frank's consultancies for GE and De Beers it was agreed that the terms of the GE consultancy should exclude diamond research.
- G.111 Includes *Research Laboratory Notes* for 22 August 1962 mentioning Frank's seminar "A commentary on theorems concerning crystal surface energies".

- G.112 Includes press release, 7 September, re "A new 'direct process' for making diamonds".
- According to the press release " ... it has become possible to achieve pressures and temperatures so high that the metal catalyst is no longer needed" to convert non-diamond carbon into diamond.
- G.113 Calculations by Frank found with preceding material. Includes 5pp manuscript calculation of a "Problem: Of random paths which cross a plane, how many do not re-cross it?"
- G.114 IMPERIAL CHEMICAL INDUSTRIES (ICI) 1974-75
- Frank's consultancy with ICI was terminated in July 1975.
- Brief correspondence includes Frank's comments on ICI's "dairy-separator version of the gas centrifuge", 1974.
- G.115-G.122 INTERNATIONAL BUSINESS MACHINES CORPORATION (IBM) 1973-82
- Frank served as occasional consultant to IBM at their Thomas J. Watson Research Center, Yorktown Heights, NY, combining short spells at the Center with visits to colleagues at other research centres, and attendance at conferences, in the US and Canada.
- G.115 1973.
- Invitation to serve as consultant.
- G.116 1977.
- Invitation, 9 December 1976, suggesting Frank combine attendance at the 1977 International Conference on Crystal Growth, Boston, MA, with consultancy work.

- G.117, G.118 1978.
- G.117 Letter re arrangements etc. See also H.116.
- G.118 IBM Thomas J. Watson Research Center Report "The science of crystal growth", an IBM education course. With Frank's annotations and interleaved manuscript notes.
- G.119, G.120 1980 3-7 November.
- Frank was invited to the Watson Research Center on the occasion of his being made a Foreign Associate of the US National Academy of Engineering (see A.27, H.140-H.142).
- G.119 Correspondence re arrangements; contract; notices of Frank's Physics Colloquium "On definitions of supersaturation"; etc.
- G.120 Correspondence and papers re attempt to obtain permanent US residence for Swiss IBM colleague.
- G.121, G.122 1982 24-28 July
- Frank was invited to the Watson Research Center in conjunction with the 1982 Gordon Research Conference (H.150, H.151).
- G.121 Correspondence re arrangements; contract; itinerary; etc.
- G.122 Contents of folder inscribed "Van Vechten". Includes reprints of two articles, 1977 and 1978, by J.A. Van Vechten, a member of the Research Center, with Frank's manuscript annotations and miscellaneous manuscript notes. Found with G.121.
- G.123 PCI DISPLAYS PTE LTD 1981
- Request from the solicitors of PCI to "review the technical arguments concerning the novelty, inventiveness or otherwise of the [Hoffman La] Roche patent" covering "the so-called Schadt-Helfrich twisted nematic liquid crystal display", 2 September. With photocopy of the patent specification.

G.124-G.130 J.A. RADLEY (LABORATORIES) LTD 1960-63
(later J.A. RADLEY RESEARCH INSTITUTE)

The Radley Laboratories were a commercial research company started "to cater for small firms ... who were, individually, not in a position to set up their own laboratories". Frank was initially asked to become a consultant in connection with work being done on metal whiskers and crystal structure in April 1960. He later became a co-opted governor of the Institute.

G.124 Correspondence re consultancy, April 1960; booklet "An introduction to Radley Industrial Research and Development Laboratories".

G.125 Notice of formation of Radley Research Institute 1961; annual reports 1959-60 and 1961-62; Chairman's interim progress report, 6 September 1961; agenda for first AGM of Board of Governors, 10 April 1962.

G.126 Letter to Frank, 23 January 1963, including list of "ideas for research proposals".

G.127-G.130 Radley Laboratories/Research Institute Final Technical Reports:

G.127 "The effect of sugars and other hydroxy compounds as inhibitors of corrosion ... ", 1958.

G.128 "General mechanism of drainage from solid surfaces", 1959.

G.129 "Mechanism of corrosion of copper and copper alloys by ammonia solutions ... ", 1959.

G.130 "Catalysis at semi-conductor surfaces", 1962.

SECTION H

VISITS AND CONFERENCES

H.1-H.169

Not all of Frank's extensive travel and attendance at conferences is documented in this section. Frank attended conferences held by a number of Societies and Organisations, most notably the International Organisation of Crystal Growth (F.116-F.175) and the Pugwash movement (F.205-F.250), and made a number of visits to South Africa in connection with his consultancy with De Beers (G.24-G.99).

The presentation is chronological as far as possible. Material relating to invitations either declined or for which there is no evidence of acceptance is placed at the end of the sequence for each year.

1939

- H.1 ICI (Plastics) Ltd. colloquium, Billingham, Durham, 6 January. Frank spoke on "The high frequency electrical behaviour of plastics and other insulating materials".

Correspondence re arrangements; advance summary of Frank's contribution.

1948

- H.2 Colston Research Society Symposium on Cosmic Radiation, Bristol, 20-24 September.

HMSO diary for 1946 used from the front for Frank's notes on proceedings, including loose manuscript notes. At the back are unrelated notes and calculations.

Brief correspondence re publication of Frank's report on the symposium.

1949

- H.3 British Association for the Advancement of Science Meeting, Newcastle, 31 August - 7 September. Frank spoke on "Recent investigations at Bristol University".

Brief correspondence only.

Invitations for 1949

- H.4 British Rheologists' Club, 26 September.

Société Française de Métallurgie autumn meeting, Paris, 3-8 October.

1950

- H.5 Visit to Paris, January.

Brief correspondence, 1949-50, re visit of Frank and N.F. Mott.

H.6, H.7 Visit to USA, 15 April - 23 June.

Frank was initially invited to present a paper at the Office of Naval Research/Carnegie Institute of Technology Conference on the Fundamentals of the Plastic Deformation of Crystalline Solids (title later changed to Deformation of Metals), Pittsburgh, PA, 19-20 May, where he spoke on "The origin of dislocations". He also attended a conference on recrystallisation at Notre Dame and was invited to visit and speak at other research centres. See H.6 for itinerary.

H.6 Invitations; correspondence re arrangements with colleagues; itinerary for 20 April - 30 May.

H.7 Conference on Recrystallisation, Notre Dame, IN, 1-2 June.
Correspondence; programme; Frank's notes on papers presented.

Invitation for 1951

H.8 Conference on Dielectrics, Liverpool, July.

1953

H.9 Conference on Lattice Defects and the Electrical Resistivity of Metals, Birmingham, 24-25 April.

Programme with Frank's manuscript notes on back.

H.10 Symposium on Crystal Plasticity, 18 May.
Manuscript notes (not in Frank's hand) headed "Dislocation loops crossing a cluster of screw dislocations (at the Symposium on Crystal Plasticity, 5/18, 1953)".

H.11-H.22 Visit to Japan, September-October.

Frank visited Japan for the International Union of Pure and Applied Physics (IUPAP) Conference on Theoretical Physics, Kyoto and Tokyo, September, and its associated symposia and meetings. He chaired a session of the Conference and spoke on "Visual evidence of dislocations" at a pre-conference Symposium on Crystal Plasticity and Deformation, Nikko, 12-13 September. Frank also attended several informal meetings and visited a number of Japanese research centres.

H.11 Correspondence with organisers re arrangements for IUPAP conference; lists of participants; programme.

- H.12 US IUPAP National Committee information notes for the American delegation.
- H.13 Programmes for the Nikko symposium; manuscript and typescript drafts of Frank's contribution.
- H.14 Annotated programme for Informal Meeting on Crystal Dislocation, Research Institute for Iron, Steel and Other Metals, Tohoku University, 29 September, attended by Frank and N.F. Mott. With information on the Research Institute.
- H.15 Frank's manuscript notes on discussion on "Science and Peace". Participants included R.P. Feynman and several Japanese scientists.
- H.16 Material re other meetings and lectures.
- H.17, H.18 Information on Japanese research centres.
2 folders.
- H.19 Photographs (some mounted, probably used by Frank to illustrate his lectures).
- H.20 Invitations and information sent to Conference delegates re "Hiroshima", a Japanese film shown at Tokyo University during the conference.
- H.21, H.22 Miscellaneous memorabilia.
2 folders.
- 1954
- H.23 United Steel Companies Ltd. Conference for University Lecturers and Tutors in Science and Engineering on Iron and Steel Making, Research and Engineering, Sheffield University, 6-11 September.
Programme; lists of participants.

