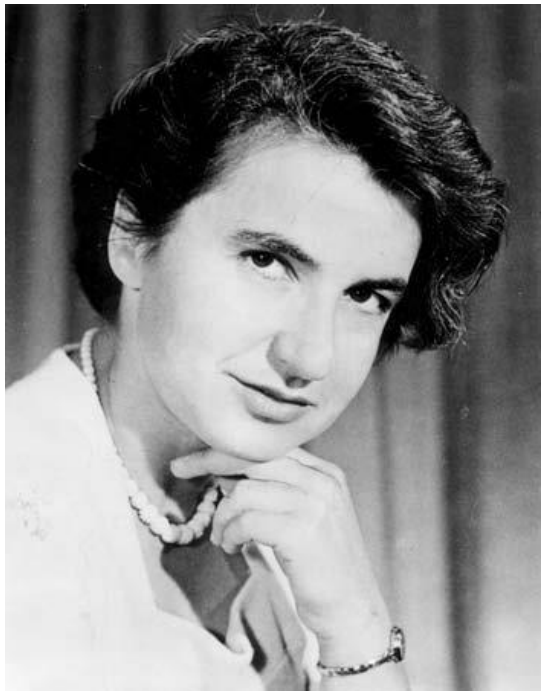
Tribute to Rosalind Franklin

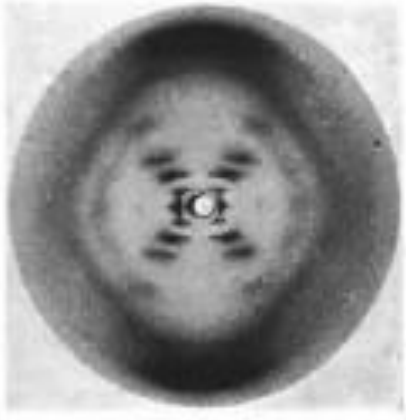
101 years on: her pivotal research on coal, DNA and viruses.

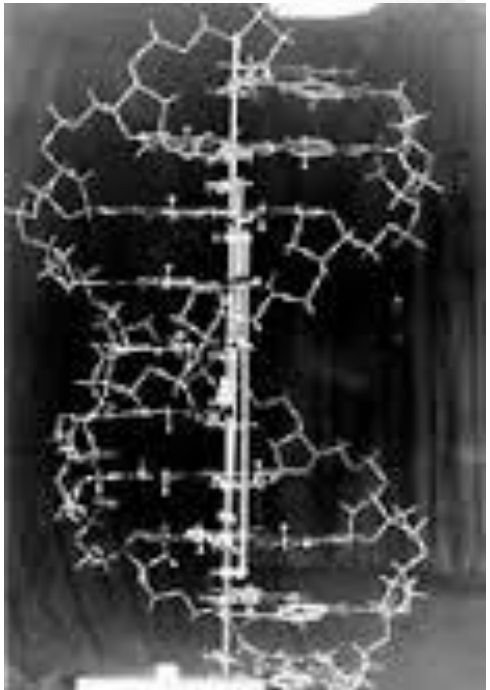
ACA Virtual meeting, 2nd August 2021











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Thanks to the ACA sponsors

































Rosalind Franklin Tribute

The Plan:



- **Introduction: early life**
- Coal and graphite
- DNA
- Viruses
- The future?







Rosalind Franklin
25/7/1920-16/4/1958

- Born London to Muriel and Ellis Franklin. Brother, David, one year older, two younger brothers (Colin and Roland), and a younger sister, Jenifer (Glynn).
- Rosalind aged 6, her Aunt Mamie Bentwich on a Cornish holiday with the family, said:

"R is alarmingly clever – she spends all her time doing arithmetic for pleasure & invariably **gets her sums right"**

- Aged 9-11 Boarding school at Bexhill-on-Sea



Rosalind Franklin
25/7/1920-16/4/1958
Physical chemist and X-ray crystallographer



- Aged 12-17 St Paul's Girls' School 'Every girl is being prepared for a career. The High Mistress considers that no woman has a right to exist who does not live a useful life'… 'look beyond marriage as your goal'.
  RF excelled at both sport and in her studies.
- Aged 16: her mother 'All her life, R knew exactly where she was going, and at 16 she took science as her subject.' **All her life it came straight from the heart.'**

