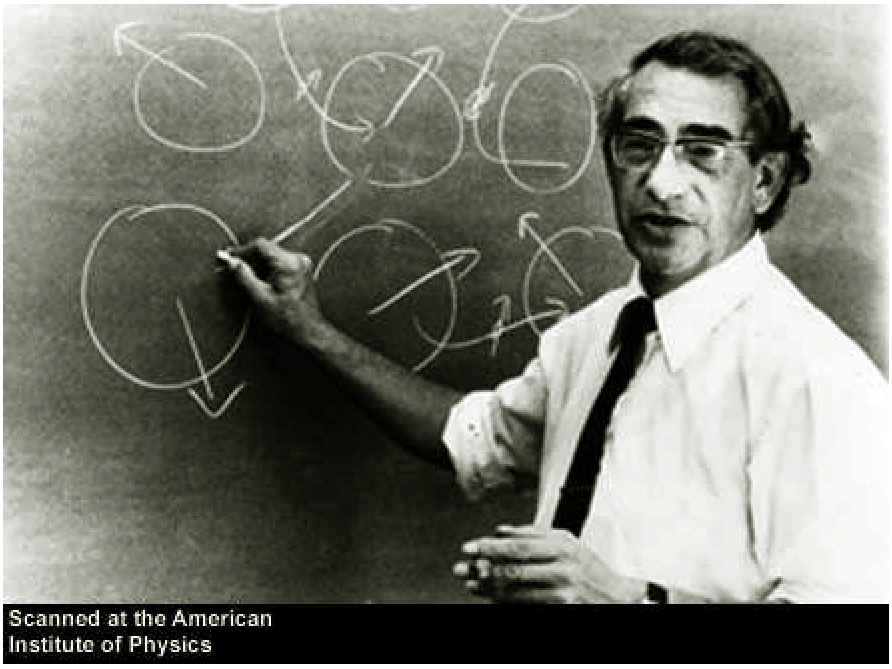

BIOGRAPHY OF JOHN HUBBARD (1931 - 1980)

born Oct. 27, 1931, London , England. died Nov. 27, 1980, San Jose, CA., U.S.

The Biography of John Hubbard not easy to find.

AIP gives the following summary:
Theoretical physicist (solid state); born and educated in London, England; science officer and group leader solid state theory, Atomic Energy Research Establishment, 1961-1976; research scientist solid state theory, IBM Research Laboratory, San Jose, California from 1976.

Wikipedia electronic Encyclopedia(http://en.wikipedia.org/) , includes an article Hubbard Model, and short biography of John Hubbard: John Hubbard (physicist).

The Bibliography of John Hubbard contains the 50 items: 45 journal papers, 5 conference proceedings and a couple of unpublished lecture notes.

The analysis of the works of John Hubbard in the field of strongly correlated electron systems and the quantum theory of magnetism was carried out in the review article:
A. L. Kuzemsky, Statistical Mechanics and Many-Particle Model Systems. *Physics of Particles and Nuclei*, 2009, vol. 40, Issue 7, pp.949-997.(in English)
(PDF, 531.5Kb)

COMMEMORATION of John Hubbard was written by T. M. RICE in 1981.

OBITUARY of John Hubbard was published in Physics Today in June 1981.

Magnetic states

diamagnetism – superdiamagnetism – paramagnetism – superparamagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – metamagnetism – spin glass

Dedicated to the Memory of

John Hubbard

Susono, November, 1980

BIOGRAPHY OF JOHN HUBBARD

born Oct. 27, 1931, London , England.
died Nov. 27, 1980, San Jose, CA., U.S.

John Hubbard studied physics at London University, Imperial College of Science and Technology.

Promotor of his B.Sc. thesis (1953) and Ph.D. thesis (1958) was Prof. Stanley Raimes from the Department of Mathematics, Imperial College, London, who wrote two very readable textbooks:
Wave Mechanics Electrons in Metals, North-Holland, 1961;
Many-Electron Theory, North-Holland, 1972.

John Hubbard took his Ph.D., in 1958 on a thesis devoted to the Description of Collective Motions in Terms of Many-Body Perturbation Theory with Applications to the Electrons in Metals and Plasma.

John Hubbard published his famous article "Calculation of Partition Functions" in Phys. Rev. Lett., 5 (1959) N 2, pp.77-78. The famous Hubbard-Stratonovich

transformation has been refined and reformulated for the calculation of the grand partition functions of some many-body systems.

