

# One-hour broilings

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UA scientist

## thinks meteor baked Earth

By Dan Huff

The Arizona Daily Star

Imagine the entire sky erupting with fire.

Now feel the heat from such a horror — 10 times hotter than high noon on a July day in the Arizona desert. Hot enough to ignite much of the world's forests like so much tinder.

Hot enough to broil steaks — dinosaur steaks.

UA planetary scientist H. Jay Melosh and his colleagues say in an article published last week in *Nature* magazine that geologic evidence suggests such a worldwide conflagration occurred about 65 million years ago — and the fire lasted for an hour or so after a comet or asteroid roughly six miles in diameter slammed into the Earth.

The hypothesis for such a cosmic collision was first offered in 1980 by Nobel Prize-winning physicist Luis Alvarez and his geologist son, Walter.

They speculated that a half-inch-thick layer of dust containing the meteoritic element iridium, found at last count in roughly 70 locations around the world, resulted from dust kicked up by a mountain-sized rock hitting the Earth at 40,000 miles an hour.



H. Jay Melosh believes a meteor may have hit the planet, sparking a firestorm



up by a meteorite...  
ing the Earth at 40,000 miles an  
hour.

The Alvarezes theorized that the dust may have blocked sunlight, cutting off the photosynthesis required for plant growth, thus starving dinosaurs into extinction. The fossil record indicates the dinosaurs died off about then.

Because in 1985 researchers Edward Anders and Wendy S. Wolbach of the University of Chicago found graphitic carbon — soot — in the iridium layer, Melosh and his colleagues believe the scenario was far worse.

They say vaporized rock and debris thrown up by the incomprehensible force of this impact would have shot upward, puncturing the Earth's atmosphere. The incandescent plume would have risen high above the planet and rolled out around it, with the vaporized rock and earth cooling and condensing in the process, Melosh says.

The celestial firestorm would have come as the condensation, much of it in the form of particles no bigger than grains of sand, re-entered the Earth's atmosphere.

Melosh and his colleagues have calculated that these grains would have been moving at five to eight kilometers per second as they hit the atmosphere. Accord-

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ing to their calculations, at those speeds, each of the trillions of sand grains would carry energy in an amount larger than its weight in TNT.

When the grains hit the Earth's upper atmosphere, 45 miles over the surface of the planet, the resulting friction would generate heat — 1,800 to 2,000 degrees Fahrenheit, he said.

Melosh notes that a meteorite flashing across the night sky is caused by a single tiny particle. Imagine, he says, an entire sky full.

Half of the heat would have dissipated into space.

Water vapor in the atmosphere — especially dense clouds over tropical forests — would have stopped another two-thirds of the heat from reaching the ground, but there also would have been "heat pulses" — especially hot bursts — in some areas caused by heavy concentrations of re-entering particles, according to Melosh.

The remaining one-third of the heat would have reached the ground, Melosh said. Detailed calculations indicate the amount of heat energy on the ground could have amounted to as much

as 10 kilowatts per square meter, he said.

"To get a gut feeling for this," Melosh said, "one weekend I disconnected my oven and measured its power consumption. On broil it produced about 10 kilowatts per square meter. When you do that, you begin to understand what global extinction is."

In other words, the Earth was broiled for an hour.

There would have been enough heat to set whole forests aflame, he said, citing the calculations of Donald Latham of the U.S. Forest Service Intermountain Fire Sciences Laboratory at Missoula, Mont. Latham is an expert on ignition of forests by radiant energy.

Other scientists theorize that tiny, primitive mammals, safe in their burrows, perhaps under some thick tropical forest, survived. They could have emerged after the resulting dinosaur die-off to fill the ecological niches suddenly vacated by the lumbering beasts.

The search is on for the remains of the giant crater caused

### Celestial firestorm

Comet or asteroid  
slams into Earth



As the debris re-enters  
trillions of grains of s  
degrees Fahrenheit.

Incoming debris

45 miles

Source: H. Jay

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# Broiling

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by the collision, Melosh said.

But he added that if the collision occurred in the ocean, the same plate tectonic activity that causes the rise of continents and that is thought to contribute to earthquakes in such places as California, may have obliterated all record of the impact.

The impact crater may have been "subducted," or pulled under the Earth's crust, into the molten regions below, he said.

That the dinosaurs disappeared about 65 million years ago is not generally disputed. However, a large number of sea creatures also disappeared about the same time — a fact that puzzles scientists.

Melosh and his colleagues have an explanation.

He said it was suggested by John Lewis of the UA's planetary sciences department at the beginning of this decade. Lewis theorized that a massive oceanic die-off could have been triggered when the atmosphere, heated by the collision with the comet or asteroid, forced nitrogen and oxygen gases to combine in the lower atmosphere to form nitric acid.

"So we may have had a very intense acid rain," Melosh said.

When acid is dropped on limestone — calcium carbonate — the limestone dissolves. According to the fossil record, sea creatures with calcium carbonate shells fared

poorly 65 million years ago, while those with shells made of silica survived, Melosh said.

The Alvarezzes met with a great deal of skepticism when they announced their theory, Melosh said. But during the last few years, more scientists have been jumping on their bandwagon.