1955

- H.24 S.O. hardback notebook used by Frank for notes on unidentified conference [? on irradiation], July.

Participants include A.H. Cottrell, N.F. Mott, E.W.J. Mitchell, G.F.J. Garlick, H.S.W. Massey, M.H.L. Pryce.

- H.25 International Union of Theoretical and Applied Mechanics Colloquium, San Lorenzo del Escorial, Spain, September.

Signed menu and hotel bill. Not otherwise documented.

1956

- H.26, H.27 Visit to USA and Canada, May-September.

During this period Frank served as consultant to General Electric (GE) at their Research Laboratory Schenectady, NY (see G.100, G.102). Whilst in North America Frank attended a number of conferences including the International Congress on Theoretical Physics, University of Washington, Seattle, 17-21 September.

- H.26 Invitation to Seattle Congress; correspondence with organisers and Frank's manuscript notes re arrangements; list of participants; preliminary programme etc.

- H.27 Material re other engagements fulfilled by Frank.

These included Special Physics Colloquium, Brookhaven National Laboratory, 19 July; Gordon Research Conference on the Chemistry and Physics of Metals, 23-27 July; Canadian Metal Physics Conference, Edmonton, 22-24 August. Frank also appeared in a television programme on Crystals broadcast in San Francisco, 24 September (see E.78).

1957

- H.28 Birmingham University Research colloquium, 16 April. Frank spoke on "Complex alloy structures and the packing of spheres" (see D.44, D.45).

Correspondence re arrangements.

1958

H.29-H.31 Visit to USA.

Frank served as consultant to GE at their Research Laboratory, Schenectady, NY, in the summer of 1958 (see G.102-G.108). Whilst in the US Frank attended international conferences at Rochester and Cooperstown, NY, and was invited to speak at colloquia in Washington, D.C. and at the University of Maryland.

H.29 International Conference on Superconductors, University of Rochester, NY, 18-22 August.

Programme; Frank's manuscript notes.

H.30 International Conference on Crystal Growth, Cooperstown, NY, 27-29 August. Frank gave the Introductory Lecture and papers on "Theory of dissolution shapes and transient growth shapes of crystals" and "Electron microscope observations of moire patterns in single crystals of Polyethylene" (with A.W. Agar and A. Keller).

Programme; list of participants; Frank's manuscript notes; "Extemporaneous comments" by F. Seitz. For photographs of Frank and conference photograph with key, see A.96.

H.31 Invitation to Frank to speak at the Greater Washington Solid State Physics and University of Maryland Physics Department colloquia.

H.32-H.40 "Exposition Universelle et Internationale de Bruxelles".

Contents of envelope so imprinted: duplicated typescript information sheets explaining exhibits displayed at the Exposition. The material is divided into four sections entitled "Atom", "Molecule", "Crystal" and "Living Cell". Most of the information sheets are in English, but a few are in French, German or Dutch.

Frank visited the Exposition with Professor Willi de Keyser, head of the Mineralogy Department of Ghent University, who organised the crystallography exhibits. Frank had considerable research interests in common with the Mineralogy Department at Ghent and had received an honorary degree from the University three years earlier.

H.32, H.33 "Atom" section.

2 folders.

H.34-H.36 "Molecule" section.
3 folders.

H.37, H.38 "Crystal" section.
2 folders.

H.39, H.40 "Living Cell" section.
2 folders.

1961

H.41 High Polymer Research Group Conference on the Relation between Chemical Structure and Physical Properties of Elastomers with Particular Reference to the Fundamental Aspects of the Subject, Moretonhampstead, Devon, 17-21 April.

Programme with list of participants.

H.42 National Research Development Corporation Solid State Sciences Conference on The Mechanical Properties of Solids, Caius College Cambridge, 13-17 July. Frank spoke on "Polymers".

Programme; draft Conference Report; transcript of Frank's contribution.

H.43 Visit to Czechoslovakia, 18 September - 2 October.

Frank was a member of a British Council delegation to Czechoslovakia which visited universities in Prague, Bratislava, Brno and Olomouc.

Correspondence with British Council re arrangements; itineraries; reports on visit for the British Council by delegation members.

1962

H.44

Visit to USA.

Frank again served as consultant to GE at Schenectady in late summer (G.110-G.113). While in the US he attended the American Chemical Society Symposium on Crystallisation of Polymers, Atlantic City, NJ, 10-11 September.

Programme; abstracts; Frank's manuscript notes on proceedings re Atlantic City Symposium.

H.45

International Conference on Lattice Defects, Kyoto, 7-12 September.

Correspondence with organisers and Royal Society re financial arrangements. Frank had initially intended to participate in the conference but later withdrew.

1963

H.46

Conference on High Magnetic Fields, Brasenose College Oxford, 10-11 July.

Programme (with alteration by Frank); abstracts.

H.47, H.48

International Conference on the Science of Superconductivity, Colgate University, Hamilton, NY, 26-29 August.

H.47

Invitation; correspondence re arrangements.

H.48

Conference handbook.

1964

H.49

National Institute for Research in Nuclear Science meeting "to discuss the provision of a UK high flux thermal neutron source", Rutherford High Energy Laboratory, Chilton, Berks., 3 July.

Brief correspondence with Sir John Cockcroft, chairman; programme; background information.

1964-65

H.50-H.52 Visit to USA.

Frank spent nine months in California as Visiting Professor at the University of California's Institute for Geophysics and Planetary Physics, La Jolla, San Diego. In the US he visited colleagues at a number of other research establishments and attended a VESIAC conference on Shallow Seismic Events.

H.50 Correspondence with colleagues re visits; manuscript notes for lecture on "Modes of deformation of solids" to Earth Scientists, 2 March 1965.

H.51 VESIAC Special Advisory Conference on Current Status and Future Prognosis for Understanding the Source Mechanism of Shallow Seismic Events in the 3 to 5 Magnitude Range, La Jolla, 22-24 March. Frank led a discussion on "The physics of earthquake sources".

Correspondence with organisers; programme; abstracts; Frank's introduction to the discussion.

H.52 Miscellaneous background material.

1965

H.53 Centre National de la Recherche Scientifique International Colloquium on Adsorption et Croissance Cristalline, Pont-A-Mousson, Nancy, 6-12 June.

Correspondence with organisers re arrangements; programme; memorabilia.

H.54 British Ceramic Society and Netherlands Ceramic Society 3rd Joint Meeting on Science of Ceramics, Bristol University, 5-8 July.

Invitation; programme (with manuscript calculations on back).

1966

H.55 Upper Mantle Committee Symposium on Non-Elastic Processes in the Mantle, Newcastle-upon-Tyne, 21-25 February 1966 (rearranged from 13-19 October 1965).

Correspondence re arrangements; programmes; draft of Frank's contribution to discussion, etc.

- H.56, H.57 Symposium on areas for further research in polymer technology, Loughborough, 31 March - 2 April.
- H.56 Correspondence with organisers re arrangements; programme; list of participants; abstracts; transcript and "tidy version" of Frank's remarks.
- H.57 Duplicated typescript text of symposium proceedings.
- H.58, H.59 Società Italiana di Fisica meeting on European collaboration in physics, Pisa, 16-17 April.
- H.58 Correspondence re arrangements; programmes; reports of Working Groups. For Frank's report see *Bibliog.* 87 (D.69).
- H.59 Conference handbook.
- H.60 Battelle Institute colloquium on Phase Stability in Metals and Alloys, Geneva and Villars, Switzerland, May. Frank chaired a discussion on Liquids and defect solids.
- Draft of Frank's remarks; for photographs of Frank taken during discussion and group photograph of colloquium see A.96.

1967

- H.61, H.62 NATO Advanced Study Institute on The Application of Modern Physics to the Earth and Planetary Interiors, Newcastle-upon-Tyne, 29 March - 4 April. Frank spoke on "Diamonds and deep fluids in the upper mantle" (*Bibliog.* 99).
- H.61 General information; list of participants; draft of Frank's contribution; correspondence re publication of proceedings.
- H.62 Conference handbook.
- H.63 Royal Astronomical Society discussion on Earthquake Mechanism, London, 28 April. Frank spoke on "Fracture mechanics of the earthquake source".
- Correspondence re arrangements.

