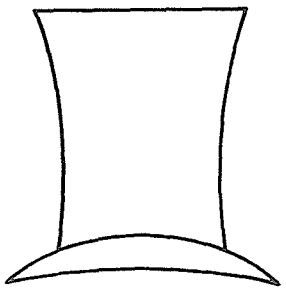
Science & Technology

SEEING: Illusion, Brain and Mind
by John P. Frisby
Oxford, 1980
160 pp. $16.95



Roxby Press, Ltd.

In talking about sight, we frequently resort to the inadequate model of photography. This analogy explains the first steps in the process of seeing, in which the eye, like a camera's lens, focuses an image of the world on its retina. But vision, notes Frisby, a British psychologist, involves more than just mirroring light patterns back to the brain. A camera, television, or computer printout can replicate reality but cannot see. The eye extrapolates. Shape, texture, movement, size are all "seen." Furthermore, "brain pictures" are not made with photographic accuracy; our minds "expect" to find certain patterns and will impose them where they do not exist. (The top hat at left, for example, is actually as wide as it is tall, contrary to what our eyes, overestimating vertical lengths, tell us.) Frisby also discusses the roles played by environment and heredity in sight development. Studies suggest that Asians have less difficulty than Caucasians in distinguishing between vertical or horizontal lines and oblique ones, he notes. Kittens reared in a drum painted solely with horizontal stripes develop only horizontally tuned striate nerve cells in the cortex of the brain—the body's visual center. Frisby's clarifications of as yet unanswered questions about eyesight inspire the reader's awe of this "familiar" function.

FROM ATOMS TO QUARKS: An Introduction to the Strange World of Particle Physics
by James S. Trefil
Scribner's, 1980
225 pp. $12.95

When Ernest Rutherford and Niels Bohr discerned the atom's structure in the early 1900s, scientists thought they had found the basic building blocks of all matter (protons, electrons, and, possibly, neutrons). They had not. By the early 1960s, hundreds of additional particles (neutrinos, positrons, mesons, baryons, to name a few) had been discovered. Trefil, a University of Virginia physicist, traces scientists' confusion about the properties of these new particles: Experimenters could not predict where they would turn up. "Once more," he writes, "our picture of the

world had become complex." Then, in 1961, Cal Tech's Murray Gell-Mann and Yuval Ne'eman, of London's Imperial College, found that the new particles tended to form octets. In 1964, Gell-Mann and George Zweig explained this phenomenon by hypothesizing that neutrinos, positrons, and the rest were made up of still more elementary constituents, which they called "quarks"—from a line in James Joyce's *Finnegans Wake* ("Three quarks for Muster Mark"). The theory worked —for a while. But since 1974, evidence has pointed to the existence of more than one kind of quark. So now, Trefil reports, physicists are stalking heavy leptons, magnetic monoploes, and tachyons, as well as the still-elusive quarks.

WEATHER MODIFICATION: Prospects and Problems
by Georg Breuer
Cambridge, 1980, 178 pp.
$24.95 cloth, $8.95 paper

Scientists have been trying, with mixed results, to influence the elements via sophisticated meteorological techniques since the late 1940s. In 1973, there were 67 weather-modification projects in the United States, of which 55 were commercial enterprises. "Seeding" clouds—either by releasing silver iodide crystals from an airplane or by generating silver iodide smoke from the ground—has, judging from crop yields, increased rainfall. But the art remains imperfect. Scientists cannot isolate moving clouds for experimentation (as they can, say, white mice), so they cannot determine whether a seeded cloud might have released rain—or more or less of it—without their efforts. In this international survey, first published in Germany in 1976, Breuer, a meteorologist, points out that in addition to boosting crop yields, seeding can produce kilowatts (by increasing rainfall over the river catchments of hydroelectric plants), wash toxic substances from the atmosphere, and even drench a battlefield (the U.S. military tried it during the Vietnam conflict). The only *predictable* success in weather modification so far, however, has been the temporary dispersion of fog over airfields, accomplished by warming the surrounding air with jet engines or smoke generators.