He took the position of a researcher at the Atomic Energy Research Establishment, Harwell in the Theoretical Physics Division, headed by W. Marshall in 1955.

He took the position of the Head of the Theoretical Physics Group at the Atomic Energy Research Establishment, Harwell in the Theoretical Physics Division in 1961.

During the years from 1963 to 1966 he formulated his famous Hubbard Model in series of 6 papers in the Proceedings of the Royal Society:

1. J. Hubbard, Electron Correlations in Narrow Energy Bands. *Proc.Roy.Soc.* A 276, 238 (1963).
CITED by 4052 (on 06.2011)

2. J. Hubbard, Electron Correlations in Narrow Energy Bands.II. The Degenerate Band Case. *Proc.Roy.Soc.* A 277, 237 (1964).

3. J. Hubbard, Electron Correlations in Narrow Energy Bands.III. An Improved Solution. *Proc.Roy.Soc.* A 281, 41 (1964).
CITED by 1502 (on 06.2011)

4. J. Hubbard, Electron Correlations in Narrow Energy Bands.IV. The Atomic Representation. *Proc.Roy.Soc.* A 285, 542 (1965).

5. J. Hubbard, Electron Correlations in Narrow Energy Bands.V. A Perturbation Expansion About the Atomic Limit. *Proc.Roy.Soc.* A 296, 82 (1966).

6. J. Hubbard, Electron Correlations in Narrow Energy Bands.VI. The Connection with Many-body Perturbation Theory. *Proc.Roy.Soc.* A 296, 100 (1966).

John Hubbard told the story of the invention of the model in the inteview: Citation Classic, Number 22, June 2 in 1980.

He worked at Harwell up to 1976.

He moved from Harwell to the IBM Research Laboratory, San Jose, California at 1976. During the years from 1976 to 1980 he worked on the problems of magnetism of Iron and Nickel and one-dimensional conductors.

John Hubbard was not elected by a fellow of the Royal Society and did not received any Honors or Awards.

P.S. This biography was written in 2005 on the basis of the published works of John Hubbard and small pieces of information from the colleagues. Now the more precise data on John Hubbard biography are available (see text below).

JOHN HUBBARD: THE MAN BEHIND THE MODEL.

Those who knew John Hubbard describe him as a very shy man – to the point that others, who did not know him so well, may have perceived him as somewhat aloof. Born on 27 October 1931, Hubbard was educated first at Hampton Grammar school and then at Imperial College, London, where he obtained his PhD in 1958 under Stanley Raimes. Unusually for his time and social context, he lived with his parents in Teddington throughout his university education. At the end of his PhD, Hubbard was recruited to the Atomic Energy Research Establishment in Harwell, Oxfordshire, by Brian Flowers, who was then heading the theory division. An anecdote from this period of Hubbard's career illustrates his retiring personality.

While at Imperial, Hubbard had dealt with the project assigned to him for his PhD fairly quickly, and had then looked for a more challenging problem. At the time, quantum-field-theory methods, particularly Feynman diagrams, were being applied to problems in many-body theory. However, it was difficult to bring the same methods to bear on the many-electron problem – relevant to solid-state systems – because the Coulomb interaction between electrons made quantities like the total energy diverge. Hubbard realized that these divergences could be controlled: the trick was to sum up an infinite series of a particular class of Feynman diagrams.

When Hubbard arrived in Harwell, he mentioned this to Flowers, who wanted to see the paper. Alas, there was no paper, Hubbard explained, because when he was about to write it up he saw an article by other researchers who had introduced a different method to solve the same problem. Hubbard had found their method physically appealing, checked privately that their results coincided with his, and concluded there was no need for an additional publication on the topic. Flowers then issued an explicit order that Hubbard should publish his groundbreaking work.

Hubbard's most famous papers are the series he wrote on his eponymous model, starting in 1963. He was not the only one working on the strong-correlations problem: some months earlier, Takeo Izuyama, working at Nagoya University, and Duk-Joo Kim and Ryogo Kubo, at the University of Tokyo, both in Japan, had argued that a proper description of correlations in metals with strong electron–electron interactions could explain the observed spin-wave spectrum. Martin Gutzwiller, who was then working at IBM's research laboratories in Zurich, had also produced essentially the same model. Yet it was Hubbard's calculations that showed that the model that now bears his name could in fact describe both the metallic and insulating behaviour as two extremes of the same thing. His application of a Green's function technique to the model was a template for many other works in condensed-matter theory, and his papers from that time contain many crucial insights, such as the existence of so-called Hubbard bands that are a main feature of our current understanding of Mott insulators.

