

John Hubbard

The Hubbard model 50 years on

**John Hubbard
in the early
1960s**



Origins of the model (from This Week's Citation Classic, Vol. 22, p. 84, June 2, 1980)

- 1962 - neutron scattering data from Harwell on transition metals - d electrons were well described by Heisenberg model
- More than a perturbation or renormalization of band structure
- Simplest mathematical model which could yield both insulating and metallic behavior in the appropriate limits - completed calculations in a few hours one afternoon
- Competition between two terms - the tight binding approximation and the Coulomb repulsion term for doubly occupied site
 - U/t ratio
 - Particle density

Family background: childhood

- Born October 27, 1931 - first child of Charles and Marion Hubbard
- Lived in Teddington during childhood and college years, apart from short period during WWII spent in Yorkshire
- Good at maths, but mother finally taught him to read by insisting he read the newspaper every day at age 8 or 9 (when WWII began)
- First publication: at age 11, a school essay he wrote on how to calculate the amount of thrust needed to launch a rocket into space was published in local paper
- Loved walking in Bushy Park (near Hampton Court Palace) and greatly missed it later

Family background - adult life

- My parents were both employees of Harwell living in the hostels when they met
- My mother (Joan) worked in personnel or human resources at Harwell. They married in August 1958
- 3 children, Charles(b. 1961), Catherine (b. 1964), and Margaret (b. 1967)
- Lived in Authority housing in Abingdon provided for Harwell employees
- Family moved to Saratoga, California in summer of 1976, when my father joined IBM Research Lab in San Jose
- Remained at IBM until death in November 1980. My mother then became an IBM employee, working in admin and payroll from 1981 to 1993.
- My mother and siblings still live in the general Bay Area region

Working style

- Preferred to work at home; at office for meetings and computer runs
- During time at Harwell, liked to walk on the Ridgeway, England's oldest road(?), parts of which are now a UK National Trail. Did Hubbard model originate here?
- Bob Schrieffer and Leon Cooper - felt that they were all fairly equally matched in physics knowledge, but Dad was far ahead of them in mathematics

US connections

- First traveled to US in 1958; sabbatical year spent at Berkeley, with sidetrips to Urbana (6 weeks), and Princeton (day or two)
- 6 weeks in the summers of 1965 and 1969, at Brookhaven National Lab, working with Martin Blume
- Autumn 1970 - teaching at Brown University
- First half of 1971 - IBM Research in San Jose
- July 1976 - left England and returned to IBM Research San Jose as an employee, working with George Castro

Hobbies and personal info

- Gardening - kept meticulous “lab” notebooks! Ornamental flowerbeds and vegetable garden
- Piano - started playing in 1970 when at Brown, continued as lifelong interest
- Playing and watching tennis and cricket

Some final amusements

- My grandmother was delighted that Dad was getting mathematics degrees; hoped he would be an actuary
- When asked by mother-in-law what the book “The Many-Body Problem” was about, declared that it was a murder mystery
- Day trip to Scotland: McDougalls (flour producer) needed his expertise to solve a problem (reducing amount of foreign material in flour!). Purely mathematical problem solved within a day.