H.64 Visit to USA, July-September.

Frank visited the USA as consultant to the Colorado School of Mines, Golden, CO. While in the US Frank visited several research centres including the Institute of Geophysics and Planetary Physics, Los Angeles and the Earthquake Mechanisms Laboratory, San Francisco. He also attended the 16th Annual Denver X-ray Conference on Applications of X-ray Analysis.

Correspondence and manuscript notes re arrangements; itinerary; programme for Denver conference.

Invitation for 1967

H.65 Invitation to spend a school year at Northwestern University, IL.

1968

H.66 Official Founding Ceremony of the European Physical Society, Geneva, 26 September.

Correspondence re arrangements. Frank combined a holiday in Czechoslovakia, Austria and northern Italy with attendance at the Ceremony. He also briefly attended the Trezzano course on ceramic science and technology (E.21-E.27).

1969

H.67-H.71 Conference on Industry and the Science Graduate, Bristol, 25-27 March.

The conference was proposed by Frank and organised with the Department of Extra-Mural Studies. Frank was a joint chairman and spoke on "What industry desires from the universities".

H.67 Correspondence with possible participants, 1968.

H.68 Correspondence with G. Cunliffe, Director of Extra-Mural Department, 1968-69.

H.69 Draft programme and conference handbook.

H.70 Correspondence re publication of proceedings. Includes extensively corrected draft of C.F. Powell's summing-up.

- H.71 Conference Report.
- H.72 European Physical Society Inaugural Conference on The Growth Points of Physics, Florence, 8-12 April.

Notice; addendum to list of participants; letter from *Czechoslovak Journal of Physics* re interview during the conference.
- H.73 Société Française de Physique Colloquium on Liquid Crystals, Montpellier, 5-7 June.

Provisional programme annotated by Frank with train times between Paris and Montpellier.
- H.74-H.76 International Union of Pure and Applied Chemistry Microsymposium on Rheology of Polymer Solids and Concentrated Solutions, Prague, 1-4 September. Frank chaired a session.
- H.74 Symposium handbook.
- H.75 Information re Czechoslovak Academy of Sciences Institute of Macromolecular Chemistry.
- H.76 Miscellaneous memorabilia.
- H.77 Symposium on the Hydrology of Glaciers, Cambridge, 7-13 September. Frank spoke on "The hydrology of the intergranular veins in a temperate glacier" (with J.F. Nye).

Letter from organisers; photocopy of Frank and Nye's paper; transcript of Frank's contribution to the general discussion.

Invitations for 1969

- H.78 Conference on The Chemistry of Extended Defects in Non-Metallic Solids, Phoenix, AZ, 20-25 April.
- Conference on Fundamental Aspects of Dislocation Theory, Spring 1967 (subsequently rearranged for 28 April - 2 May 1969).
- International Conference on Growth and Characterization of Electronic Materials, Chania, Crete, 1-14 June.
- Gordon Conference on Physical Metallurgy, Seattle, WA, 7-11 July.
- International Conference on Quantitative Relations between Properties and Microstructure, Haifa, Israel, 27 July - 1 August.
- AEI Scientific Apparatus Ltd. Symposium on New Techniques in Materials Analysis, National Physical Laboratory, Teddington, 1 October.

1970

- H.79, H.80 British Polymer Physics Group Conference on Polymer Chain Flexibility, Colchester, 7-9 January.
- H.79 Programmes; list of participants; information; correspondence re Soviet participation.
- H.80 Abstracts, some annotated by Frank; Frank's manuscript notes on proceedings.
- H.81 High Polymer Research Group Conference on Relaxation Phenomena in Polymers, Moretonhampstead, Devon, 4-8 May.
- Invitation with letter of acceptance; programme; information.
- H.82-H.85 Visit to USA and Canada, August-September.
- Frank was invited to attend the Gordon Research Conference on Physical Metallurgy, Tilton, NH, 24-28 August. In advance of the conference he visited Bell Telephone Laboratories at Murray Hill, NJ and GE's laboratory at Schenectady, and was invited to IBM's Thomas J. Watson Research Center.
- Following the conference Frank spent a week at the Institute for Materials Research, McMaster University, Hamilton, Ontario as Visiting Lecturer.
- H.82 Itineraries; lists of addresses.

- H.83 Correspondence re arrangements; programmes; list of participants etc. for Gordon conference. Frank spoke on "The Earth - the largest accessible specimen for the solid-state physicist".
- H.84 Correspondence with colleagues at other US research centres.
- H.85 Correspondence with colleagues at McMaster University re Visiting Lectureship; schedule; notice of Frank's lectures "The mechanics of the Earth's crust" and "Processes for aligning polymer molecules".

Invitations for 1970

- H.86 Conference on the Yield Deformation and Fracture of Polymers, Churchill College Cambridge, March/April.
- NATO Advanced Study Institute on the Moon and Planets, Newcastle-upon-Tyne, 9-16 April.
- Conference on Law, Science and Politics : Water Pollution and its Effects considered as a World Problem, Aberystwyth, 11-12 July.
- International Conference on the Science and Technology of Iron and Steel, Tokyo, 7-11 September.

1971

- H.87 Colloquium on Liquid Crystals, Pont-à-Mousson, Nancy, 27 June - 3 July. Frank chaired the first session.
- Correspondence with organisers; programmes; lists of participants; Frank's manuscript notes on proceedings.
- H.88 International Symposium on X-ray Topography, Bristol, 29 September - 1 October. Frank delivered the Opening Address.
- Information; draft of Address.

Invitations for 1971

- H.89 Institute of Science Technology meetings, Bristol, April-May.
- Society of Metals Science Japan, International Conference on
 the Mechanical Behaviour of Materials, Kyoto, 15-20 August.
- Exeter University discussion meeting on Indentation Hardness
 of Solids, 23-24 September.

1972

- H.90-H.94 Europhysics Conference on Disclinations, Aussois, France, 21-
 23 June. Frank was joint organiser with M. Kléman and chaired
 the first session.
- H.90-H.92 Correspondence with Kléman and possible participants, and with
 institutions and companies re funding, 1971-72.
- 3 folders.
- H.93 Programme; list of participants; disclination bibliographies;
 Frank's manuscript notes.
- H.94 Abstracts.

Invitations for 1972

- H.95 Gordon Research Conference on Polymer Plastics, Andover, NH,
 26-30 June.
- [Soviet] All-Union Conference on Crystal Growth, Tsakhkadzor,
 Armenia, 16-23 September.

1973

- H.96 Plastics Institute 2nd International Conference on Yield,
 Deformation and Fracture of Polymers, Churchill College
 Cambridge, 26-29 March.
- Press notice; invitations to sum up proceedings. The notice
 is annotated by Frank "I want to go. I don't expect to offer
 a paper".

Invitations for 1973

- H.97 Israel Association of Growth of Crystals and Thin Films 4th Annual Meeting, Bar Ilan University, 4 January.
- International Summer School on Point Defects and their Interaction with the other kind of Lattice Imperfections, Zakopane, Poland, 18-30 June.
- 1st European Crystallographic Meeting, Bordeaux, 5-8 September.

1974

- H.98, H.99 Symposium on Dissociation of Dislocations and Associated Two-dimensional Defects, with emphasis on their effects on Mechanical Properties, Beaune, France, 9-12 September. Frank was a member of the Advisory Committee.
- H.98 Correspondence with organisers; information circular; list of participants.
- H.99 Abstracts.

1975

- H.100 International Union of Geodesy and Geophysics 16th General Assembly, Grenoble, 25 August - 6 September. Frank delivered a review paper on "Snow Crystals" to the International Symposium on Snow and Ice Crystals held under the auspices of the General Assembly.
- Circulars; abstract of Frank's contribution.
- H.101-H.105 NATO Advanced Study Institute on Surface Effects in Crystal Plasticity, Hohegeiss, FRG, 5-14 September. Frank delivered the concluding Summary Lecture (*Bibliog.* 133).
- H.101 Invitation; correspondence re arrangements.
- H.102 Information; programme; list of participants.
- H.103 Abstracts.

