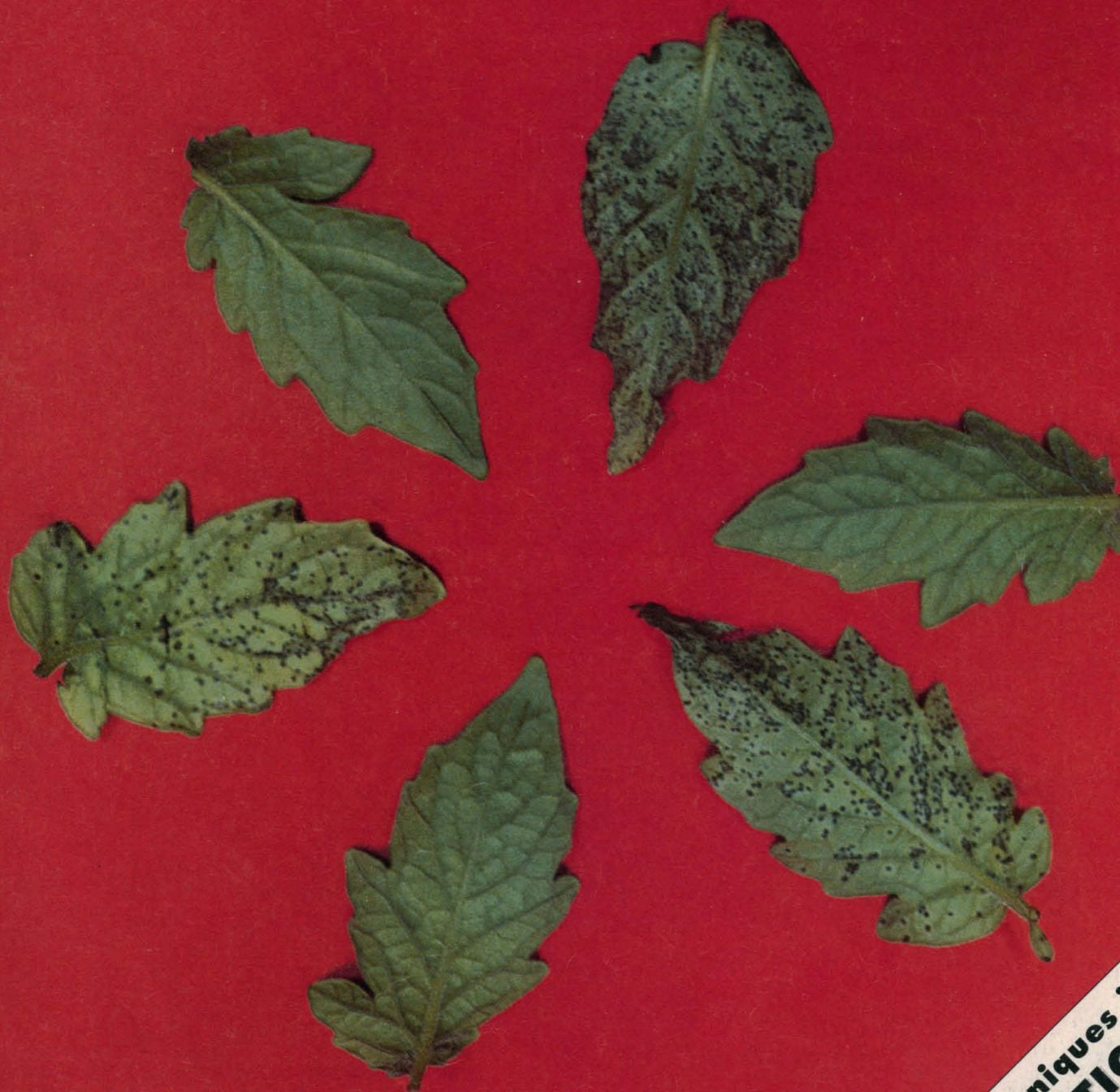


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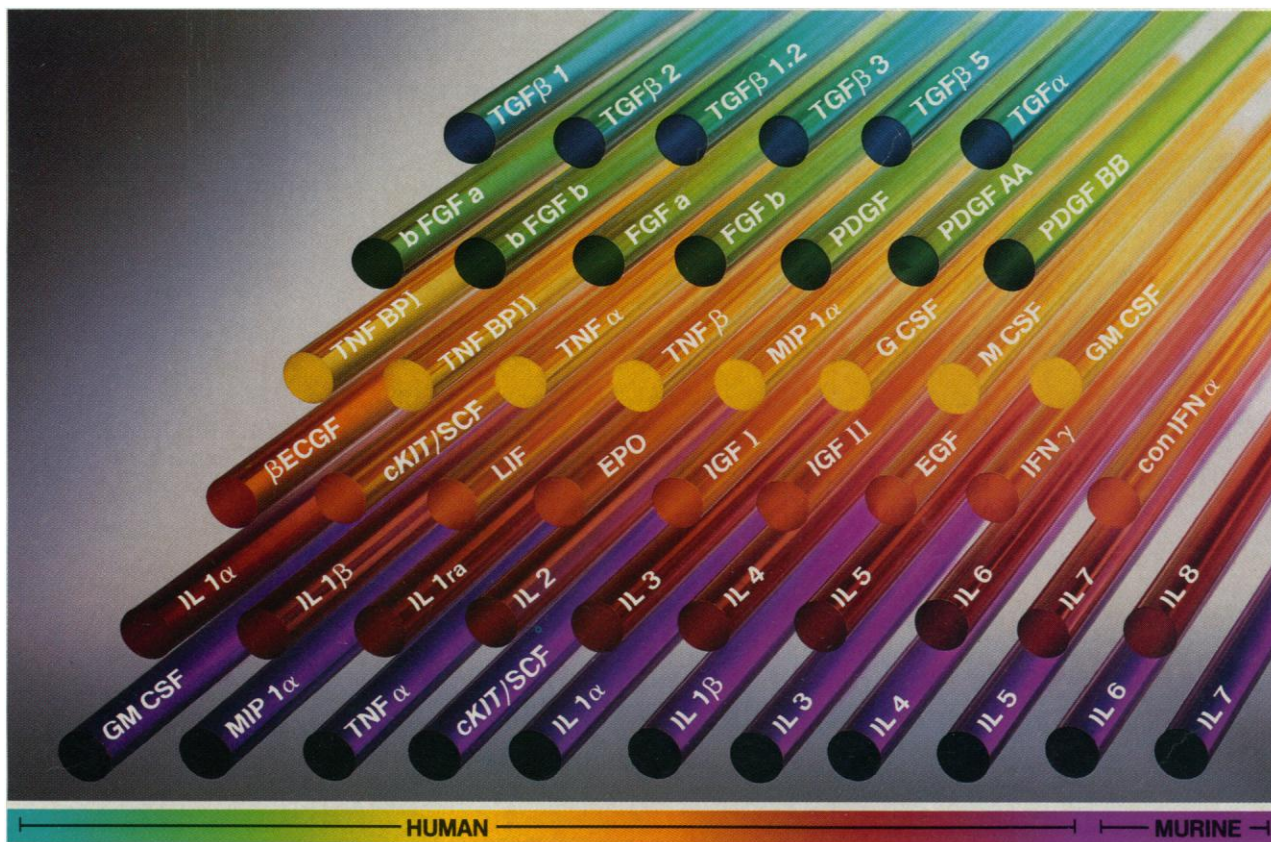
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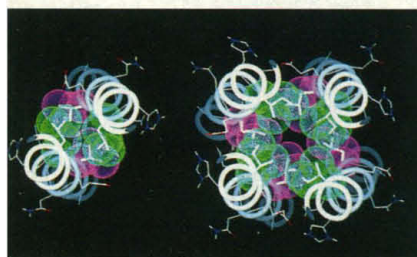
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COVER

Resistance genes are widely used to control plant diseases caused by bacteria, fungi, viruses, and nematodes. A single gene, *Pto*, encoding a protein kinase, confers resistance in tomato to the bacterial pathogen *Pseudomonas syringae* pv. *tomato*, as shown by the

healthy leaves from genetically modified plants (diseased leaves are from susceptible, wild-type plants). The presence of *Pto* homologs in many crop species may expedite the isolation of other plant resistance genes. See page 1432. [Photo: Gregory B. Martin]



