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Gravitational Effects of a Crystalline Quantum Foam DAVID CROUSE, Clarkson Univ — In this work, concepts in quantum mechanics and general relativity are used to derive the quantums of space and time. After showing that space and time, at the Planck scale, must be discrete and not continuous, various anomalous gravitational effects are described. It is discussed how discrete space necessarily imposes order upon Wheeler's quantum foam, changing the foam into a crystal. The forces in this crystal are gravitational forces due to the ordered array of electrically neutral Planck masses, and with a lattice constant on the order of the Planck length. Thus the crystal is a gravity crystal rather than the more common crystals (e.g., silicon) that rely on electromagnetic forces. It is shown that similar solid-state physics techniques can be applied to this universe-wide gravity crystal to calculate particles' dispersion curves. It is shown that the crystal produces typical crystalline effects, namely bandgaps, Brillouin zones, and effective inertial masses that may differ from the gravitational masses with possible values even being near zero or negative. It is shown that the gravity crystal can affect the motion of black holes in dramatic ways, imbuing them with a negative inertial mass such that they are pushed by the pull of gravity.

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