H.104 A4 notepad used by Frank for notes on proceedings.

H.105 Manuscript and typescript drafts of Frank's lecture.

Invitations for 1975

H.106 2nd Liquid Crystal Forum, Leeds, 5-6 April.

L'Association Bourguignonne des Sociétés Savantes annual conference, Beaune, France, 25-27 May.

Institution of Metallurgists autumn review course on Innovation Management in Metallurgy, Bristol, 31 October - 2 November.

European Conference on Physics of Smectics and their Applications, Les Arcs, France, 15-18 December.

1976

H.107 Royal Astronomical Society Discussion Meeting on Solid State Physics and Geophysics, London, 12 November. Frank spoke "On the significance of Grüneisen's Gamma". See D.122, D.123.

Programme and brief correspondence.

Invitation for 1976

H.108 First European Conference on Crystal Growth, Zürich, 12-18 September.

1977

H.109 Visit to Paris, 15 February - 15 July.

In 1975 J. Friedel invited Frank to spend a few months after his retirement working at the Laboratoire de Physique des Solides, Université de Paris-Sud. Whilst in France Frank gave lectures to Association Française de Cristallographie ("Consequences of pressure changes in the interior of the Earth caused by differentiation of the upper mantle"), Paris, 4 May; Centre de Recherches sur les Macromolécules, Strasbourg, 24 May; Laboratoire de Physique des Solides ("Some examples of new phase states: domains in magnetic bubble plates and nematic thin films"), 2 June.

Correspondence and papers re visit; material re lectures.

- H.110 Royal Astronomical Society UK Geophysical Assembly, Edinburgh, 12-15 April.
- Advance notices; copy of registration form filled in by Frank "If in UK I would wish to attend".
- H.111 University of Newcastle-upon-Tyne Geophysics Colloquium, 22 June. Frank spoke on coupling between mantle and core.
- Brief correspondence only. Frank was visiting Newcastle as External Examiner (K.11-K.17).
- H.112, H.113 6th Europhysics Conference on Macromolecular Physics: Phase Transitions in Bulk Polymers, Varna, Bulgaria, 26-29 September. Frank was on the Scientific Committee and spoke on "Phase transitions".
- H.112 Invitation; correspondence with organisers; draft of Frank's paper "Corrected: as delivered Varna 26 Sept. 1977"; related correspondence.
- H.113 Conference handbook.

Invitations for 1977

- H.114 Dielectrics Society meeting on Anisotropic Dielectrics, Cambridge, 29-31 March.
- Symposium on Crystallinity Control and Polymer Mechanics, Chicago, 28 August - 2 September.
- International Glaciological Society symposium on the Physics and Chemistry of Ice, Cambridge, 11-16 September.
- 5th [Soviet] All-Union Meeting on Crystal Growth, Tbilisi, 16-20 September.
- Meeting on physical aspects of polymer science, Lyons, 27-28 October.
- International Conference on Metaphor, Melbourne, 15-19 December.

1978

- H.115 7th International Liquid Crystal Congress, Bordeaux, 3-7 July. Frank was on the Scientific Committee of the Congress.

Brief correspondence re meetings of the Scientific Committee.

- H.116 Visit to USA, July-August.

Frank was invited to IBM's Thomas J. Watson Research Center, NJ, for consultancy work (see G.117, G.118). While in the US he attended the 4th American Conference on Crystal Growth, Gaithersburg, MD, 16-20 July to receive the first Crystal Growth Award of the American Association for Crystal Growth.

Annotated conference brochure; press release announcing the award; brief correspondence from American colleagues.

- H.117 8th Europhysics Conference on Macromolecular Physics: Structural Aspects common to Synthetic and Biological Macromolecules (including methods of examination), Bristol, 19-22 September.

Information; programme; booking form "sent 6/1/78".

- H.118 Sektion für Kristallwachstum der Schweizer Gesellschaft für Kristallographie meeting, Brig, Switzerland, 5-8 October. Frank spoke on "Theory of the growth of snow crystals".

Correspondence and notes re arrangements; programme; unidentified photographs and graphs. For photographs of Frank taken during meeting see A.97.

Invitations for 1978

- H.119 Conference on Physics and Applications of Smectic and Lyotropic Liquid Crystals, Madonna di Campiglio, Italy, 9-13 January.

NATO Advanced Study Institute on the Mechanism of Continental Drift and Plate Tectonics, Newcastle-upon-Tyne, 29 March - 7 April.

1979

- H.120 Gordon Research Conference on Crystal Growth, Santa Barbara, CA, 15-19 January. Frank chaired the guest presentation.
- Invitation; correspondence with organisers and colleagues; programme; list of participants; draft of "Introductory remarks for evening session ... in particular, introducing Dr. Mandell"; manuscript notes etc.
- H.121 NATO Advanced Study Institute on Mechanism of Continental Drift and Plate Tectonics, Newcastle-upon-Tyne, 27 March - 10 April. Frank spoke on "The effect of anisotropy on conduction in the mantle".
- Preliminary programme; brief correspondence re publication of proceedings; draft of Frank's paper; manuscript notes and calculations.
- H.122 Royal Astronomical Society meeting, University College Durham, 10-11 April.
- Programme and menu only. Not otherwise documented.
- H.123 2nd European Conference on Crystal Growth, Lancaster, 10-15 September.
- Initial invitation, annotated "Answered 'Yes'"; invitation to be Guest of Honour and to chair a session.
- H.124 Seminar, Institut de Physique du Globe, Paris, 8 November.
- Letter and telegrams re arrangements; letter arising.

1979-80

H.125-H.138 Visit to India, December-February.

The Indian Academy of Sciences originally invited Frank to India as Raman Visiting Professor for 1978 when Dorothy Hodgkin, who had declined the Academy's 1977 invitation, was thought to be again unavailable. Subsequently Hodgkin indicated her willingness to visit India and Frank's visit was postponed for a year.

Although as Visiting Professor he was based at the Raman Research Institute, Bangalore, Frank was able to visit Indian research centres and colleagues in Madras, Kalpakkam, Delhi, New Delhi, Kanpur and Mysore. Frank also attended a liquid crystals conference arranged to coincide with his arrival at which he gave the opening lecture.

H.125 Correspondence and Frank's notes re arrangements for visit (including postponement), 1978-79.

H.126, H.127 International Conference on Liquid Crystals, Raman Research Institute, 3-8 December. Frank spoke on "What is the director of a liquid crystal?"

H.126 Correspondence with S. Chandrasekhar re arrangements; copy of Frank's contribution; copy of paper by W. Helfrich delivered at the conference with letter from Frank suggesting amendments.

H.127 Conference handbook.

H.128 Raman Research Institute, Bangalore.

Information on Institute activities.

H.129 Indian Institute of Science, Bangalore.

Brief correspondence re visit to Physics Department; Frank's criticisms of an article by Institute members, with their rebuttals; material re total solar eclipse, 16 February, including accounts by Frank and his wife; invitation to the Inauguration of the International Winter School on Crystallographic Computing by Sir John Kendrew.

H.130 Madras, 9-11 January.

Frank visited the Reactor Research Centre, Kalpakkam, where he gave a seminar on "Personal reminiscences of the history of crystal defects", the British Centre where he spoke on "Prince Rupert's Drops", and the Institute of Mathematical Sciences.

Brief correspondence; notices for Frank's talks.

H.131 National Physical Laboratory, New Delhi, 13-20 January.

Frank delivered the 14th Krishnan Memorial Lecture on "Interaction between scientific disciplines: can study of liquid crystals teach anything of importance for Geophysics?"

Correspondence re lecture; manuscript and typescript drafts of lecture with calculations and lists of references found with them.

H.132 Indian Institute of Technology, Kanpur, 20-27 January.

Frank spoke at a colloquium on "Consequences of pressure change in Earth's interior resulting from the differentiation of the Upper Mantle" and gave an Institute Lecture on "Prince Rupert's Drops: a long chapter in the history of materials science".

Correspondence re arrangements; programme for Frank's visit.

H.133 Solid-State Physics Laboratory, Delhi, January.

Frank offered to speak on "Recollections of the history of crystal defect studies".

Brief correspondence only.

H.134 Invitations to visit Physical Research Laboratory, Ahmedabad and the Physical Society, Sir Theagaraya College, Madras.

