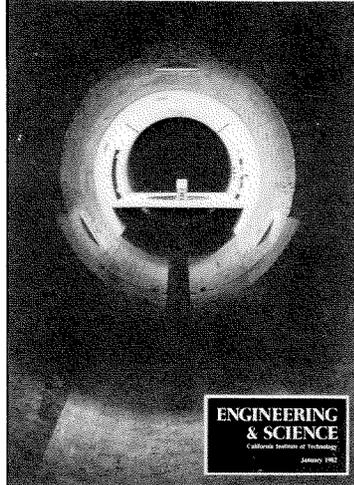


## In This Issue



### Tunnel Vision

On the cover — a truck model undergoes aerodynamic testing in the 10-foot wind tunnel. Originally designed and built over 50 years ago for research with aircraft, the wind tunnel has also been used for more than 20 years to study the aerodynamics of road vehicles.



The person responsible for bringing cars and trucks into Caltech's wind tunnel was William H. Bettes. He first came here in 1956 as a consultant with the Southern California Cooperative Wind Tunnel, which was managed by Caltech. He began to work part time for the Institute in 1958 and full time in 1960. (He also earned his MS in aeronautics from Caltech in 1963.) By the time he came here, however, Bettes was getting "bored with airplanes," and, since he had "always been interested in cars," the wind tunnel found a new application.

Designers of cars built for speed have long known the advantages of wind tunnel research (for example, the land speed record car *Goldenrod*, whose 1965 record still stands, was tested in the Caltech tunnel), but it has been only recently that the major automobile manufacturers have begun to look at aerodynamic design as a way to cut fuel consumption. Overcoming aerodynamic drag accounts for half of the

fuel consumption in highway driving.

So it was quite a timely topic that Bettes, who is now director of experimental facilities and manager of GALCIT, presented in his October Watson lecture. An article adapted from that talk, with some of the technical data omitted, "The Aerodynamic Drag of Road Vehicles — Past, Present, and Future," begins on page 4.

### Cosmic Connection

Research on cosmic rays — atomic nuclei stripped of their electrons bouncing around our galaxy at speeds almost up to the speed of light — has a long history at Caltech. Even before he came here, Robert A. Millikan had begun his studies of this "penetrating radiation," which he later proved came from the cosmos and named "cosmic rays." Although he mistakenly believed they were photons rather than charged particles, Millikan's initial work spawned research that began to reveal the characteristics of these and other particles.

Caltech scientists are still among the leaders in catching cosmic rays and deciphering the messages they carry about the universe and its formation. Since the atmosphere stops most cosmic rays, sophisticated detectors are being packed off into space — still on balloons as in Millikan's day, but also on satellites and other spacecraft. Voyager 1 is now on its way out of the solar system to send back the first data on low-energy galactic cosmic rays. In "Star Stuff," beginning on page 15, News Bureau Director Dennis Meredith describes some of these current experiments and the mysteries they are solving, as well as some of the new riddles they are posing.

### Castles in France



Last spring a conference on "Family and Property in Traditional Europe," sponsored by the Division of the

Humanities and Social Sciences with the support of the Weingart Foundation, brought together historians from the U.S., Canada, and Europe at Caltech and the Huntington Library. The five-day program included, in addition to the scholarly seminars, public lectures by some of the visiting scholars.

One of these lectures concerned a new slant on the political role of the earliest French castles, presented by Michel Bur, professor of medieval history at France's University of Nancy II. An article adapted from it, "The Motte and Bailey Castle: Instrument of a Revolution," appears on page 11.

Bur is an archaeologist as well as a historian, and when he found insufficient information in written records, he set out to find more evidence in the ground. And the remains of the 10th- and 11th-century castles are quite literally only ground, little hills barely distinguishable from the ones put there by nature. As the pioneer of this archaeological approach to French history, he currently heads a national research team compiling a catalog of fortified dwellings in France.

He is also writing a book describing the history of a medieval family through the changes in its castle or residence, and he is working with John Benton, professor of history at Caltech, on an edition of the charters of the counts of Champagne.

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