chairman: E. F. Poncelet, "Fracture propagation"; H. Kolsky, "High speed photography."

30 Aug. Surfaces, J. W. Michener, *chairman*: E. U. Condon, subject to be announced; W. F. Koehler, "Geometry of glass surfaces." *Surfaces,* H. E. Simpson, *chairman*: speaker to be announced, "Chemical reactivity of glass surfaces; the use of tracers."

31 Aug. Speaker to be announced, "Ionic diffusion in surface domain"; speaker to be announced, "Coupling of protective films and organic films to glass."

Graham Edgar, Chemist of Parts

First as a youthful university professor and then as a creative industrial chemist and a capable executive, Graham Edgar led a full life and will be remembered in many ways. Nevertheless, his principal contribution—like that of many another modest research worker and teacher—has gone largely unrecognized. Those few in a position to know say that Edgar's discovery and preparation of isooctane and his missionary work with the engineers in the U.S. Air Force were directly responsible for the early development of 100-octane aviation gasoline. This fuel was an important factor in winning the Battle of Britain and in the subsequent Allied superiority in the air during World War II.

Born in Fayetteville, Arkansas, on 19 September 1887, Edgar grew up in an era when education was obtained with an economy of time and money that is unknown today. Before he was 22 he had joined the faculty of the University of Virginia, with a B.S. degree from the University of Kentucky and a Ph.D. in chemistry from Yale. He was a member of Phi Beta Kappa, Sigma Xi, and Tau Beta Pi. His initial research was in the sternly disciplinary field of analytic chemistry; his later work covered a wide range in both physical and organic chemistry. The abstractor of his first papers foreshadowed the character of all of Edgar's research when he said, "The method is very accurate . . . with excellent results obtained thereby."

Edgar taught at Virginia for 15 years, with an interlude during World War I. His wartime service included research at California Institute of Technology and work for the National Research Council and the Ordnance Department, notably in the Fixed Nitrogen Laboratory. Indeed, his first patent, which he obtained during this period, related to the manufacture of fertilizer. The appropriateness of a pedagogue's contributing to this particular art always tickled Edgar's lively wit!

As a teacher, Edgar is remembered by his students with both affection and awe. Apart from his teaching, his major contribution to education was the chapter on "Homogeneous equilibria" in Taylor's classic, *Treatise on Physical Chemistry.* It was characteristic of Edgar that this work was published, not independently, but as part of a cooperative project.

Up to this point, Edgar's career had followed a conventional course. But he himself was innately a pathfinder, not a follower. When the opportunity came, he had the courage to leave the security of the university and turn to the exploration of new territory in industry. In June 1924, he joined the General Motors Chemical Company to help in the development of an infant industry: the use of tetraethyl lead as an antiknock for gasoline. Thus, in August 1924, he was one of the original staff of the then-named Ethyl Gasoline Corporation.

That industry was a far from healthy infant, and its survival was the result in no small part of Edgar's care. Working with only a handful of employees and with the most primitive facilities, he carried out both pure and applied research of significant importance. In 1925, on the basis of an inspiration of Thomas Midgley's, Edgar suggested and tested the first workable method for recovering bromine from sea water. In 1926, he made the first synthesis of the branched-chain hydrocarbon known as isooctane, discovered its unexpected antiknock value, developed a method for its manufacture, and produced it in pilot-plant quantities. He obtained the companion straight-chain hydrocarbon, *n*-heptane, from a surprising source: the oil of the Jeffrey pine that grows in California. On the basis of his work with these two compounds, Edgar in 1927 established the octane-number scale that is still in use for determining the antiknock quality of gasolines.

He then synthesized all the nine isomeric heptanes in high purity and, with the participation of specialists in a number of university laboratories and the National Bureau of Standards, determined their important physical properties, thereby setting the pattern for the type of cooperative program that was later employed with such success by the American Petroleum Institute and other groups. This was followed by pioneer research in the slow oxidation of different hydrocarbons and the development of the theory of fuel knock and antiknock action. At the same time, Edgar perforce had many practical problems, which he handled with expedition and acumen.

Later years found him increasingly occupied with matters of his company's policy and management, but he kept a guiding hand on its research program. In September 1952, at age 65, he was retired as vice president of Ethyl Corporation and Ethyl-Dow Chemical Company; however, as a consultant, he remained active in the corporation's affairs. Although smitten with leukemia early last year, he persevered and was still working on his final publication shortly before his death on 8 September 1955.

Today, many of us are better chemists—and citizens—for having come under the influence of Graham Edgar's personality. We enjoyed the fruits of his wide learning, ready wit, and gusto for the good things in life; and we came away with respect for his candor, his integrity, his contempt for pretense in any form, and his abiding courage to speak out for his convictions. He set us a good example.

HAROLD A. BEATTY
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