H.135 Photographs and slides of the charnockite margins at Kabbaldurga, visited 25 February (F.C.F., private communication, 9 September 1989).

H.136-H.138 Miscellaneous memorabilia.

3 folders.

1980

- H.139 NATO Advanced Study Institute on Physics of Defects, Les Houches, France, 28 July - 30 August. Frank gave a short course on the history of defects and organised an informal session on smectics.

Correspondence with organisers re arrangements; programmes; background material; manuscript notes and figures.

- H.140-H.142 Visit to USA, 17 October - 15 November.

Frank was initially invited to attend the Annual Meeting of the US National Academy of Engineering to receive formal recognition as a Foreign Associate Member (A.27, F.194).

In the US Frank also served as consultant for IBM at the Thomas J. Watson Research Center, Yorktown Heights, NY (see G.119, G.120) and visited research centres in New York, Massachusetts and Colorado.

- H.140 Frank's manuscript notes re arrangements, including itineraries.

- H.141 National Academy of Engineering 16th Annual Meeting, Washington, DC, 29-30 October.

Correspondence re arrangements; programme, etc.

- H.142 Correspondence with colleagues re visits to National Bureau of Standards, Washington, DC, 31 October; National Center for Weather Research, Boulder, CO, 8-12 November; Harvard University, 12-15 November. At each Frank spoke on "Definitions of supersaturation".

Invitations for 1980

- H.143 Reading University Physics Department colloquium, February.

Post Office Research Centre, Martlesham Heath, Ipswich, April or May.

Gordon Research Conference on Crystal Growth, Holderness, NH, 14-18 July.

4th International Conference on Magnetic Bubbles, Tokyo, 24-27 September.

1981

- H.144 United Nations Association seminar on the need for disarmament, Bristol, 17 October. Frank was chairman.

Brief correspondence re arrangements.

Invitations for 1981

- H.145 Workshop on Nucleation, Les Houches, France, 18-28 February.

Conference on High Temperature Plasticity, Les Houches, 19-27 March.

NATO Advanced Study Institute on Early Evolution of the Planets and their Atmospheres, Newcastle-upon-Tyne, 23 March - 3 April.

Gordon Conference on Liquid Crystals, New London, NH, 6-10 July.

International Association of Seismology and Physics of the Earth's Interior symposium on the Properties of Materials at High Pressures and Temperatures, London, Ontario, July.

1982

- H.146, H.147 2nd General Conference of the Condensed Matter Division of the European Physical Society, Manchester, 22-25 March. Frank spoke at the conference dinner.

- H.146 Invitation; programme; list of participants; general information.

- H.147 Correspondence re publication of Frank's contribution in *Physica Scripta* including proof with Frank's corrections. Not listed in *Bibliog*.

- H.148, H.149 Visit to Spain 13 April - 3 May.

Frank visited Spain at the invitation of the Instituto di Fisica del Estado Solido of the Autonomous University of Madrid, supported by the Royal Society European Programme. He also visited the Complutense University Madrid, the Universities of Seville and Saragossa, and the University of the Basque Countries, Bilbao.

- H.148 Invitation; correspondence re arrangements; autobiographical note by Frank introducing a paper on "Crystal growth without dislocations"; itineraries.

H.149 Frank's "Report on an R.S.E.P. visit to Spain" and correspondence arising from the visit.

H.150, H.151 Visit to USA, July.

Frank attended a Gordon Research Conference and served as a consultant for IBM (G.121, G.122). He also visited friends in Vermont.

H.150 Gordon Research Conference on Crystal Growth, Plymouth, NH, 12-16 July. Frank spoke on "Crystal growth without dislocations".

Correspondence re arrangements; programme; list of participants; background information. For group photograph of participants with key, see A.97.

H.151 Correspondence with H. Brooks, Bread Loaf, VT, re visit, 7-11 July.

Invitation for 1982

H.152 Lecture course on Polymer Science, University of Massachusetts.

1983

H.153 Cambridge University Department of Metallurgy and Materials Science colloquium, 28 February.

Brief correspondence re arrangements.

H.154 Maison Française d'Oxford Colloquium on Technical Terms in French and English, 28-29 March.

Correspondence re arrangements; programme; background information.

Invitations for 1983

H.155 Workshop on Clays and the Origin of Life, Glasgow, 18-24 July.

6th International Summer Institute in Surface Science, University of Wisconsin-Milwaukee, 22-26 August.

2nd International Seminar on the Living State, New Delhi, November.

1984

- H.156-H.158 Eshelby Memorial Symposium on Fundamentals of Deformation and Fracture, Sheffield, 2-5 April. Frank was a General Consultant to the Symposium's Advisory Board.

Correspondence, and material sent to Frank as Consultant (programme, abstracts etc.).

3 folders.

- H.159 10th International Liquid Crystal Conference, York, 15-21 July. Frank gave the Introduction.

Draft of first paragraphs of the Introduction; extensively annotated reprint of Frank's "Introductory remarks" made at a 1983 Royal Society meeting on Liquid Crystals (not otherwise documented); International Liquid Crystal Song.

- H.160 European Workshop on NDE of Polymers and Polymer Matrix Composites, Termas de Vimeiro, Portugal, 4-5 September. Frank spoke on "Orientation mapping", *Bibliog.* 142.

Correspondence re arrangements; programme; list of participants; list of references from C. Upstill "for the atmospheric optics we were discussing in Portugal".

Invitation for 1984

- H.161 Workshop on Colloidal Crystals, Les Houches, France, 13-24 February.

1985

- H.162 International Discussion Meeting on Polymer Science and Technology, Rolduc Abbey, Limburg, Holland, 14-18 April. Frank was a member of the Meeting's Advisory Committee.

Correspondence from A. Keller and organisers.

- H.163 Visit to Paris, 27-30 June.

Itinerary only.

- H.164 Symposium in Honour of David Turnbull on Phase Transitions in Condensed Systems - Experiments and Theory, Boston, MA, 5-6 December. Frank was co-chairman of the session on Crystal growth and solid state transitions.

Invitation; correspondence re arrangements; programme; abstracts.

Invitation for 1985

- H.165 Indian Academy of Sciences Golden Jubilee Meeting, Bangalore, 6-8 February.

1986

- H.166 Visit to Canada, 6-23 August.

Travel documents only.

Invitation for 1986

- H.167 4th Hungarian Conference on Crystal Growth/1st International Symposium on Shaped Crystal Growth.

1987

- H.168 International Conference to celebrate the 40th Anniversary of the Discovery of the Pion, Bristol, 22-24 July. Frank participated in a Round Table Discussion with H. Fröhlich, C.M.G. Lattes, B. Marshak and others.

Invitation; poster; preliminary programme.

Invitations for 1987

- H.169 Gordon Research Conference on Liquid Crystals, Wolfeboro, NH, 22-26 June.

International Workshop on Quasicrystals, Peking, 30 August - 5 September.

SECTION J

CORRESPONDENCE

J.1-J.266

J.1-J.228

GENERAL SCIENTIFIC CORRESPONDENCE

Correspondence with individuals. In alphabetical order with an indication of information of particular biographical, historical or scientific interest.

J.229-J.266

SHORTER SCIENTIFIC CORRESPONDENCE

In chronological order.

GENERAL SCIENTIFIC CORRESPONDENCE

- J.1, J.2 Ashbee, K.H.G. 1971-84
- Ashbee was a colleague in the Bristol Physics Department. He and Frank were jointly responsible for the invention of the "nitinol" heat engine. The material in J.2 concerns the invention and patenting of this device. For photograph of Frank and Ashbee with their engine see A.97.
- J.1 1971-84.
- J.2 1975-83.
- J.3 Atkinson, R.H. 1969-71
- Slip traces in α -brass.
- J.4 Bartley, D.L. 1976-77
- Chiefly re Bartley's paper on "Reconstructed ledges and roughening transition at ice-vapor surfaces".
- J.5-J.7 Bassett, D.C. 1960-83
- Bassett was a Courtauld Scholar in the Bristol Physics Department 1960-61 and held a postdoctoral research post 1961-62.
- Research, appointments.
- J.5 1960, 1963, 1970.
- J.6 1975, 1976.
- J.7 1981-83.
- J.8 Beaumont, P.W.R. 1971, 1973
- J.9 Beevers, J.A. 1973
- Models of snow crystals.

