Dr. Harry Blackmore Whittington

Date of Birth: March 24, 1916

Nationality: UK

Position: Emeritus Professor, University of Cambridge

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Education and Career:

1936	B.Sc. from University of Birmingham
1938	Ph. D. from University of Birmingham
1950-1957	Associate Professor, Harvard University
1957-1966	Professor, Harvard University
1966-1983	Professor, University of Cambridge
1983-	Emeritus Professor, University of Cambridge

Awards and Distinctions:

1957	Bigsby Medal, Geological Society of London
1971	Fellow, Royal Society, London
1983	Paleontological Society Medal (USA)
1990	Mary Clark Thompson Medal, National Academy of Science, USA
2000	Lapworth Medal, Paleontological Association, UK
2000	Geological Association of Canada Medal
2001	Wollaston Medal, Geological Society of London

Academic Achievements

During a paleontological career that spans more than sixty years, Dr. Harry Blackmore Whittington has achieved brilliant results in the study of fossil arthropods of the early Paleozoic era, with a particular focus on trilobites. Among Dr. Whittington's major achievements are: (1) the study of trilobite morphology, ecology, and fossil stratigraphy, together with paleogeography; and (2) the study of the Burgess Shale fauna, which led to elucidation of the nature of the Cambrian explosion.

Research on Trilobites

Trilobites are fossil animals characteristic of the Paleozoic era; in particular, there are many known species from the early Paleozoic, i.e., the Cambrian and Ordovician periods, in every part of the world. The members of this major taxon of arthropods have proved valuable in determining geological eras and as biogeographical indicators. However, normally only the carapace survives as a fossil, due to calcification of the exoskeleton. The fossil record seldom allows observation of the ventral part of the body, to which the appendages and various organs are attached. The silicified fossils that are sometimes found in calcareous rock are very useful research materials, since they can be extracted intact by means of acid treatment.

Dr. Whittington pursued research on the biology of trilobites after publishing his first research papers in this area in 1938, and in 1956 he discovered some Ordovician trilobites in the eastern United States that were silicified and therefore exceptionally well-preserved. The detailed descriptions that he published marked a breakthrough in the field, as he succeeded in reconstructing the growth of individual organisms from fossil material that included larvae and exuviae (molted shells).

In further monographs on trilobites, based on similarly well-preserved specimens, he explained the structure and function not only of the carapace but also of the appendages and their joints, the gills, the mouthparts, and so on. Knowledge of the form and structure of these organs provided a basis from which the locomotion and feeding behavior of trilobites could be inferred, and thus led to major advances in the study of their paleoecology. Such achievements required an ample knowledge of arthropod morphology and histology coupled with a painstaking, patient approach to dissection, together with the necessary technical skills and a talent for accurate observation and sketching. Dr. Whittington brought all of these qualities to his work, and as a result he made groundbreaking contributions to our understanding of what kind of animals the extinct trilobites were. His findings were brought together in the 1998 revised edition of the *Treatise on Invertebrate Paleontology: Trilobita,* the most important sections of which were written by Dr. Whittington. When one compares this volume with the previous edition, published in 1959, it is clear that striking advances have been achieved in the study of trilobites over the last four decades, and it is also clear that many of those advances are owed to Dr. Whittington.

Dr. Whittington is also deeply versed in geology, which was his original field, and he has made substantial contributions in applying the trilobite fossil record to elucidate the history of the Earth (especially in the areas of fossil stratigraphy and biogeography). Trilobites in general serve as the main index fossils for the dating and comparison of strata from the Ordovician period, and Dr. Whittington has carried out such work based on rich Ordivician trilobite faunas in many parts of the world, including Newfoundland, Wales, and China, while also discussing boundaries and contrasts among the zoogeographic regions of that period. Recently, these marine faunal regions have been reinterpreted in relation to plate tectonics.

Research on the Burgess Shale Fauna

In the mid-1960s, Dr. Whittington began reexamining the animal fossils yielded by the Burgess Shale, which dates from the mid-Cambrian period (some 530 million years ago). By describing species in detail, one by one, and considering their taxonomic position, he revealed the amazingly diverse nature of the site's fossil fauna and its implications for evolutionary history.

