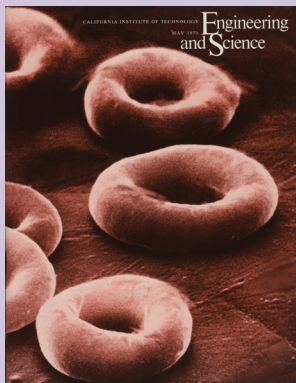


Saturn's rings are made of particles ranging from tiny pieces of dust to huge boulders. On May 3, 2005, the Cassini spacecraft sent radio signals back to Earth through the rings to measure the particles' size distribution. In this simulated image, which has a resolution of 10 kilometers, purple represents regions where all the particles are bigger than five centimeters wide. Green areas contain particles smaller than five centimeters, and blue ones have particles smaller than one centimeter. The white zones are so dense that the signal didn't get through. For more on what Cassini is showing us about the rings, go to page 22.

40 YEARS AGO IN *E&S*

May 1970's cover shot of red blood cells was taken with a scanning electron microscope by Richard Baker, a professor at USC and a Caltech research associate. He, Professor of Engineering Science J. Harold Wayland (MS '35, PhD '37), and JPL's John Devaney were studying the cells' mechanical structure.

"The Future Isn't What It Used to Be," Arthur C. Clarke told Caltech on April 12, 1970. The dean of science-fiction writers had been invited to campus to speculate on what the world would be like in—of course!—2001. He cautioned that his conjectures were far from predictions, and indeed many of his ideas seem outlandish today. Yet the themes he touched on are still very much relevant. He recognized the inefficiency of raising animals for food, and suggested that we domesticate animals such as antelopes, tapirs, or hippos that could live off "marginal land that's of no use for anything else." We could also herd whales instead of cattle, an idea he wrote about in his 1957 novel, *The Deep Range*. And we could engineer microorganisms to transform "inedible materials—such as sawdust and wastes of various kinds—into food which we or our animals can eat." He even suggested, those being the days before the first oil crisis, that much of our protein could be derived from petroleum products.

Perhaps fortunately for our taste buds, none of these have come to pass. But Clarke did predict the communications revolution and an interconnected world thriving on a vast "information grid." Although he thought this revolution would come by way of satellites instead of fiber-optic cables and Internet cafés, the globalized world he envisioned has essentially come true: "The home will have a kind of communications console with a television screen, television camera, computer keyboard, microphone, and probably hard-copy readout." He also foresaw the troubles now facing print journalism, saying that "the newspaper as we know it will be extinct."

Since everyone will be connected remotely, "many people will be able to do most of their work without leaving home—unless their wives insist." (He apparently didn't anticipate the rise of the working woman.) Everyone around the globe would live and work together in step, he said, and time zones will be abolished—or else sleep itself, via some chemical or electronic innovation. The future would give us more free time, and education would be the greatest industry, followed by entertainment. Clarke was hopeful that the world would turn the corner by the 21st century, that "2001 could mark the great divide between barbarism and civilization." Maybe it didn't quite turn out that way, but we can always be optimistic and raise a tall glass of whale milk to the future.

Also in the May 1970 issue, JPL's Ray Newburn (BS '54, MS '55) discussed the prospect of a "Grand Tour" of the outer planets, using a then-untried method of gravitational slingshots to take advantage of a 1976 planetary alignment that had last occurred during the Jefferson administration and wouldn't happen again until 2148. Accompanying the article were two grainy, telescopic photos of Jupiter and Saturn, and neither Newburn nor anyone else could've anticipated the stunning images that the grand tourists—the Voyager spacecraft—would return.

Beyond Saturn, the planets were just fuzzy blobs. Newburn noted that we weren't even sure of Neptune's size, much less its density. Seeing the gas giants up close was a once-in-several-lifetimes opportunity. "We have a chance to do that with reasonable economy this decade; otherwise we must develop new vehicles with greater performance and spacecraft with very long lives, or wait until the middle of the 22nd century." Fortunately, we didn't wait. —MW **ess**



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