J.10	Bilby, B.A.	1955, 1957, 1982
	1982 correspondence is re J.D. Eshelby Memorial Fund and Bilby's Royal Society memoir of Eshelby.	
J.11	Blackman, M.	1975, 1976, 1983
J.12-J.14	Braun, E.	?1984
	"First draft" of Braun's chapter "Mechanical properties of solids" sent to Frank for comments.	
	3 folders.	
J.15	Buckingham, A.D.	1976-78
	Isotropic segregation effects.	
J.16, J.17	Bunn, C.W.	1961
	Draft of Bunn's paper on melting points sent to Frank for comments.	
	2 folders.	
J.18	Burch, C.R.	1960-83, nd.
J.19-J.21	Cabrera, N.	1970-82
J.19	1970-71.	Proposed visit to UK.
J.20	1974-76.	Proposed visit to UK.
J.21	1981-82. "Celebration" of 1951 paper by Frank, Cabrera and W.K. Burton "The growth of crystals and the equilibrium structure of their surfaces" (<i>Bibliog.</i> 30) during British Association of Crystal Growth meeting, September 1981.	

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|-----------|--|---|
| J.22 | Cahn, J.W. | 1982-85 |
| | 1982 correspondence is re Cahn's paper "Transitions and phase equilibria among grain boundary structures". | |
| J.23 | Candler, C. | 1952-53 |
| | Spectrographic analysis of diamond dust. | |
| J.24 | Chandrasekhar, S. | 1981, 1983 |
| | Visits to Bristol. | |
| J.25-J.27 | Cherian, K.A. | 1977-85 |
| J.25 | 1977-79. | Chiefly re overgrowths on diamond. |
| J.26 | 1980. | Metastable growth of diamond at low pressure. |
| J.27 | 1981, 1985. | 1981 material is re Cherian's paper "Crystallization of diamond at atmospheric pressure". |
| J.28-J.30 | Cladis, P.E. | 1974-83 |
| J.28 | 1974, 1976. | |
| J.29 | 1981-82. | Chiefly re cholesteric blue phases. |
| J.30 | 1983. | |
| J.31 | Davies, M. | 1983-84 |
| | Chiefly re Davies's tribute to P. Debye published in <i>Phys. Bull.</i> 35 (1984). | |
| J.32 | Decker, P. | 1973 |
| | Crystal growth. | |

- J.33 De Gennes, P.G. 1972-77
- 1977 material is letter to Frank from De Gennes entitled "Difference between random walk probabilities and statistical weights for ideal chains near a wall", with drafts of Frank's reply and manuscript notes and calculations.
- J.34 Dew-Hughes, D. 1963
- Visit to Bristol to discuss superconductivity.
- J.35, J.36 DiMarzio, E.A. 1979
- 2 folders.
- J.37 Domb, C. 1975, 1977
- 1975 material is re paper "Cluster shapes in lattice gases and percolation" by Domb et al.
- J.38 re Eades, J.A. 1973
- J.39 Eisner, E. 1967
- J.40-J.44 Elton, Margaret Ann, Lady, and others 1972-76
- Correspondence and papers re the future of the Sir Arthur Elton Collection of historical material on the Industrial Revolution. After Sir Arthur Elton's death in 1973 the Treasury accepted the Collection in lieu of death duties. It is now held by the Ironbridge Gorge Museum.
- J.40 1972, 1973.
- J.41 1974, 1975.
- J.42 1976.
- J.43 Obituaries 1973.
- J.44 Background material.

- J.45-J.49 Eshelby, J.D. 1960-79, nd.
- J.45 1960. Comments on paper by J.P. Hirth and J. Lothe (*Phys. Rev.* 115).
- J.46 1965, 1966.
- J.47 1968.
- J.48 1970-79.
- J.49 Nd.
- J.50, J.51 Evans, T. 1962-81
- Evans studied for his B.Sc. and Ph.D. at Bristol University.
- J.50 1962, 1975.
- J.51 1981. Includes Frank's comments on Evans and Z. Qi's paper "The kinetics of the aggregation of nitrogen atoms in diamond".
- J.52 Evison, F.F. 1965-66
- Earthquake sources.
- J.53-J.55 Fisher, J.C. 1960-82
- J.53 1960-73. Includes calculation of relative fuel consumption per passenger-mile of Concorde and the Queen Mary.
- J.54 1975-76. Includes correspondence re Fisher's paper "Elementary particle model based on a non-linear 8-component Fermion field.
- J.55 1980-82.
- J.56 Flory, P.J. 1962
- re Flory's paper "On the morphology of crystalline state in polymers".

- J.57-J.59 Forty, A.J. 1953-83
- Forty was Frank's first research student at Bristol.
- J.57 1953. Includes draft of Forty's paper "Some evidence for the existence of dislocations in crystals" with Frank's comments.
- J.58 1964-65.
- J.59 1982-83.
-
- J.60 Freeman, G.P. 1952
- Slip-bands in diamond.
-
- J.61-J.64 Friedel, J. 1972-80
- J.61 1972-75, 1980. 1975 correspondence is re surface diffusion on ice.
- J.62-J.64 1977. Drafts of papers on dislocations by Friedel with comments by Frank and M. Kléman. 3 folders.
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- J.65 Geach, G.A. 1949
- Furrow structure on aluminium.
-
- J.66 Gibbs, D.F. 1973-81
- 1980-81 correspondence is re Physics Teachers' Forum.
-
- J.67, J.68 Giess, E.A. 1980-83
- J.67 1980-81. 1981 correspondence is re paper by Giess et al "Gadolinium gallium garnet liquid phase epitaxy and the physical chemistry of garnet molten solutions".
- J.68 1982-83. Chiefly re paper by K. Watanabe and Giess.

J.69 Goulty, N.R. 1975, 1977

Chiefly re Goulty and R. Gilman's paper "Repeated creep events on the San Andreas fault near Parkfield, California recorded by a strainmeter array".

J.70 Gray, D.G. 1976

Hydroxypropyl cellulose aqueous mesophase.

J.71 Griffin, G.J.L. 1970

Patents law, motion of ellipsoidal particles in viscous fluid.

J.72 Hallett, J. 1975, 1980

J.73 Hart, M. 1968-84

J.74-J.84 Hesketh, R.V. 1966-83

Hesketh worked at the CEGB's Berkeley Nuclear Laboratories until 1983. He was Visiting Lecturer in Bristol Physics Department 1966-70. Most of the correspondence 1969-77 concerns Hesketh's study of thermodynamics and in particular his claim that he had shown "we can link thermodynamic equilibrium rigorously to the linear region of disequilibrium, and this in turn quantitatively to the non-linear region of disequilibrium".

J.74	1966-69	J.80	1974 (2)
J.75	1970	J.81	1975
J.76	1971 (1)	J.82	1976 (1)
J.77	1971 (2)	J.83	1976 (2), 1977
J.78	1973	J.84	1979, 1981, 1983
J.79	1974 (1)		

J.85 Hodgkin, D.M.C. 1958, 1976

1976 correspondence is re the "Merton Calculators".

- J.86-J.88 Hoffman, J.D. 1959-86
- J.86 1959, 1960, 1962. Polymer crystals, spherulitic growth.
- J.87 1975, 1976, 1979. 1979 correspondence is re fibrils formed by flow-induced crystallisation.
- J.88 1981-86.
- J.89 Holland, W.P. 1980, 1984
- 1984 correspondence is re "eutectic" phase in liquid (or "fluid") crystals.
- J.90-J.92 Holt, D.B. 1965-80
- J.90 1965, 1968. 1968 material is draft of Holt's paper "Antiphase boundaries in semiconducting compounds" with Frank's comments.
- J.91 1974-75.
- J.92 1980. Draft of Holt's paper "Polarity reversal and symmetry in the sphalerite structure" with Frank's comments.
- J.93 Hoyle, F. 1947
- Hydrogen-helium ratio in stars.
- J.94 James, A.N. 1977-79
- Crystal growth pressures.
- J.95-J.122 Jones, R.V. 1949-84
- Jones was a contemporary of Frank's at Oxford, graduating in 1932. They became close friends as postgraduates while Jones was studying infra-red radiation.
- At the outbreak of war Jones was working in scientific intelligence for the Air Ministry. Frank joined his team, at Jones's request, in November 1940. The wartime activities of Jones and his colleagues are documented in Jones's book *Most Secret War* (1978).
- After the war Jones was appointed Professor of Natural Philosophy at Aberdeen University.
- The material is scientific and non-scientific correspondence and drafts sent to Frank for comment.