The Burgess Shale is located in the Canadian Rocky Mountains, near Banff, and is famed for the great diversity and exquisite state of preservation of its animal fossils. This fauna was discovered in 1909 by the American Charles D. Walcott, Secretary of the Smithsonian Institution, who was himself a trilobite scholar, and a series of excavations in the area yielded a vast number of specimens. In addition to trilobites, the site was remarkable for yielding — in excellent condition — a large number of soft-bodied animals, which do not normally remain in the fossil record. Walcott tentatively named and described many of these soft-bodied animals, but he found numerous specimens that were so strange in form as to be unclassifiable, since no comparable animals were known, and these awaited detailed study by a later generation of scientists. Thus, many of the soft-bodied animals of the Burgess Shale had little more than a name; their nature remained a mystery. Moreover, since all of the fossils had been compressed into a thin film by the weight of sediments above them, the work of recreating their three-dimensional forms required familiarity with the basic anatomy of a wide variety of animals, as well as great skill at dissection.

In the mid-1960s, Dr. Whittington launched a step-by-step reexamination of the Burgess fauna, carrying out new excavations in addition to studying the vast number of specimens already held at the Smithsonian's National Museum of Natural History, the Agassiz Museum of Comparative Zoology at Harvard University, and other institutions. Applying original techniques of dissection and ultraviolet photography that he had developed in his work on trilobites, he closely observed and described the species, one by one. These studies shed light on the nature of such creatures as *Marrella,* which resembles a trilobite with a swallow-shaped structure on its back; *Opabinia,* with its nozzle-shaped mouthparts and five eyes; *Aysheaia,* which is thought to be related to the present-day Onychophora; and the giant predator *Anomalocaris*. Many of these animals could not be assigned to any existing group in the classification system. Not only did Dr. Whittington report on their morphology, but he also used these findings as the basis for detailed reconstructions of their ecology and diet, and even discussed the fossilization process based on the nature of the sediments.

In the 1970s, recognizing the great diversity and importance of this fauna, Dr. Whittington organized the Cambridge Group, which included outstanding younger scientists such as his own former students Derek Briggs and Simon Conway-Morris. With these coworkers, he pursued the study of the Burgess fauna still more vigorously. The group has succeeded in clarifying the nature of a key event in the history of life on Earth, the "great Cambrian explosion." Formerly, paleontologists believed that life had grown steadily more diverse and more sophisticated in a gradual process that continued through the geological eras from the Cambrian onwards, but the findings of the Cambridge Group overturned this accepted view. It is now widely recognized that: (1) a massive burst of differentiation occurred in a relatively short time during the Cambrian period; (2) most of the phyla of higher animals that exist today, including the Chordata to which we human beings belong, were already in existence at this time; (3) there were many types of animals that did not belong to any of the phyla or classes commonly known today; (4) hence, only some of the many species then in existence survived to become the ancestors of later animals. It is thought that, on the Earth at the time of the great explosion, a variety of habitats were unoccupied and conditions were in place for multicellular animals to undergo an enormous adaptive radiation. The nature of the explosion has been clarified still further in recent years as the Cambridge Group has extended its research to other faunas, such as those of Sirius Passet in northern Greenland and Chengjiang in China's Yunnan Province (both of which are early Cambrian and contain many soft-bodied animals). Although Dr. Whittington is not directly involved in the latter projects, his achievements both as a pioneer in this field and as the mentor of a number of outstanding researchers can be said to occupy a special place in the annals of paleontology.

In recent years, the aims, subject matter, and methods of paleontology have been rapidly expanding, and there has been much excellent work incorporating theoretical or hypothesis-inference approaches. However, the unique potential of paleontology remains the same: it can provide original, direct evidence of the evolution of living things. While Dr. Whittington has employed orthodox methodology to study seemingly undramatic primary materials, his achievements can be said to exemplify paleontological science at the height of its potential.