ST PAUL'S
GIRLS' SCHOOL



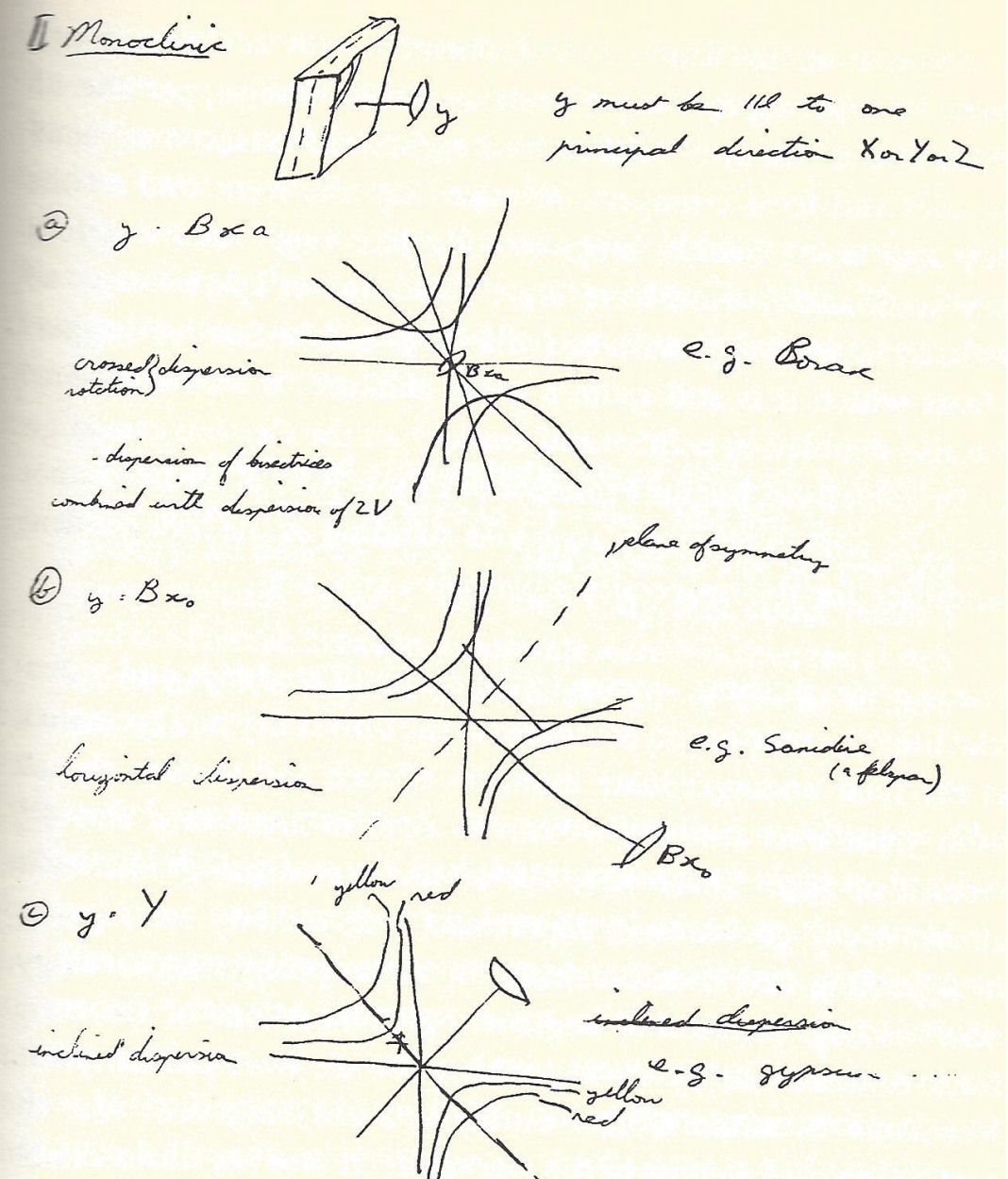




Rosalind Franklin 25/7/1920-16/4/1958
Physical chemist and X-ray crystallographer

- Summer 1938. Visit to Paris – perfected her French: loved France, the French people and all things French (+hiking & mountains).
- 1938-41 Newnham College, Cambridge, Natural Sciences/Chemistry
- Thought nothing of riding home to London at the end of term on her bike (105 km)!
- 2nd in all her year group in 1st year exams (‘Prelims’)
- 1939. Note to self with a sketch of a helical structure of nucleic acid ‘Geometrical basis for inheritance?’
- Final year research project supervisor Fred Dainton, photo and polymer chemistry, went well.