- J.95 1949-51, 1956, 1957. 1949 correspondence is chiefly re lithium fluoride crystals.
- J.96 1960-64. 1960 correspondence is chiefly re proposed crystal growth conference. 1961 material is re Jones's articles in *The Times* on "Scientists at War".
- J.97 1968-70.
- J.98 1971. Includes copies of Jones's correspondence with R.E. Peierls re momentum.
- J.99 1972.
- J.100 1973. Chiefly re Royal Society meeting on the effect of the world wars on British science.
- J.101 1974 February, May.
- J.102 1974 June-December. Includes copy of Jones's "Epilogue" to Royal Society meeting on science and the world wars (J.100).
- J.103 1975.
- J.104 1976. Includes letter of 8 October enclosing Jones's first draft of *Most Secret War* sent to Frank for comments, and Frank's reply of 15 November.
- J.105-J.111 Draft of *Most Secret War*. The draft is incomplete because Jones only sent the later sections and because Frank returned those pages he had annotated. 7 folders.
- J.112 Press-cutting re and reviews of *Most Secret War*, including Frank's.
- J.113 1977. Chiefly correspondence with D.G. Kendall re "number problem" first put to Kendall by Jones in 1975.
- J.114 1978. Includes copy of tribute to Jones by N.E. Butcher.
- J.115 1979. Includes copy of tribute to Jones by L.R.B. Elton.
- J.116 1980. Includes letter of 21 August enclosing Jones's "draft of the bulk of the paper on technology and conflict" sent to Frank for comments, and Frank's reply of 11 September.
- J.117,J.118 Draft of "Some impacts of new technology on conflict". 2 folders.

- J.119 1981-83.
- J.120 1984 March-June. Chiefly correspondence with Jones and P.L. Rose, a historian of science, re the German attempts to harness atomic power during the Second World War.
- J.121 1984 November. Draft of "Heisenberg, German morality and the atomic bomb 1939-1945" by Rose.
- J.122 Nd. Includes untitled draft by Jones beginning "The devices of Archimedes in the defence of Syracuse gave an earnest of what would happen in warfare as scientific knowledge expanded".
- J.123 Kay, H.F. 1964-69
- J.124 Keith, H.D. 1976-83
- J.125, J.126 Keller, A. 1960-83, nd.
Keller was a colleague in the Bristol Physics Department.
- J.125 1960, 1965, 1970. 1970 material is copy of Keller's inaugural lecture as Research Professor in Polymer Science.
- J.126 1974-77, 1983, nd. 1974 material is research proposal; 1976 correspondence with Keller and D.S. Oliver re discussion on fibre reinforced plastics; 1977 correspondence chiefly re research on elongational flow.
- J.127 Kelly, A. 1969-72
Includes draft of Kelly's paper "The core of the earth - a conjecture", with Frank's comments.
- J.128 Kern, R. 1968-71

J.129-J.143 King, G.C.P., and others 1970-81

King applied for Royal Society Paul Instrument Fund grants for 1970-72 for the construction of a wire strain gauge, and 1975-81 for building geophysical tiltmeters. Frank on both occasions consented to act as assessor.

J.129	1970	J.137	1977 (3)
J.130	1971	J.138	1978
J.131	1972 (1)	J.139	1979 (1)
J.132	1972 (2)	J.140	1979 (2)
J.133	1974, 1975	J.141	1979 (3)
J.134	1976	J.142	1980
J.135	1977 (1)	J.143	1981
J.136	1977 (2)		

J.144, J.145 Kléman, M. 1975-85

J.144 1975-78.

J.145 1979-85. Includes 1983-84 material re Kléman and P. Oswald's paper "Experimental evidence for helical instabilities of screw dislocation lines in Sm A phases".

J.146 Knight, C.A. 1971-80

J.147, J.148 Landauer, R. 1978, 1980-81

J.147 1978. Notes on overdamped soliton motion etc. by Landauer.

J.148 1980-81. Solitons.

J.149-J.153 Lang, A.R. 1962-87, nd.

Lang was a colleague in the Bristol Physics Department.

J.149 1962-65. 1965 material is Frank's comments on Lang and H.H. Schlössin's paper "A study of repeated twinning, lattice imperfections and impurity distribution in amethyst".

J.150 1966-68. Letter of 10 October 1967 is re proposed research on crystals.

J.151 1977, 1979, 1983

J.152 1987. Cold fusion. Includes copy of Lang's letter to *The Times* drawing attention to Frank's 1947 article in *Nature* (Bibliog. 13) which first introduced the idea of meson-catalysed fusion. With a photocopy of the article and other background material.

J.153 Nd.

J.154 Laves, F. 1964, 1975

J.155-J.157 Lawn, B.R. 1966-80

Lawn was Postdoctoral Fellow in the Bristol Physics Department 1963-66.

J.155 1966. Lawn's paper "Hertzian fracture in single crystals, with special reference to diamond".

J.156 1967-73.

J.157 1975, 1980.

J.158 re Levich, V.G. 1972

Soviet Academician Levich was expelled from his Chair at Moscow University for seeking permission to emigrate to Israel. The material relates to the campaign in the West on his behalf in which Frank was involved.

J.159 Lewis, B. 1971-72

Chiefly re nucleation theory.

J.160	Lothe, J.	1958-59
J.161	McGregor, A.G.	1967
J.162, J.163	Mackley, M.R.	1976-83
J.162	1976. Includes Mackley and M.V. Berry's paper "The six-roll mill: unfolding an unstable persistently extensional flow" with Frank's brief comments.	
J.163	1977-83. 1982-83 correspondence re disclination loops.	
J.164	Mevrel, R.	1974-75
J.165	Meyer, R.B.	1968-77
	1968 material re Meyer's paper "Effects of electric and magnetic fields on the structure of cholesteric liquid crystals".	
J.166	Miles, M.J.	1981
	Material on slackness elements and calculation of velocity profiles sent to Frank by Miles, retained in original envelopes.	
J.167	Mitchell, J.W.	?1951
	Mitchell was a colleague in the Bristol Physics Department.	
	Duplicated typescript papers by Mitchell.	
J.168	Moore, A.M.	1969, 1972, 1974
	Moore studied for his M.Sc. and Ph.D. at Bristol.	

- J.169-J.172 Mott, N.F. 1946-83, nd.
- Mott was Professor of Theoretical Physics at Bristol when Frank joined the Physics Department in 1946 and held the H.O. Wills Chair of Physics 1948-54. In 1954 he was appointed Cavendish Professor of Experimental Physics at Cambridge.
- J.169 1946, 1948-50. Much of the early correspondence is letters received by Mott and passed on to Frank.
- J.170 1950. Translations from Soviet periodicals dealing with the relationship between science and the Soviet State, sent to Mott by the Foreign Office and passed on to Frank.
- J.171 ?1952, 1954-56.
- J.172 1966, 1983, nd.
- J.173 Munk, W.H. 1981
- J.174-J.176 Nabarro, F.R.N. 1949-87
- Nabarro was Royal Society Warren Research Fellow in the Bristol Physics Department from 1945. In 1949 he took up a post in the University of the Witwatersrand, returning to Bristol as Visiting Professor 1959-60.
- J.174 1949-64.
- J.175 1965-74.
- J.176 1975-87. 1975 material chiefly re proposed visit to UK.
- J.177-J.180 Nicolaysen, L.O. 1980-81
- Correspondence re drafts of papers by Nicolaysen on theory of the Earth's core.
- 4 folders.
- J.181 Owen, H.G. 1976
- re Owen's paper on "The expanding earth".

