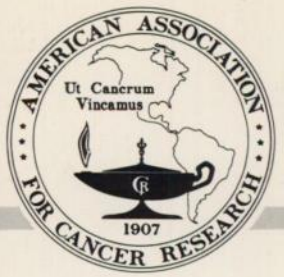
April 15, 1989



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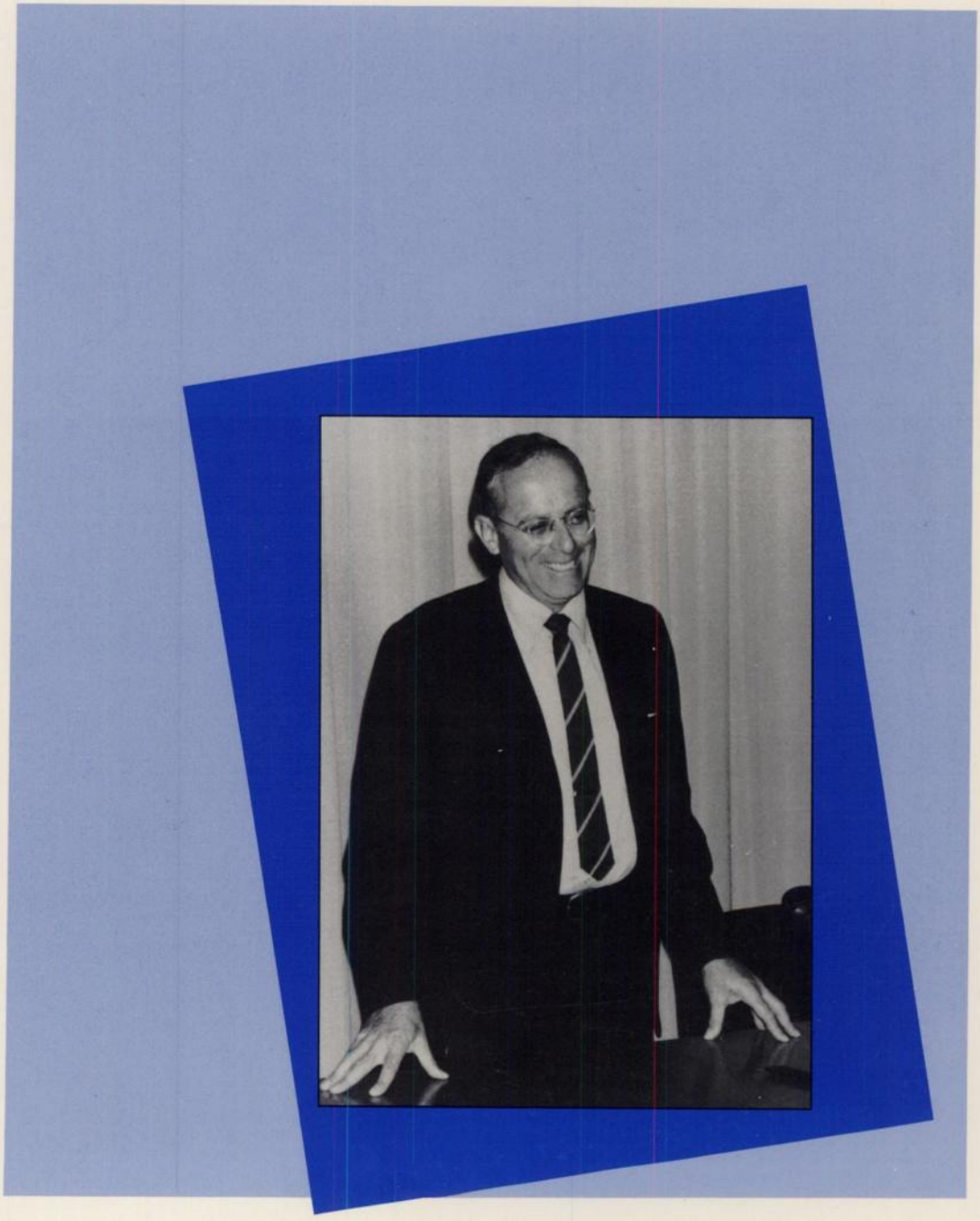

