

Researcher finds hint of dark energy discussion in letters between Einstein and Schrodinger

December 11 2012, by Bob Yirka



Erwin Schrödinger

(Phys.org)—Alex Harvey, a physics professor at the City University of New York has uploaded a paper to the preprint server *arXiv*, in which he claims Albert Einstein and Erwin Schrödinger were writing letters back and forth to one another in a way that indicated that that the two were on the precipice of discussing the possibility of the existence of dark energy.

The letter exchange came in the years after Einstein had published his

theories on [general relativity](#), and revolved around the matter of the [cosmological constant](#). In his original publications, believing that the universe was static, there was no constant. Shortly thereafter he added a constant to explain the case of the universe expanding or contracting due to gravity – which would cause the universe to revert back to its static state. Subsequent work by Lemaître and [Hubble](#) proved that the universe was indeed expanding however and so to account for this new development, Einstein removed the constant and wrote later that failing to predict the [expansion of the universe](#) was the biggest blunder of his career.

In letters Einstein and fellow physicist Schrödinger wrote to each other, snippets of conversation appeared to verge on the cusp of imagining the idea of dark energy, a concept that didn't come about until almost a century later. Schrödinger wrote to Einstein suggesting that perhaps the constant could be put on the right side of the equation, allowing it to be a variable under certain conditions. Einstein wrote back asking if he was imagining a scenario where the constant changed with time. Schrödinger replied back that yes, moving the constant to the other side of the equation implied it could at times be used as a variable. Doing so, both realized would imply that some force was at play – something not covered in Einstein's equations. Einstein scoffed at the idea, writing later that Schrödinger's idea didn't seem possible because it would lead "too deeply into the thicket of [hypotheses](#)."

Many years later, researchers found that the universe was expanding at an accelerating rate, which has been theorized to be caused by an unknown force called dark energy. Whether Einstein would have changed his mind about which was a bigger blunder is unknown of course, but according to Harvey, the letters between the two men indicated that they were struggling with the very same issues of [dark energy](#) as physicists are today, but just didn't realize it.

More information: How Einstein Discovered Dark Energy,
arXiv:1211.6338 [physics.hist-ph] arxiv.org/abs/1211.6338

Abstract

In 1917 Einstein published his Cosmological Considerations Concerning the General Theory of Relativity. In it was the first use of the cosmological constant. Shortly thereafter Schrödinger presented a note providing a solution to these same equations with the cosmological constant term transposed to the right hand side thus making it part of the stress-energy tensor. Einstein commented that if Schrödinger had something more than a mere mathematical convenience in mind he should describe its properties. Then Einstein detailed what some of these properties might be. In so doing, he gave the first description of Dark Energy. We present a translation of Schrödinger's paper and Einstein's response.

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