Black hole “baldness” reflected in more everyday objects: physicist

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Courtesy Washington University in St. Louis
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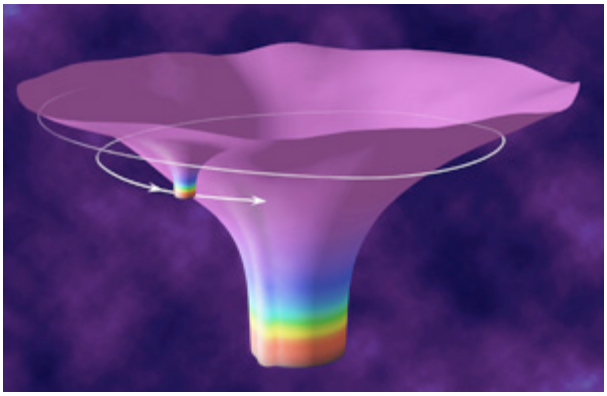
New research from a Washington University in St. Louis physicist may help scientists find spinning black holes orbited by smaller black holes in space.

A black hole is an object so dense that its field of gravity permanently imprisons anything that come too close, even light. Ordinary laws of physics also break down in its vicinity.



A mathematical representation of a small black hole orbiting a larger one. Physicist Clifford Will hopes to learn more about how these orbits play out, where the relativist Carter constant plays a key role. (Illustration by Don Davis)

Einstein’s general relativity theory implies that rotating black holes have only two observable properties: mass and spin. This simplicity is sometimes summed up by a saying, “black holes have no hair.”

A small object theoretically orbiting a rotating black hole is more complex. It traces a twisting rosette pattern with no discernible regularity, though two quantities associated with the satellite—called energy and angular momentum—would remain fixed over time.

In 1968, theoretical physicist and cosmologist Brandon Carter found that such a particle’s gyrations also hold a third variable fixed. The meaning of this quantity, dubbed the “Carter constant,” remains somewhat mysterious.

Now Clifford M. Will at Washington University has found that even among objects that follow laws of gravity, arrangements can exist whose gravitational field admits a Carter-like constant of motion. Variations in the gravitational field shape are determined by equations identical to those for rotating black holes, also called Kerr black holes.