Eventually, Hubbard became the leader of the solid-state theory group at Harwell, and Walter Marshall succeeded Flowers as head of the theory division. Unlike the shy Hubbard, Marshall, who was also an excellent theorist, was very proactive in hunting for personnel and for funding. This was a blessing in disguise for Hubbard, as Marshall ignored Hubbard's reticence completely and kept "parachuting" postdocs into his group.

Hubbard left the UK for the US in 1976, following Marshall's promotion to director of the Atomic Energy Research Establishment and a subsequent major reform of its

facilities in Harwell. He joined Brown University and the IBM Laboratories in San Jose, California, where his research focused on the study of critical phenomena: phase transitions near which universal behaviour, independent of material specific properties, is observed.
He died, aged just 49, in San Jose on 27 November 1980. (Main source: Stephen Lovesey, private communications)
SOURCE:
Jorge Quintanilla and Chris Hooley (2009). "The strong-correlations puzzle". Physics World 22: pp. 32–37.

SEE ALSO THE WIKIPEDIA LINKS:

http://en.wikipedia.org/wiki/Hubbard_model

http://en.wikipedia.org/wiki/John_Hubbard_(physicist)

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COMMEMORATION OF JOHN HUBBARD (1931-1980)

BY
T.M.RICE

The world of physics has suffered a great loss with the recent untimely death of John Hubbard. This is particularly true of those of us in the field of condensed matter physics and especially those who are concerned with the topics of localization and disorder that are the subject of this conference. It is very appropriate that at this conference we commemorate John Hubbard's passing by recalling some of his numerous important contributions to condensed matter physics and to the problems under discussion here.

When John Hubbard started his career in theoretical physics it was known that a surprisingly good understanding of the electron gas in metals could be obtained by ignoring the Coulomb interaction among the electrons but there was no understanding of how to develop a consistent way to treat these interactions. John Hubbard's doctoral thesis developed the dielectric approach to the problem and it was soon followed by a series of papers which are at the heart of the modern many body theory of the electron gas. J.R. Schrieffer has said of these papers, which had wide impact on the physics of metals, "His early work on the theory of exchange and correlation in the electron gas remains a classic".

Shortly thereafter, John Hubbard turned his attention to a different way of treating the many body problem. The result was a short but very influential paper which developed the method of functional integration. Over the years since his original contribution, many others have applied this method to a variety of problems, especially to the problems of electron localization. Indeed in his last major contribution John Hubbard came back to this method and applied it to the development of a first principles theory of the magnetism of iron and other transition metals. This work resolved the difficult theoretical problem of reconciling the simultaneous localized and itinerant behaviour of the magnetic electrons in 3d-metals and yielded a single model which gives reasonable values of both the magnetic moment and Curie temperature.

John Hubbard however is best known for the classic series of papers that treated electron correlations in narrow band materials. While the importance of correlation in causing the breakdown of band theory and insulating character of magnetic insulators was known from the work of Mott, Peierls, Van Vleck and Anderson, it was John Hubbard who put the problem on a firm foundation. The famous Hubbard Hamiltonian for electron correlation is as crucial and fundamental as the Ising and Heisenberg Hamiltonian for localized spins and by now has spawned almost as much work. However the large literature on the Hubbard Hamiltonian that now exists also serves to emphasize the importance of his original contribution and the depth of his understanding. W.Kohn has described his contribution as "the basis of much of our present thinking about the electronic structure of large classes of metals and insulators". It is also the basis of much of what we are discussing at this conference.

John Hubbard studied at Imperial College, University of London, receiving B.Sc. and Ph.D. degrees in 1955 and 1958 respectively. Most of his scientific career was spent as Head of the Solid State Theory Group at the Atomic Energy Research Establishment in Harwell, England. He visited a number of institutions in the U.S. at various times in his career and in 1976 he joined the staff of the IBM Research Laboratory at San Jose, Ca., a position he held at his death.

John Hubbard's work was characterized by great originality and by an uncommon ability to obtain elegant mathematical formulations and solutions of very difficult and fundamental problems. His passing leaves a void in the theoretical physics community which will not be filled.