- J.182 Pamplin, B.R. 1974-75, 1979
1974-75 correspondence re Paul Instrument Fund support for Accelerated Crucible Rotation Crystal Growth.
- J.183-J.185 Pârasnis, A.S. 1969, 1980-84
Pârasnis studied for his Ph.D. at Bristol as Research Fellow 1958-59.
- J.183 1969. Growth of sodium chloride crystals from vapour.
- J.184 1980. Draft of Pârasnis and K. Rao's paper "Dislocation dipoles and charged dislocations in Magnesium Oxide" with Frank's comments.
- J.185 1981-84. Visits, research.
- J.186-J.192 Parkin, D.W. 1967-81
Correspondence and papers re work submitted for publication by Parkin.
- J.186 1967, 1969, 1971-72 J.190 1978 (2)
- J.187 1973 J.191 1978 (3)
- J.188 1974-75 J.192 1979-81
- J.189 1978 (1)
- J.193 Pennings, A.J. 1969-71
Crystallisation phenomena.
- J.194-J.198 Plumley, G.A.K. 1978-83
Theory of thermodynamics.
- J.194 1978 J.197 1982
- J.195 1979 J.198 1983
- J.196 1980-81

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|--------------|---|------------------|
| J.199 | Pond, R.C. | 1976-86 |
| | Research on crystals, 1976 material chiefly re coincidence boundaries. | |
| J.200 | Pound, G.M. | 1956-66 |
| J.201 | re Powell, C.F. | 1969, 1974, 1982 |
| | Powell won the Nobel Prize for Physics in 1950 and was Frank's predecessor as Director of the H.H. Wills Physics Laboratory. Powell died in 1969. | |
| J.202, J.203 | Powers, H.E.C. | 1949-81 |
| J.202 | 1949, 1956, 1970, 1972. | |
| J.203 | 1979-81. Chiefly re Powers' paper "An alphabet of sucrose nucleation". | |
| J.204 | Pryce, M.H.L. | 1949, 1956, 1961 |
| | Letter of 18 May 1956 is re diamond spikes. | |
| J.205-J.207 | Puttick, K.E. | 1966-79 |
| | Puttick held the Royal Society Armourers and Brasiers' Research Fellowship at Bristol 1954-57. | |
| J.205 | 1966, 1969. 1969 correspondence re research project on epitaxial growth on diamond. | |
| J.206 | 1972-74. Puttick's paper "Stress and strain fields round indentations in Poly (methyl methacrylate)". | |
| J.207 | 1975, 1978-79. Polymer indentation, energy scaling of Hertzian stress fields. | |
| J.208 | Rault, J. | 1975, 1977, nd. |
| J.209 | Read, W.T. | 1950-78 |

- J.210 Richardson, M.J. 1965
re Frank's comments on Richardson's paper "Thermodynamic properties of polyethylene single crystals".
- J.211 Rossi, G. 1969
Crystal surfaces.
- J.212-J.214 Sadler, D.M. 1982-87, nd.
Sadler was a colleague in the Bristol Physics Department.
- J.212 1982-84.
- J.213 ?1986. Draft of Sadler's paper "On the growth of two dimensional crystals" with Frank's comments.
- J.214 ?1987, nd. Includes drafts of Sadler's papers "A new explanation of chain folding" and "Kinetic theories of crystallization" with Frank's comments.
- J.215 Sciama, D.W. 1974.
Funds for gravitational wave detector.
- J.216 Simon, F.E. 1949, 1950, 1955
- J.217 Small, P.A. 1948-49
Dissociation pressure of polymethyl methacrylate.
- J.218 Surek, T. 1975
Direction of growth on crystal surface.
- J.219 Suzuki, T. 1956, 1959
- J.220 Tabor, D. 1949, 1971, 1977, 1980

- J.221 Thomas, J.M. 1973, 1975, 1976
1976 material includes draft of Thomas, S.E. Morsi and J.O. Williams's paper "Stacking sequences and partial dislocations as interpretative frameworks for solid state reactions in organic molecular crystals" sent to Frank for comment.
- J.222 Tolansky, S. 1948-49
Triangular pits on diamond, inflected fringes, thin films.
- J.223 Vadilo, P.S. 1961-62, 1976
1976 material includes draft of Vadilo's paper "Sculpture of diamond and its significance" sent to Frank for comment.
- J.224 Wells, P.N.T. 1981
Measurement of pressure changes in the bladder. Frank suggested a means of calculation involving the measurement of the resonant frequency of a small air-bubble injected into the bladder.
- J.225 Whiffen, D.H. 1981
Scientific symbols.
- J.226 Wirtz, K. 1945-50, 1960
- J.227 Wylie, R.G. 1949, 1959, 1969, 1977
1959 material re dissolution properties of crystal surfaces.
- J.228 Young, P.H.J. 1979-82
Letter of 25 February 1981 re "The Jet Engine".

SHORTER SCIENTIFIC CORRESPONDENCE

J.229	1936-43	J.248	1975 January-June
J.230	1944, 1947, 1948	J.249	1975 July-November
J.231	1949	J.250	1976 January-June
J.232	1950	J.251	1976 July-December
J.233	1952-54	J.252	1977 February-June
J.234	1955	J.253	1977 July-November
J.235	1956	J.254	1978
J.236	1957-59	J.255	1979 January-April
J.237	1960-61	J.256	1979 June-November
J.238	1962-63	J.257	1980
J.239	1964-66	J.258	1981 January-May
J.240	1967-68	J.259	1981 June-November
J.241	1969	J.260	1982
J.242	1970	J.261	1983
J.243	1971	J.262	1984 January-March
J.244	1972 January-June	J.263	1984 April-October
J.245	1972 August-December	J.264	1985, 1986
J.246	1973	J.265	1987
J.247	1974	J.266	Nd.

SECTION K

REFERENCES AND APPOINTMENTS

K.1-K.62

K.1-K.22

EXAMINING

K.23-K.43

APPOINTMENTS

K.44-K.51

GRANT APPLICATIONS

K.52-K.55

HONOURS AND AWARDS

K.56-K.62

MISCELLANEOUS

MATERIAL IN THIS SECTION IS SUBJECT TO RESTRICTION

EXAMINING

Higher Degrees

K.1	1952, 1956	K.6	1975-78
K.2	1967, 1968	K.7	1979
K.3	1970, 1971	K.8	1980, 1981
K.4	1972	K.9	1982
K.5	1973, 1974	K.10	1983

Aberdeen

Frank served as External Examiner for Aberdeen University Department of Natural Philosophy from 1948.

K.11	1948 (1)	K.15	1950
K.12	1948 (2)	K.16	1955
K.13	1949 (1)	K.17	Examination papers 1941-47
K.14	1949 (2)		

Newcastle

Frank served as External Examiner for Newcastle University School of Physics 1976-78.

K.18	1975-76	K.21	1977 (2)
K.19	1976	K.22	1978
K.20	1977 (1)		

APPOINTMENTS

K.23	1954, 1960	K.34	1976-77
K.24	1964	K.35	1977 (1)
K.25	1965	K.36	1977 (2)
K.26	1966	K.37	1977 (3)
K.27	1967	K.38	1978-80
K.28	1968	K.39	1981
K.29	1969	K.40	1982
K.30	1970	K.41	1983
K.31	1971, 1972	K.42	1984, 1987
K.32	1973	K.43	Nd.
K.33	1974, 1975		

GRANT APPLICATIONS

K.44	1957, 1959, 1966-68	K.48	1972, 1975
K.45	1968-69	K.49	1976
K.46	1969-70	K.50	1977, 1979
K.47	1971	K.51	1982

HONOURS AND AWARDS

K.52	1967, 1968	K.54	1977, 1978
K.53	1972, 1975	K.55	1980, 1982-84

MISCELLANEOUS

Cambridge University Committee for Geodesy and Geophysics

Frank was invited to serve on the Committee as Royal Society representative on 10 December 1974. The Committee met annually to receive a report from the Head of the Department of Geodesy and Geophysics and to advise on Departmental activities. Frank served until its dissolution in 1980 when the Department was merged with those of Geology, and Mineralogy and Petrology in the new Department of Earth Sciences.

The material consists principally of correspondence and committee papers.

K.56	1974, 1975	K.59	1978
K.57	1976	K.60	1979, 1980
K.58	1977		

NATO Advanced Study Institutes

Frank gave advice to the Advisory Panel on the Advanced Study Institutes Programme between 1974 and 1986.

K.61 Correspondence and papers.

United Bristol Hospitals Advisory Appointments Committee

K.62 Frank served as Bristol University representative 1967.

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