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Discrete Space-Time: History and Recent Developments DAVID CROUSE, Clarkson Univ — Discussed in this work is the long history and debate of whether space and time are discrete or continuous. Starting from Zeno of Elea and progressing to Heisenberg and others, the issues with discrete space are discussed, including: Lorentz contraction (time dilation) of the ostensibly smallest spatial (temporal) interval, maintaining isotropy, violations of causality, and conservation of energy and momentum. It is shown that there are solutions to all these issues, such that discrete space is a viable model, yet the solution require strict non-absolute space (i.e., Mach's principle) and a re-analysis of the concept of measurement and the foundations of special relativity. In developing these solutions, the long forgotten but important debate between Albert Einstein and Henri Bergson concerning time will be discussed. Also discussed is the resolution to the Weyl tile argument against discrete space; however, the solution involves a modified version of the typical distance formula. One example effect of discrete space is then discussed, namely how it necessarily imposes order upon Wheeler's quantum foam, changing the foam into a gravity crystal and yielding crystalline properties of bandgaps, Brilluoin zones and negative inertial mass for astronomical bodies.

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