Engineering & Science welcomes letters. Send correspondence to Douglas L. Smith, editor, *E&S* magazine, Caltech mail code 1-71, Pasadena, CA 91125, or e-mail dsmith@caltech.edu. We reserve the right to edit any letters selected for publication for length, content, and clarity.

Caltech Solid Mechanics Symposium, to be delivered annually by an internationally recognized scholar chosen by the faculty. The first lecture, by Rohan Abeyaratne of MIT, is scheduled for February 27 at 9 a.m. in Beckman Institute Auditorium. The lecture will be followed by a daylong program of talks by 12 current grad students and postdocs from the Division of Engineering and Applied Science. Open to the public, the Knowles lecture and symposium will commemorate his contributions to solid mechanics, his love for Caltech, and his encouragement of young researchers.

Knowles leaves behind a wife, Jacqueline, and sons John, Jeff, and James, and their families. — *JW* E&S

F. BROCK FULLER

1927–2009

F. Brock Fuller, emeritus professor of mathematics, died on November 6 at the Rafael Convalescent Hospital in San Rafael, California, four years after being diagnosed with diffuse Lewy body disease. He was 82.

After receiving his bachelor's, master's, and PhD degrees from Princeton, Fuller came to Caltech in 1952 as a research fellow. He became an assistant professor of mathematics in 1955 and was appointed associate professor in 1959, and professor in 1966. In 1994, he became professor emeritus.

Fuller worked on the topology of how curves twist and coil, an endeavor prompted by the need for a quantifiable description of the supercoils being found in double-stranded DNA helices. A DNA supercoil forms when the famed double helix is itself twisted and coiled, the way the cord on the wall phone in your kitchen likes to do. A DNA molecule can be thousands of times longer than the cell whose blueprints it contains, so twisting it into compact supercoils allows it to fit inside the cell. Fuller developed a quantity called a writhing number, which is the number of times the double helix crosses over itself. The sum of the writhing number and another quantity called the twisting number, which Fuller defined as the number of times each DNA strand twists around the other, together measure the amount of supercoil in the DNA.

In the early 1980s, Fuller—who was also an audiophile—was involved in analyzing digital recording technologies as they began to reach prominence in the audio-entertainment industry. Working alongside Caltech colleagues such as Gary Lorden (BS '62) and James Boyk, Fuller examined music piped into Thomas Laboratory from Dabney Lounge, comparing various signals.

Fuller moved to San Rafael, in northern California, in 1996. He is survived by his wife, Alison Clark Fuller of San Rafael; his daughter, Lynn D. Fuller of San Francisco, her husband, William Bivins, and their four children, Samuel, Zachary, Elizabeth, and Claire Bivins; and his sister, Cornelia Fuller of Pasadena.
— *JW,MW* E&S

I take issue with a statement you make in your article: "Unfortunately, burning carbon dioxide back into hydrocarbons is very, very hard." It is only hard for human beings. Some species of algae find this task very easy. Melvin Calvin, a Nobel Prize winner from UC Berkeley, spent 25 years of his life studying plants that make hydrocarbons.

Calvin identified the genus *Botryococcus* as a remarkable source of hydrocarbons. He reported that the dry weight of this algae is 86 percent hydrocarbon! He identified the structures of some of the major components in the mixture. They fell into two groups: linear isoprene oligomers and cyclized steroids. Both of these products could be burned instead of coal to produce electricity and be fed to refineries in place of petroleum.

The work you wrote about requires two major investments to produce a feedstock that will replace coal or oil. The first is the solar power tower. The second is the Fischer-Tropsch unit. Neither is cheap compared to digging up coal or pumping up oil. The two investments cannot compete with skimming algae off the ocean surface and pressing out their hydrocarbons.

Too many entrepreneurs brag about how their invention will be competitive with petroleum in a few years. They are careful not to specify the price of the petroleum they are competing against. This is a real problem. The winning solution will be the one that requires the least new capital investment.

Frank Weigert [PhD '68]
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