Bonds of friendship

Brian Pippard

Fritz London: A Scientific Biography. By Kostas Gavroglu. *Cambridge University Press: 1995. Pp. 323. £50, $69.95.*

FRITZ London, the son of a professor of mathematics at Bonn, was born into a Jewish family in 1900. He had reached the right age when the discovery of quantum mechanics initiated the great surge of theoretical physics in the late 1920s, and his background was right for the education that prepared him to play a part. London was baptized in his youth, but this was no help when Hitler came to power; in 1933, he left Germany for good. After some years in Oxford and Paris, he settled at Duke University, North Carolina, where he spent 15 years until his early death in 1954.

London's wanderings play a central role in Kostas Gavroglu's account. With no great facility for languages, and a leaning to the patient rigour of former German scholarship, he did not settle down easily and made few close friends. Lindemann, also German-born, who had built a strong team of refugee physicists at the Clarendon Laboratory, could give only limited support, and he felt himself excluded from the closed shop of collegiate Oxford. Others in the team — Simon, Kurti, Mendelssohn among them — fitted in better and were able to settle down there.

The Paris years were happier, enlivened by the friendship of Langevin, Perrin and Joliot, whose sympathy with communism was no handicap to a liberal intellectual and victim of the Nazis. But in 1939, anxious at the prospect of war, London accepted an offer from Duke University, not then the most congenial place for one of his temperament; the racialism he found there was repugnant. The Austrian physicist Paul Zilsel was only too well aware of the problem from his own parents' tragedies, and expressed his understanding with the remark: "He wanted to be accepted, yet he could not hide his contempt". In the McCarthy era, both were interrogated about their attitudes to communism, but while London was given clearance as a possible consultant at Los Alamos, Zilsel was forced to accept paid leave from his post at Connecticut University and excluded from the campus. In the event, London's death put an end to the projected consultancy. He had been ill for some years and unfit for more than the mildest exertion, and his original intellectual vigour had faded. The two volumes of *Superfluids* (1950 and 1954) absorbed most of his residual energy, for all that they systematize, with little enlargement, ideas that had been his main occupation ever since 1935.

London's innovations mostly belong to the period 1927–39. The first of real note, in collaboration with Heitler, showed how quantum mechanics accounts for the binding of the hydrogen molecule — an exciting and unexpected discovery. They had set out to elucidate the van der Waals force between two hydrogen atoms and were astonished to find they had discovered homopolar bonding. The overlap of atomic wave-functions was the key mechanism; at greater distances, where there is no overlap, the polarization of one atom by the fluctuating dipole moment of the other is responsible for van der Waals attraction. This was sorted out by London a few years later. Meanwhile, he had attempted to extend the theory of homopolar bonds to other molecules, but was overtaken by the more intuitive procedures of such as Mulliken and Pauling.

Characteristically, London did not favour such methods. He preferred precise formulation, even in situations where he recognized that their complexity demanded abandoning a severe reductionism in favour of what came to be called phenomenological theories. This paid a handsome reward when in 1935 he devised the equations for the supercurrent that have since been central to studies of superconductivity. The original inspiration may have been Fritz London's, but many of the consequences were recognized by his brother Heinz, seven years his junior. It was some years before anyone else saw so clearly the significance of these ideas, and the brothers rightly share the credit.

Fritz was less successful with the apparently related problem of superfluidity in liquid helium, whose origin he attributed to the Bose–Einstein condensation. When Tisza used the notion to construct his two-fluid model, London became a strong supporter against Landau's alternative theory — undoubtedly urged in this direction by Landau's seemingly cavalier disregard of rigour. In the end, measurements of second-sound velocity gave victory to Landau. It is easy, some 50 years later, to appreciate that Landau's physical instinct was of a higher order than London's, but the problems were new and puzzling, and few could then see where the truth lay.

Even if, as I now judge, London was not quite in the top class of physicists, his ideas were stimulating and some have undoubtedly found a permanent place in the textbooks. Gavroglu has given proper attention to the physics, and has done particularly well to use it as a framework for the story of a troubled life. I am personally grateful for the full-length picture of a man from whom I learnt many things, who always had time for serious discussion and whose welcoming smile is among my happiest of memories. □

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PALMS — the quintessential tropical plants — are of immense ecological and economic value. The South American species shown here have a myriad of uses: the fruits provide a popular beverage, which in turn can be boiled down to produce a clear oil; trunks are used in construction; leaves are woven into baskets; and leaf sheath fibres are used for blowpipe darts. The photographs appear in the comprehensive and detailed *Field Guide to the Palms of the Americas* by A. Henderson, G. Galeano and R. Bernal. Princeton University Press, $75, £50.