Editorial

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In the movie *Annie Hall*, there is a scene where a boy is depressed after learning at school about the expansion of the universe. The boy grows up with an inexpressible anxiety, and during a visit to a psychiatrist, he says: "The universe is expanding". "But why are you depressed?" asks the psychiatrist. The boy replies, "The universe is everything, and if it is expanding, some day it will break apart and that will be the end of everything".

The expansion of the universe is one of the major discoveries of the twentieth century and one of the few to have entered popular discourse. It is, on one hand, disconcerting to realise that the cosmos that looks eternal at first sight could be increasing in size at a frightening speed, and on the other hand, the concept of expansion of the whole universe raises many prickly questions, like the one posed by the boy in the movie. Is our solar system expanding? If the universe is expanding, then what is it expanding *into*? If *everything* is expanding, then how can we ever measure it, since our measuring tapes would also be expanding? If everything has been going away from one another forever, then how did matter come together to form stars or galaxies? If we reversed the direction of time and looked into the past, would we go back to a point when the universe had no size at all?

We feature Edwin Hubble and his work in this issue of *Resonance*, with articles that try to answer some of these questions. Hubble's discovery came at a time when physicists were grappling with the implications of Einstein's new theory of gravitation. The calculations showed that the universe could not be static, and Einstein introduced an extra term in his equations to make it static, being unaware of the astronomer's work. The work of Hubble put an end to the debate. Hubble was therefore fortunate that his work came at a time when it could be

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understood with the help of a theoretical framework. He was also fortunate to have had access to the largest telescope at that time. It was only around the beginning of the twentieth century that astronomers started building telescopes on the top of mountains, to avoid the effects of turbulence in the lower atmosphere. A set of telescopes were built atop Mount Wilson in the western coast of USA just before Hubble began his work. The discovery of the expansion of the universe therefore is an example of the coming together of theoretical work and innovation in technology in the advancement of science.

This year, we are celebrating the International Year of Astronomy. Four hundred years ago, in 1609, Galileo held his telescope to view the starry heavens, and changed the course of science with his first discoveries. Edwin Hubble's discovery was one of the most startling discoveries that astronomers have ever made, and it is fitting that *Resonance* should discuss the pros and cons of his work in an issue this year.

Hubble was also a great fan of science fiction and Jules Verne's *Twenty Thousand Leagues under the Sea* was one of his favourites. In the cartoon below, Hubble is portrayed in the role of the famous Captain Nemo, exploring the frontiers of the universe.