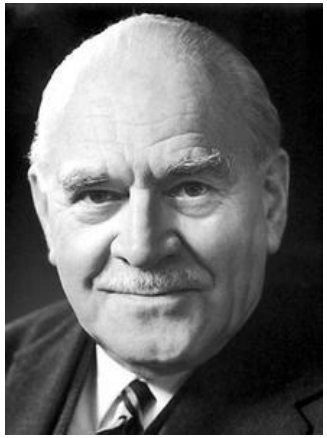
Learning crystallography at Cambridge



RF's notebook headed 'Crystal Physics' shows her learning the space groups and various crystal forms. Autumn 1939, 2nd year



Rosalind Franklin 25/7/1920-16/4/1958
Physical chemist and X-ray crystallographer



Norrish

- 1941-42: 4th year scholarship from Newnham. Research supervisor was RGW Norrish ‘bad-tempered and autocratic treatment of juniors’ impossible project on polymerisation of formic acid and acetaldehyde
- Claustrophobic: small dark room
- Confrontation when cornered was her tactic (Norrish)
- She ‘didn’t suffer fools gladly’.
- Women were not awarded degrees from Cambridge until 1947 (in Oxford it was 1921!)

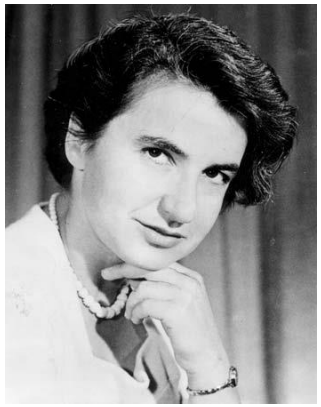




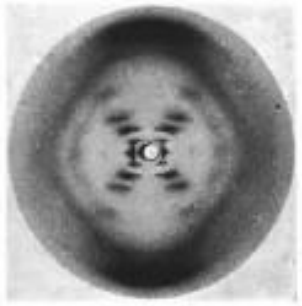


Rosalind Franklin 25/7/1920-16/4/1958
Physical chemist and X-ray crystallographer

- 1942-1945 PhD registered at Cambridge but worked in Kingston for the British Coal Utilisation Research Association (BCURA) on permeability and shrinkage of coals to gas (helium) and water as a function of temperature. ‘Assistant Research Officer’
- Air raid warden in WWII.
- 1945: PhD thesis title: “The physical chemistry of solid organic colloids with special reference to coal and related materials”









Rosalind Franklin 1920-1958

- 1946: First paper. Trans. Farad. Soc. Hypothesis of ‘molecular sieves’. Very important for gas masks.
- 1947- 51: Paris, Postdoc, studied coal & graphite under Jacques Mering (trained by Bragg) at the Laboratoire Central des Services Chimiques de l'Etat (Govt Lab). Got ‘unEnglished’. Pay: £5/week, rent £3/month

  ‘**women engaged as equals**’
- 1951- 53 King’s College, DNA fibres (under Randall)
- 1953-1958 Birkbeck College, viruses, RNA, senior scientist (under ‘Sage’ Bernal)



Rosalind Franklin Tribute

The Plan:

- Introduction
- **Coal and graphite**
- DNA
- Viruses
- The future?

Coal: anthracite





Brown coal: lignite



Coal: bituminous

graphite



THERMAL EXPANSION OF COALS AND CARBONISED COALS.

By D. H. Bangham and Rosalind E. Franklin.

Received 19*th August,* 1946.

RF first peer reviewed published Paper (of 37)

The coefficient of thermal expansion of a solid, being determined by the vibrational amplitudes of an orchestra of atomic—and larger—oscillators, should depend on its molecular constitution rather than upon the physical structure on a colloidal scale of magnitude. With the important reservation discussed in the next section, it can be regarded as an intra-micellar property rather than one concerned with micellar surfaces and inter-micellar contacts. Its variation as between different specimens of coal was expected to throw light on a number of obscure questions, as, for example :

1. whether or not the anisotropy of coal—the mechanical properties of which vary markedly with orientation with respect to the " bedding " plane—extends to the atomic (or molecular) dispositions within the micelles ;
2. whether or not there is any marked trend in the size or nature of the dynamic unit of structure with increasing " maturity " of the coals ;
3. whether the important changes in the technical qualities of coal engendered by preheating below 300° c. (such as the suppression of " caking properties ") are associated with intramicellar chemical change, or confined to the micellar surfaces and contacts. Aside from the other forms of chemical change, any variation in the size or number of the dynamic units—whether brought about by condensation, polymerisation or cross-linking—would be likely to reveal itself in a dependence of the expansion coefficient upon temperature of pre-treatment.

Trans. Farad. Soc, (1946) 48: 289