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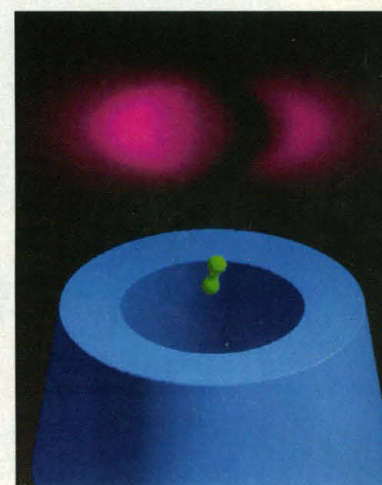
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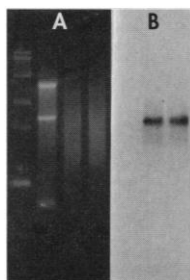


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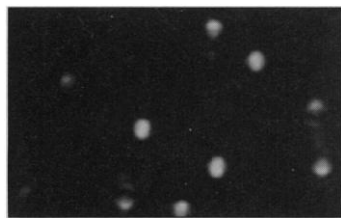
edited by PHIL SZUROMI

Search for the center

Sagittarius A* is a prominent radio source that may mark the center of our galaxy. Observations by radio interferometry have so far failed to resolve its structure, and the latest such work, by Backer *et al.* (p. 1414), shows that the source can be no more than 3.3 astronomical units in diameter—not much bigger than the orbit of Mars. Although the mechanism of galactic center radio emission has not been convincingly elucidated, it is often supposed that Sagittarius A* is a black hole; if so, these new observations limit its mass to no more than 1.5 million solar masses.

One by one

Microscopists would like to image individual molecules, but the job is made difficult by background light, photobleaching, and low spatial resolution. Betzig and Chichester (p. 1422; see the Perspective by Kopelman and Tan, p. 1382) imaged single



carbocyanine dye molecules with near-field optical scanning microscopy. By funneling the excitation light through an aperture smaller than the optical wavelength, the authors confined the detection volume; an image was then composed by scanning the aperture across the specimen. The orientation of each molecule was determined from the structure of the emitted radiation, and the electric field distribution near the aperture was mapped using the molecule as a probe.

DNA binding by the α subunit of RNA polymerase

In prokaryotes, promoter regions for transcription centered at sites 10 and 35 base pairs upstream of the start site interact with the σ subunit of RNA polymerase (RNAP). Ross *et al.* (p. 1407) have identified a third promoter element upstream of the *Escherichia coli* ribosomal RNA promoter *rrnB* P1; the UP element (the region 40 to 60 base pairs upstream) is rich in A and T nucleotides. This DNA promoter binds directly to the carboxyl-terminal region of the α subunit of RNAP. Mutations in this region diminished the activity of *rrnB* P1 and three other promoters, *rrnB* P2, RNA II, and *leuV*, which also have (A + T)-rich upstream regions. The underlying mechanism of transcriptional stimulation may share common features with certain transcriptional activator factors that are also inactivated by carboxyl-terminal α mutations.

On the double

Proteins might be very efficient frequency doublers, but because protein solutions are ionic and conduct electricity, it is not possible to apply a static electric field to orient the molecules and determine their electro-optic properties. Clays *et al.* (p. 1419) determined the nonlinear polarizabilities of ionic molecules by molecular orientation. They used the oscillating electric field present in an intense laser beam which, because of its high frequency and rapid phase changes, does not permit the molecules to move and give rise to conduction. The frequency doubling capacity of a protein solution is in fact large, and the authors give an idea for building supramolecular protein structures with very large optical nonlinearities.

Let it glow

The scanning tunneling microscope (STM) is normally used to record the location and geometry of a sample, but Berndt *et al.* (p. 1425) show that if the tunneling current at the STM tip is sufficiently large, luminescent photons can be excited and recorded to produce an optical image. They obtained a 4 ang-

strom spot of light from individual fullerene molecules on a gold surface. Spectroscopic studies of the luminescence may yield a useful diagnostic of the bond structure.

