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OBITUARY

Harry Whittington (1916–2010)

Palaeontologist who revealed the extraordinary animals of the Burgess Shale.

Harry B. Whittington, who died on 20 June aged 94, led research on the fossils of the Burgess Shale in British Columbia, Canada. His team's studies of these fossils, which date to about 505 million years ago, revolutionized our understanding of the 'Cambrian Explosion', the origin of all the major animal body plans. Whittington was also the world's leading authority on trilobites, diverse marine arthropods of Palaeozoic age — the era between 542 million and 251 million years ago — that fascinate professionals and collectors alike. Whittington continued to publish on them into his nineties.

Whittington grew up in Birmingham, UK, and developed a lifelong interest in Lower Palaeozoic rocks and fossils as a PhD student at Birmingham University. He mapped the geology of the Berwyn Hills in north Wales, determining the age of the rocks using brachiopods and trilobites. In 1938, a Commonwealth Fellowship took him to the Peabody Museum at Yale University in New Haven, Connecticut, where he focused on trilobites, including blind forms called trinucleids, which are characteristic of rocks of Ordovician age (dating to about 488 million to 444 million years ago). Whittington became enthralled by the extra morphological detail afforded by trilobites that have been replaced by silica during fossilization. Silicified specimens do not have to be dug out of the rock; they can be isolated by dissolving limestone in acid — leaving the fossils intact.

Whittington married an American — Dorothy Arnold, who would be his constant companion for more than 50 years — before he left Yale in 1940 and took up a lectureship in Rangoon. The ensuing invasion of the Japanese army prompted a remarkable journey out of Burma (now Myanmar) to China, where Whittington taught at Ginling Women's College in Chengdu, Sichuan Province, until the Second World War ended in Europe.

He returned to Birmingham as a lecturer in 1945. So began further fieldwork in north Wales on the stratigraphy and fossils of the classic Ordovician rocks around Bala. But Whittington continued to be fascinated by silicified trilobites and the remarkable complexities of the trilobite skeleton that they reveal. In 1947, he spent three months in Washington DC studying examples from the Ordovician rocks of Virginia, and in 1949 seized the chance to work in the United States when he was offered a post at the Museum of Comparative Zoology at Harvard in Cambridge, Massachusetts.

During Whittington's 17 years at Harvard, he became established as the international

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authority on trilobites. In addition to monographs on faunas from Virginia, Newfoundland and north Wales, he studied the development of trilobites from larva to adult using silicified specimens. In those days — before the advent of scanning electron microscopy — he had to develop photographic techniques to illustrate tiny specimens, sometimes less than 1 millimetre in dimension. Whittington made major contributions on the morphology, biology and evolution of trilobites, including some of the earliest identifications of ancient faunal provinces on the basis of trilobite distributions and the former positions of tectonic plates.

Whittington's research shifted dramatically in 1966, when he was invited to head a Geological Survey of Canada investigation of the Burgess Shale, including fieldwork in the Rockies. The Burgess Shale had been discovered by Charles Walcott of the Smithsonian Institution in Washington DC in the decade before Whittington was born. The deposit is unusual in preserving a remarkable diversity of soft-bodied creatures, which are normally lost to decay. After Walcott's preliminary descriptions, the fauna was largely ignored, until the Canadian Survey set out to study the geology of the region and to make a new — Canadian — collection from the nation's most famous fossil locality (not least because Walcott's enormous collection is at the Smithsonian).

As he started the Burgess Shale project, Whittington moved from Cambridge, Massachusetts, to the University of Cambridge, UK. Arthropods were the most diverse group of animals in the Cambrian, as they are today, and it was no surprise that his first target was *Marrella*, the most common arthropod in the fauna. Whittington selected the most informative specimens from among thousands collected by the Geological Survey of Canada and previously by Walcott.

He and his team achieved remarkable results in their studies of Burgess Shale fossils by the painstaking application of traditional methods: a modified dental drill for removing the matrix that concealed parts of specimens, a camera lucida attached to a binocular microscope for preparing drawings, and various photographic techniques, including the use of ultraviolet light. Examining specimens preserved in different attitudes helped in restoring the three-dimensional appearance of these flattened fossils. Whittington expected his students to work independently, but he was supportive, tolerant, kind and generous — an avuncular figure to many of them, including myself.

The Burgess Shale provides a much more complete picture of Cambrian life than the fossil record of shells alone. Although Walcott identified the Burgess Shale animals as early examples of modern groups, Whittington found it difficult to place some of the more unusual forms, such as *Opabinia* and *Anomalocaris*, in living taxa. When he presented his preliminary restoration of *Opabinia* — with its anterior proboscis, five eyes, flap-like appendages and rudder-like tail — at a conference in 1972, the audience laughed. Such a reaction is unthinkable today: we have become used to the oddities thrown up by the Cambrian radiation, and now know that *Opabinia* is an early offshoot of the line leading to the modern arthropods.

More recently, exceptionally well preserved Cambrian animals have turned up in other parts of the world, notably at Chengjiang in China and Sirius Passet in Greenland. But it was the Burgess Shale that pushed the creatures of the Cambrian into the limelight. Ironically, it was not Whittington's 1985 book *The Burgess Shale* that generated the excitement (Whittington was a remarkably modest individual), but Stephen Jay Gould's 1989 laudatory best-seller *Wonderful Life*. Gould dubbed some of the more unusual Burgess Shale creatures "weird wonders". However, it was Whittington who had discovered the 'weirdness'. His major contribution was in confirming the explosive nature of the Cambrian radiation and establishing a platform for interpreting the early evolution of the major invertebrate groups — now a central concern of biologists who are delving into evolutionary development and gene sequences to resolve the tree of life.

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