Description for the general public (in English)

Alfred Wegner in 1912 first proposed that the Earth's continents wandered across the globe through geological time. He was ridiculed then, but thanks to the plate tectonic revolution of the 1960's when the ocean floor was mapped, he was shown to be correct. It has been known since that the continents, and the plates they lie on, move across the globe through plate tectonic processes which have been active since the early days of the Earth.

It is now beginning to emerge that our wandering continents came together and diverged at various points in Earth's history, a process known as the Supercontinent Cycle. The last known supercontinent was Pangaea, which existed approximately 300 million years ago, and began to break apart in the time of the dinosaurs. However, this was just one of many supercontinents stretching back in time, with the supercontinent before Pangea known as Rodinia, existing in the Neoproterozoic up to one billion years ago. This supercontinent occurred at a critical juncture in Earth's history, when the hostile environments of the ancient Earth changed into the habitable world we know today, and is an exciting avenue of research to understand how the world we know today came to be. Supercontinents, driven by forces deep within the Earth, have had a dramatic effect on the Earth's climatic and environmental system. As the supercontinent Rodinia came together, and began to break up along the equator approximately 700 million years ago, large and extensive volcanism erupted and covered the surface of the Earth's continents in lava, sometimes up to kilometres thick. Such volcanic events are unlike anything the human race has ever witnessed, but is now known to occur sporadically throughout Earth's history. Therefore, these large volcanic provinces are an important marker, and like large meteorite impacts, have been known to cause mass extinctions. **Such catastrophic volcanism 720 million years ago on Rodinia led to massive amounts of volcanic gases escaping into the Earth's atmosphere, and the weathering of the lavas into the oceans, accelerated by the positioning of the supercontinent over the equator, likely triggered a global glaciation, a Snowball Earth encasing the world in ice. This volcanic event forms the focus of this study. By studying largely undocumented fragments remaining of this large volcanic province at 720 million years ago, we can complete a fundamental puzzle piece in our understanding of the controversial paleogeography of the supercontinent Rodinia better.** This will be achieved by placing southern Africa and eastern Antarctica against North America and Siberia in a new Rodinia reconstruction through high precision geochronology and paleomagnetic studies conducted in Zimbabwe, with further samples being provided through international collaboration from Dronning Maud Land in east Antarctica. In addition, with better geochemical constraints on the large volcanic province, we can understand better its nature and source from deep within the Earth, and provenance studies on the host rocks can also allow us to match up the surrounding continental basement, all the ingredients necessary to complete the paleogeographic puzzle of Rodinia and better resolve the nature of this large volcanic province 720 million years ago.

With these results, we aim to model the existing empirical data better within the context of the supercontinent Rodinia, with the hope of understanding better how volcanism led to global glaciation, how the fire led to the ice. This is important, as when the world emerged from this glaciation, over a hundred million years later, the nutrient trapped in the oceans led to a boom in biological production. This biological production is recorded in organic carbon burial from these times, and ultimately drove photosynthesis by these single-celled organisms into over-drive, producing increasing oxygen concentrations in the Earth's atmosphere similar to what we know today. This positive-feedback loop led to the evolution of multi-cellular life, an event that sparked the biological big bang in the Cambrian 540 million years ago, and the planet we know today began to emerge.