Avoiding attack

Insect parasitoids, those that parasitize and kill their hosts, have been used as biological control agents, largely on a trial and error basis. Hawkins *et al.* (p. 1429) have examined the application of refuge theory to the problem of biological control. These studies indicate that the size of refuges (the proportion of host population immune from attack by the parasitoid) is directly related to the success of the use of parasitoids for biological control. The greater the size of the refuge, the less susceptible was the host to attack by parasitoids.

Better organized and more presentable

A B cell can become tolerized toward a particular antigen and not produce antibodies; this is especially important in avoiding the production of autoantibodies. Bachmann *et al.* (p.

1448) show that staying in this tolerant state depends on how the antigen is presented. They generated transgenic mice that expressed glycoprotein of vesicular stomatitis virus serotype Indiana [VSV-G (IND)]. The B cells of the transgenic mice were unresponsive to this soluble glycoprotein. However, immunoglobulin M antibodies were induced in these mice if they were challenged with either wild-type or inactivated VSV-IND. The responsiveness of the B cell to the glycoprotein was increased by presenting it in a more compact and organized form on the viral surface.

Ras-like proteins and Type II diabetes

Although the incidence of non-insulin-dependent or Type II diabetes mellitus (NIDDM) strongly suggests a genetic component, the gene or genes associated with this disease have not yet been identified. Skeletal muscle is a major site of insulin resistance in NIDDM; Reynet and Kahn (p. 1441) screened complementary DNA libraries from skeletal muscle of normal and diabetic individuals and identified a 29-kilodalton Ras-related protein that was overexpressed by almost a factor of 10 in NIDDM patients. The Rad protein (Ras associated with diabetes) has important sequence differences compared to other members of the Ras-guanosine triphosphatase superfamily, especially in the G2 and G3 domains that are involved in guanosine triphosphate binding and dissociation. Why Rad is overexpressed is unclear—possibilities include inhibiting normal Ras function or compensating for the blockade of signaling that leads to insulin resistance.