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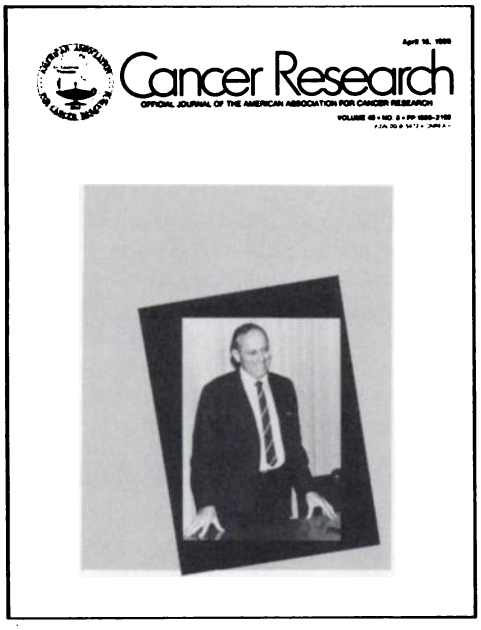

A new dimension was added to our appreciation of the biological significance of free radicals derived from molecular oxygen when McCord and Fridovich (J. Biol. Chem., *244:* 6049–6055, 1969) demonstrated that a blue-green copper-containing protein, variously termed hemocuprein, erythrocuprein, cerebrocuprein, or hepatocuprein, depending on its source, is an enzyme that catalyzes the dismutation of the superoxide anion radical, O_2^- into hydrogen peroxide and O_2. This landmark discovery of the first superoxide dismutase, SOD, led, during two decades of further studies by Fridovich and others (I. Fridovich. Adv. in Enzymol. Relat. Areas Mol. Biol., *58:* 61–95, 1986), to an understanding that the superoxide dismutases are a family of metalloenzymes that provides a defensive function. The superoxide radical is formed within cells by both enzymic and spontaneous oxidations, and its rate of production is increased by hyperoxia, redox cycling quinones and viologens, certain carcinogens, and activation of phagocytic cells. If not eliminated by the superoxide dismutases, O_2^- can directly inactivate certain enzymes, such as catalase, glutathione peroxidase, the α,β-dihydroxy acid dehydratase and others. Moreover, O_2^- can cause release of iron from ferritin and, in the presence of catalytic amounts of iron or copper, can collaborate with hydrogen peroxide in the formation of potent oxidants such as the hydroxyl radical (I. Fridovich. Arch. Biochem. and Biophys., *247:* 1–11, 1986; Halliwell (ed.). Oxygen radicals and tissue injury. Proceedings of a symposium sponsored by the Upjohn Company, published by the Federation of American Societies for Experimental Biology, 1988; Halliwell. Oxygen radicals and human disease, a meeting report. Ann. Intern. Med., *107:* 526, 545, 1987).

Cancer is prominent among many diseases now suspected to be causally linked to active oxygen species. These can attack and damage DNA, thereby initiating carcinogenesis, and can play a role in tumor promotion and progression. The presumptive anticarcinogenic action of many antioxidants can be attributed to their inhibition of active oxygen formation (Nishimura and Ames. A summary, U. S. Japan meeting, Oxygen Radicals and Cancer. Jpn. J. Cancer Res., *77:* 843–848, 1986). The role of active oxygen species, their mechanism of carcinogenic action, and their control are rapidly developing, exciting, and promising current approaches to cancer prevention.

Irwin Fridovich is the James B. Duke Professor of Biochemistry at the Duke University School of Medicine, a former President of the American Society of Biological Chemists, and a recipient of many honors and awards. He kindly supplied the photograph.

Sidney Weinhouse