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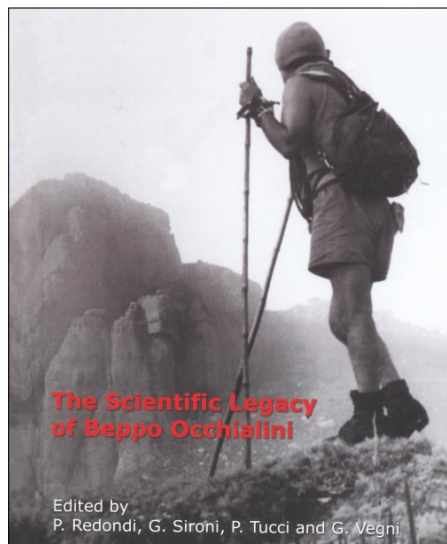
The Scientific Legacy of Beppo Occhialini

by P Redondi, G Sironi, P Tucci and G Vegni (eds), Springer. Hardback ISBN 9783540373537, £54 (€74.85).

Giuseppe Paulo Stanislaw Occhialini, or Beppo to his many friends across the world, was a charismatic, dynamic leader of discovery in particle and astrophysics for more than 50 years from the 1930s. These essays and reminiscences, by 30 colleagues and others who knew him, review his life to celebrate the centenary of his birth in 1907.

The early years of Occhialini's career were remarkable for two close encounters with the Nobel Prize: through his work on cosmic rays with Patrick Blackett and a decade later with Cecil Powell. His interest in cosmic rays began while studying at the Institute of Physics at Arcetri, part of the University of Florence, where he learnt to use new coincidence circuitry for Geiger-Muller counters from its developer, Bruno Rossi. After graduating in 1929 Occhialini stayed in research and in 1931 Rossi sent him to Cambridge to learn about Wilson cloud chambers from Blackett – who in turn learnt from Occhialini the advantages of using counters in coincidence to trigger the chamber. Soon, although unluckily a week or so after Carl Anderson at Caltech, they saw their first “positive electrons”, but, unlike Anderson, they observed e^+e^- pairs and recognized that Paul Dirac's new relativistic quantum theory predicted this. Occhialini was a keen member of the “Kapitza Club” at Cambridge's Cavendish Laboratory, where he met Dirac.

Returning to Arcetri in 1934, Occhialini found that things had changed. Facism was taking power in Italy so he left for an appointment at the University of Sao Paulo in Brazil where he stayed throughout the Second World War. He built a strong group there using counters in cosmic-ray research before leaving at the end of 1944 for England at the invitation of Blackett, who thought that his help would be valuable in the work on an atomic bomb. Since Occhialini was Italian, this was not allowed and in autumn 1945 he went to Bristol to join Powell, who was using photographic emulsions to study low-energy nuclear reactions. Occhialini was immediately intrigued and impressed by the elegance and power of the method, but saw the need to improve the emulsions' sensitivity. So he contacted the technical staff at Kodak and Ilford to add his influence. Ilford then



produced the C2 emulsion, with eight times the silver halide concentration, which Powell and Occhialini “warmly welcomed”, according to Ilford's man in charge, Cecil Waller.

Occhialini proposed exposing C2 plates to cosmic radiation at the top of the Pic du Midi (2800 m) in the Pyrenees, and did so in summer 1946. In January 1947 Occhialini and Powell published in *Nature* the first of a series of papers from the Bristol group establishing the discovery of the π -meson, its decay to the μ -meson and, after Kodak produced the first emulsions able to detect minimum ionization, the μ 's decay to an electron.

It was at Bristol that Beppo met Connie: Constance Charlotte Dilworth, who was born in 1924 in Streatham, London. She started postgraduate studies in theoretical solid-state physics at Bristol in about 1946, then switched to join Powell's group. Together with Occhialini and others, she contributed significantly to processing thick photographic emulsions. In 1948, when Occhialini was invited to Brussels to start a new nuclear emulsion group, Connie went with him. They were married in 1950 and their daughter, Etra, who contributed to this book, was born the next year. Connie and Beppo became a very effective team, a formidable duo who would provide strong leadership in Italian and European science. Beppo's excitable Italian temperament was complemented by the calm, organized approach of Connie, a notable scientist herself who always understood how Beppo's aspirations could be realized.

In 1950 the Occhialinis moved to Genoa and in 1952 to Milan University where

Beppo was director until he retired in 1974. He built up a strong emulsion group at Milan, making major contributions to the “G-stack” and other collaborations flying emulsions on balloons. He was always looking for new challenges in physics and advances in experimental techniques. On returning from a visit to Rossi at MIT in 1960, he showed his group a new detector made of silicon, saying “think what you can do with this”. They did, and established an expertise that later became the basis for Milan's major contribution to the central detector for the DELPHI experiment at LEP.

As machines replaced cosmic rays as a source for particle physics, and while maintaining a major presence for his group at CERN, Beppo turned to other techniques to continue his interest in cosmic rays, first with balloon-borne spark chambers and then adapting these to flights on satellites. Both Beppo and Connie were influential members of advisory and scheduling bodies for the European Space Research Organisation and together, as one contributor puts it, they pushed Italy into a leading position in astronomy. Milan was a “power house” for space research, with leading roles in two satellite experiments that mapped the sky for X-ray and gamma-ray sources: COS-B launched in 1975 and Beppo-SAX in 1996. Beppo maintained his interest in the design of the latter until his death in 1993, when it was named after him. Connie died in 2004.

Research into the origins of intense gamma-ray bursts (GRBs) – by far the brightest events known – is a scientific legacy of Beppo still very much alive. Until Beppo-SAX made the first accurate locations in 1997, no GRB had been associated with a visible galaxy. His most long-lasting legacies, however, are the young scientists who entered research in his care: his irrepressible enthusiasm inspired them; his lateral, dialectical probing tested their ideas; and his quick wit, wide cultural interests in art, literature and thoughts on “the film I saw last night” entertained them. This collection of essays portrays a complex personality for whom life was never dull, who was always ready to “brain storm” with colleagues, and who experienced the excitement of discovery in his research.

One question remains: why didn't he share one of the two Nobel prizes, Blackett's in 1948 or Powell's in 1950?

John Mulvey, Oxford.

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