John Clifford Barton
1923 – 2002

Obituary and Bibliography
John Clifford Barton

John Barton was one of the founders of particle astrophysics. This experimental science, born in the aftermath of the Second World War and fuelled by developments in electronics and computing, seeks answers to fundamental cosmological problems. Barton was one of the greatest experimentalists, working in deep underground locations all over the world and inspiring a generation of physicists to follow him.

Born in 1923, he was a wartime student at University College London during its evacuation to Bangor. Clearly, wartime requirements influenced the curriculum and he gained a “Certificate of Proficiency in Radio-Physics”, which was to mark out his future path. He graduated in 1943, receiving the Granville Prize, annually awarded to the best Physics graduate of London University. He did his National Service at Marconi in Chelmsford, Essex, working on military electronics. Here he acquired a thorough grounding in the basics of electronic design and construction techniques. After the war he became a PhD student at Birkbeck College, London University, working with E.P. George on cosmic rays. His first experiments were performed at an altitude of 3,457 metres, high on the Jungfraujoch in Switzerland. An amusing aside in the report thanks the director of the Jungfraujoch railway for the loan of 15 tonnes of coal that had been used for absorber. This use of available materials was to become something of a trademark of Barton’s experiments.

In 1954 he began four years at the nascent University College of the West Indies, Jamaica. As well as his teaching, Barton continued his research, measuring the cosmic muon flux as a function of depth in the sea. For this he built a transistorised cosmic-ray “telescope” using Geiger tubes contained in a pressure vessel, which was lowered to depths of 3,000m. Calibrations were made underground at Norton Hill Colliery in Somerset which were Barton’s first experiments in a mine. To record the data he used his own design of tape recorder, capable of recording eight tracks of digital data across standard quarter-inch audio tape. This was the first ever use of digital recording on a scientific experiment.

In 1958, Barton returned to London and became lecturer at Northern Polytechnic, almost immediately publishing his first paper describing a cosmic-ray detector using photomultipliers, which had just become commercially available. Photomultipliers are vacuum tubes which detect faint flashes of light, and their large area of sensitivity and high gain meant that large, robust particle detectors could be built. They are still found at the heart of innumerable physics experiments and huge numbers are used in medical imaging. Barton rapidly became one of the world experts in photomultipliers and their applications. He also had an almost intuitive feel for the “non-imaging” optics needed to carry light to the photomultipliers, and used to say to his students, “Light doesn’t go down a funnel like water does”, when they came up with ideas that didn’t work.

He began a series of experiments to determine the nature of cosmic rays that could penetrate deep underground. These experiments were performed in the “Holborn Laboratory”, a series of rooms deep in Holborn Underground station. A spare platform at Holborn had been converted to offices during the war. Immediately after the war it was used as a staff hostel, and later many of the rooms were used by physicists for experiments needing a deep location. The laboratory rooms were reached through a service door on one of the
Piccadilly Line platforms. They were linked by an extremely narrow corridor, only wide enough for a single person, running along the edge of what had once been the platform. It was a dry and dusty environment and there were occasional problems caused by rodents chewing cables, but it was none the less an extraordinarily convenient site to work. For many measurements Holborn was not deep enough and Barton and his colleagues also ran experiments in Tilmanstone Colliery in Kent and later in the Woodhead Tunnel, a disused railway tunnel under the Pennines.

In the early 1980s Barton started on a series of studies on meteorites. His low background laboratory was ideal for identifying trace radioisotopes produced in the meteorites in space before they hit the earth. This work led on to a search for “superheavy elements”. Theoretical analysis suggested that while nuclides heavier than Uranium were unstable, there would be an “island of stability” around element 114 which would have half-lives long enough to exist in nature. Others had already undertaken searches in a range of samples, particularly meteorites, and some had claimed positive results. Together with a group from Leeds, Barton repeated the experiments and, despite having more sensitive equipment, saw no superheavy elements. Years later, element 114 was made artificially at Darmstadt and was found to have a half-life of 30 seconds, a full 15 orders of magnitude smaller than the original predictions. For Barton this was a vindication of his belief that theoretical predictions must be tested by experiment and that theoreticians are often just plain wrong.

When the Physics Department of what was now the Polytechnic of North London closed in 1984, Barton officially retired, devoting himself to research. He held honorary posts at Birkbeck and at Queen Mary, London University. In 1993 the Holborn Laboratory was closed, following increasing safety concerns in the wake of the King’s Cross fire. Barton transferred his underground laboratory to the Eisenhower Centre, a wartime control centre near Goodge Street, and, when the lease on this expired, to the basement at Queen Mary, not really deep enough but workable. Increasing frailty did not deter him – an ingenious assembly of car jacks enabled him single-handed to move several tonnes of lead shielding, no mean feat in a cramped laboratory packed with chemicals, electronics, computers, domestic appliances such as freezers and all the latest state-of-the-art instruments that he could get his hands on.

He became a member of the team that built the Sudbury Neutrino Observatory (SNO) deep in a Canadian nickel mine. The observatory relies heavily on the use of photomultiplier tubes in a harsh environment that must be as free as possible from radioactive contamination. Barton’s contributions were pivotal and without them SNO’s evidence that neutrinos emitted by the Sun change their “flavour” on their way to the Earth would be much less convincing. In 1988, Neil Spooner, then at Imperial College, London, and Professor Peter Smith of the Rutherford Laboratory were forming a new collaboration to study dark matter and to hunt for the elusive “WIMPS” (weakly interacting massive particles). They knew that they needed a deep site to shield the detectors from cosmic rays and that the Boulby potash mine in North Yorkshire was the deepest mine in Britain. Barton was enthusiastic about this new project and went with Spooner on the site visit to help persuade the mine management to accept an underground laboratory. They were
successful and the Boulby Dark Matter Collaboration came into being, operating a range of dark matter detectors in the rocksalt seams, one kilometre underground. While he never visited the site again, Barton continued to make vital contributions to the collaboration. The new surface building there has recently been named the John Barton Building.

Much of Barton’s pioneering work was made with relatively cheap equipment he built himself, using the very latest technology available to him, but always on a shoestring budget. Once, when asked why he never applied for grants from the Science Research Council, he replied that, if one applied for a grant, then one had to write reports on the grant, irrespective of the scientific results, and that then one ended up believing what one had written in the reports. Most of his career was spent at Northern Polytechnic, in a period when polytechnics rarely did fundamental research. Barton managed to, despite the environment. In 1968 he put together a pack of 50 research papers and submitted them for a DSc at London University, because he wanted to show that it was possible to do good science in a polytechnic with a supportive head of department.

John Barton was a shy, private and unassuming man but you knew within the first minute of meeting him that you were in the presence of an exceptionally talented and intelligent person. He was an enthusiastic walker and always took an annual walking holiday, most recently a strenuous traverse of Corsica. He loved the cinema and chose to live in Hampstead because of the proximity to the Everyman Cinema. Barton worked in his laboratory almost daily until his final illness. On becoming housebound, he bought the first television he had ever owned, typically finding even Bang & Olufsen’s superior specification left much to be desired.

**John Clifford Barton, physicist:** London 29 September 1923; Senior Lecturer in Physics, University College of the West Indies 1954-58; Lecturer in Physics, Northern Polytechnic (later Polytechnic of North London) 1958-84, Head of Physics Department 1971-84; died London 14 October 2002.

John McMillan

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