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(G*) (POS-23) Logarithmic Wave Catastrophes: Hawking Radiation, Tidal Bores, and Radio Astronomy

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Caustics are regions of high intensity created generically by the natural focusing of waves. Some examples include optical rainbows, gravitational lensing, sonic booms, and even rouge waves. The intensity at a caustic is singular in the classical ray theory, but can be smoothed out by taking into account wave interference effects. Caustics are universally described by the mathematical theory of singularities known as catastrophe theory. Caustics can be categorized into classes of catastrophes, each class uniquely described by its own diffraction pattern. A more exotic form of wave singularity occurs near event horizons, which have analogues in classical hydrodynamics where the flow speed exceeds the speed of sound, and also in quantum fluids such as Bose-Einstein condensates (BEC), where Hawking radiation can be simulated. In particular, waves near event horizons display logarithmic phase singularities which cannot be described by the known catastrophe classifications. We introduce a new idea: a logarithmic catastrophe, which were first studied in the context of aeroacoustic flows from jet engines. We will discuss the basic idea behind these logged catastrophes and their relation to analogue Hawking radiation. Additionally we discuss two systems which appear to be categorized by logged catastrophes: undular tidal bores, and certain oscillatory
integrals in radio astronomy.

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