"There's been a long history in the earth sciences of avoiding cataclysmic theories," he said. The aversion stems from the 1840s, when early geologists had to contend with doubting Christians and their biblical versions of sudden creation.

During that time, geologists developed the dogma that large-scale changes in the Earth took place gradually, over eons, Melosh said.

The discovery of the iridium layer, however, is causing the dogma to crumble.

"Things have been snowballing since then," Melosh said. "Now we're thinking the moon may have been formed by a giant impact."

It's possible, Melosh speculates, that life on Earth, which is thought to have begun before roughly 3.5 billion years ago, may have been wiped out and forced to start over several times by asteroid or comet collisions.

The evidence suggests the Earth is struck by a large meteorite roughly every 200 million years, he said. "I wouldn't worry about it or lose any sleep over it."

Melosh's colleagues include UA graduate student Nicholas M. Schneider, NASA Ames Research Center atmospheric scientist Kevin J. Zahnle, and Latham.





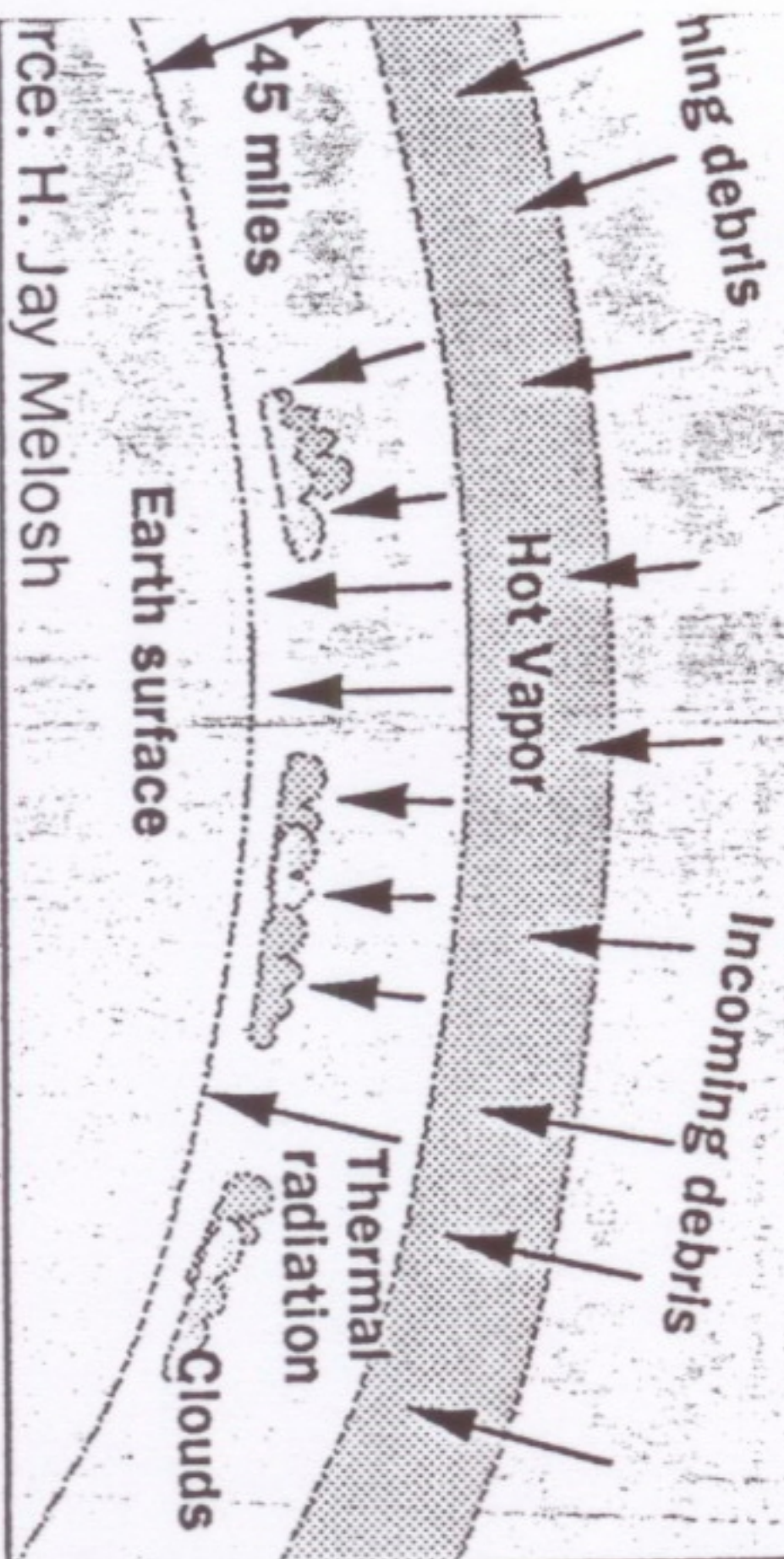


A.E. Araiza, The Arizona Daily Star  
**firestorm that destroyed most life on Earth**

## al firestorm



debris re-enters the atmosphere, each of the grains of sand would generate 1,800 to 2,000 Fahrenheit.



Source: H. Jay Melosh  
Jon Hassen, The Arizona Daily Star