Infographic: Rhic cooks up a quantum tempest in a teacup

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When particles collide inside Brookhaven Lab's Relativistic Heavy Ion Collider (RHIC), they melt at trillion-degree temperatures and form a friction-free "perfect" liquid. This quark-gluon plasma, composed of the liberated building blocks of protons, filled the early universe just microseconds after the Big Bang. Recreating this primordial plasma gives scientists a way to study the dawn of time and the forces that bind the visible matter of the cosmos.

But what would happen if we poured this ultra-hot melted matter into a teacup—admittedly a tall order—and began to stir?


QUANTUM TEMPEST
in a teapot
BOILING HOT MATTER
Water molecules transform into steam at 212° Fahrenheit.
Shattering subatomic particles takes way more energy.
The Relativistic Heavy Ion Collider has what it takes.
At RHIC, gold ions traveling at practically the speed of light meet in head-on collisions that reach 7 trillion degrees.
That's 250,000 times hotter than the center of the sun—hot enough to transform solid matter into quark-gluon plasma.
THE PERFECT BREW
Quark-gluon plasma is a bizarre and fascinating substance. It has almost no viscosity—if you were to stir a cup of it and remove the spoon, it would keep swirling for ages.
Good luck trapping it in a teacup, though.
RHIC's hot primordial plasma fizzles out in a fraction of a second, but it filled the universe 13.7 billion years ago—just after the dawn of time.
Our atom smasher sends 111 bunches, each containing billions of gold ions, around a 2.4-mile tunnel billions of times every day. The ions make as many as 3 billion trips around that ring before colliding inside our detectors.
READING THE TEA LEAVES
The heavy ion collisions create showers of subatomic particles which leave trails in the STAR and PHENIX detectors.
The path of each particle gives clues about its traits, and our scientists use this data to pry free the secrets of quark-gluon plasma and the early universe.
Momentum
Charge
Weight
BROOKHAVEN NATIONAL LABORATORY
bnl.gov/rhic
RELATIVISTIC HEAVY ION COLLIDER

Provided by Brookhaven National Laboratory