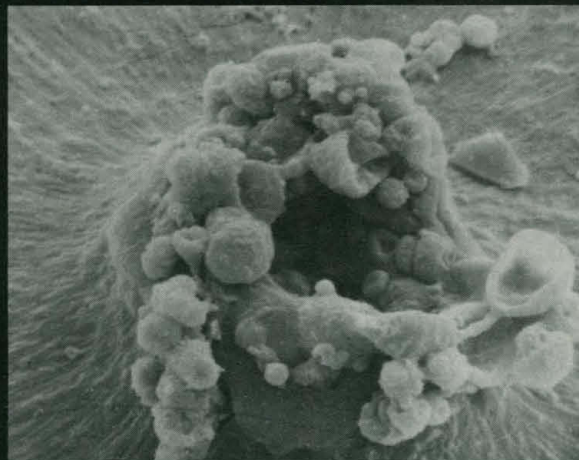
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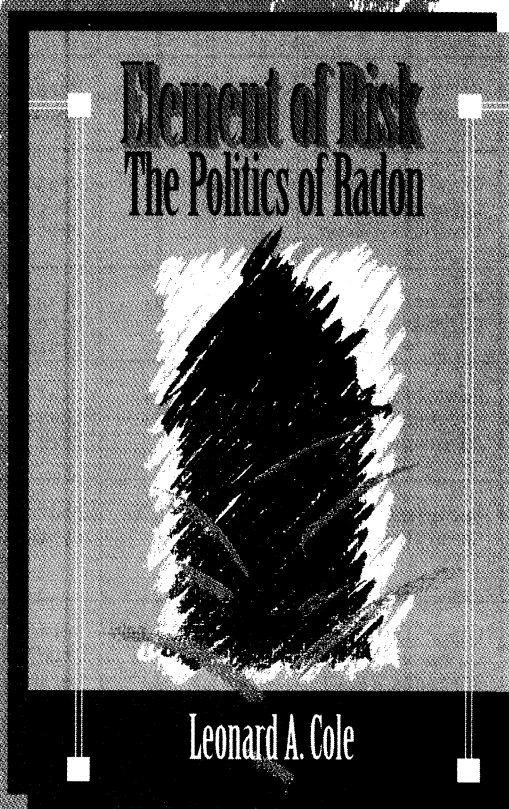
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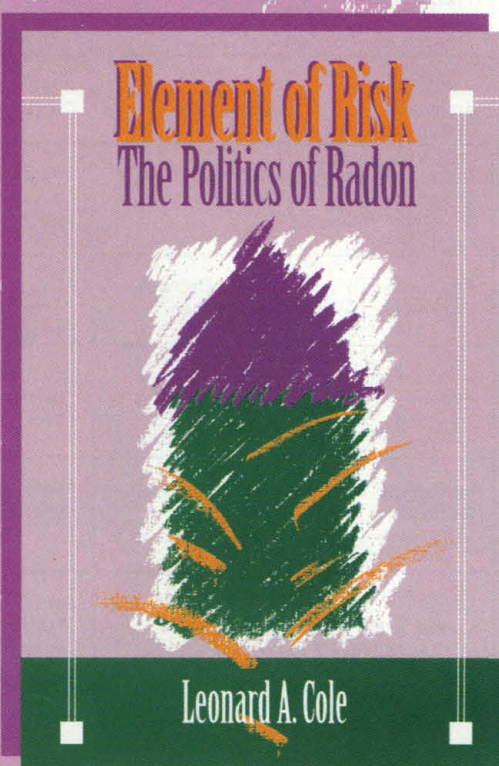
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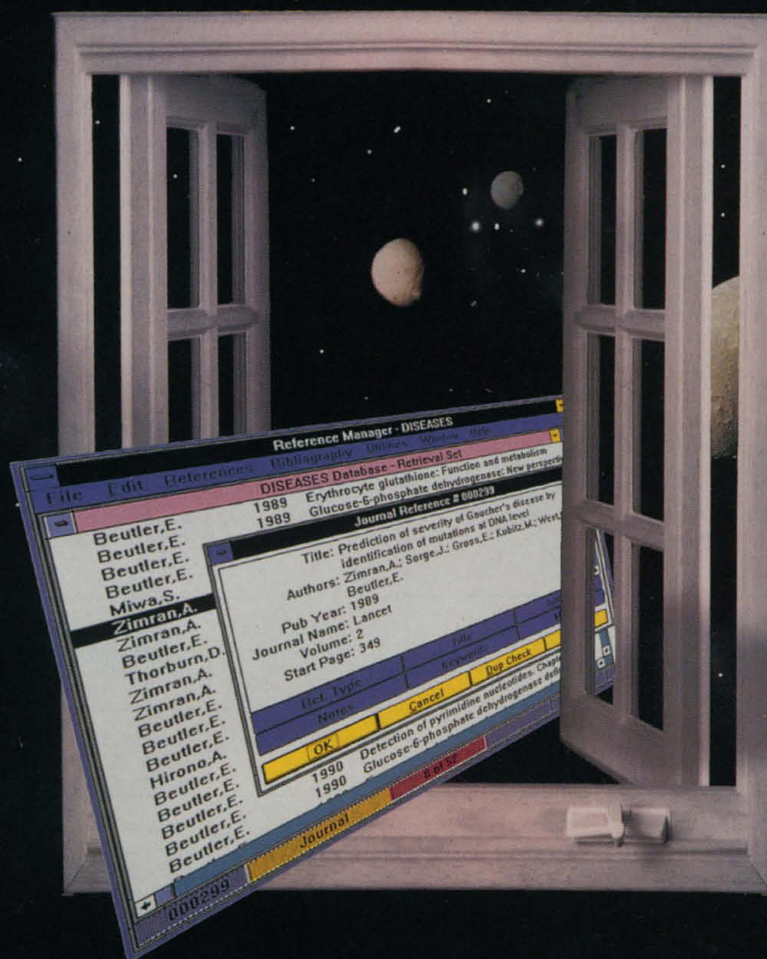
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