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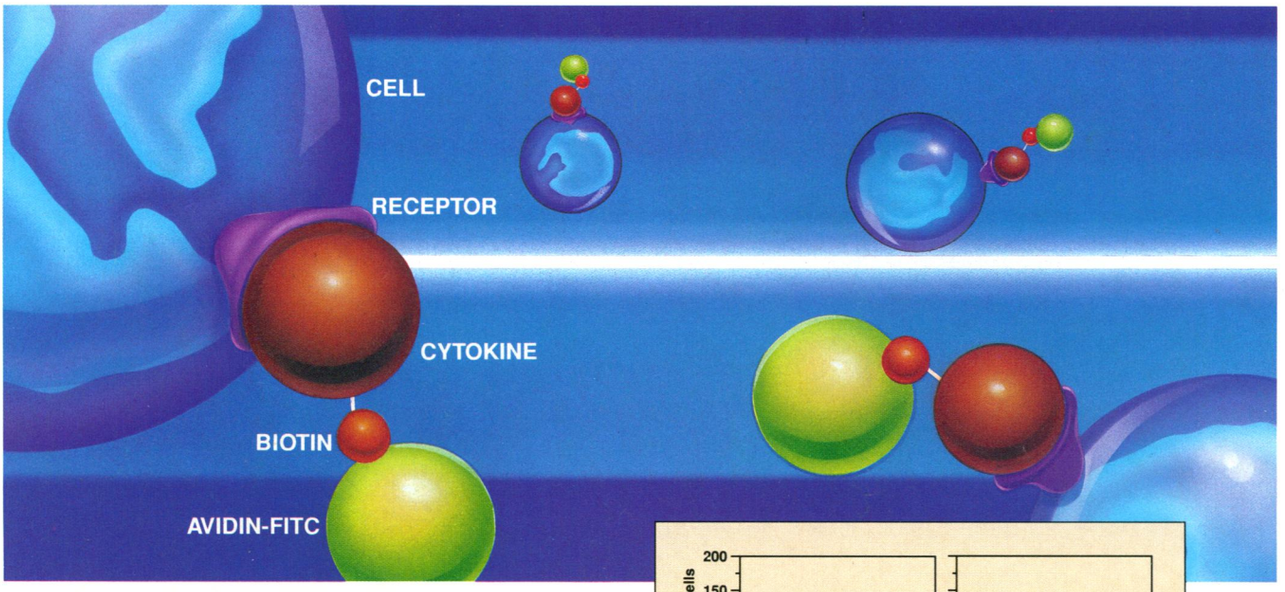
to determine the up/down regulation of cytokine receptors.



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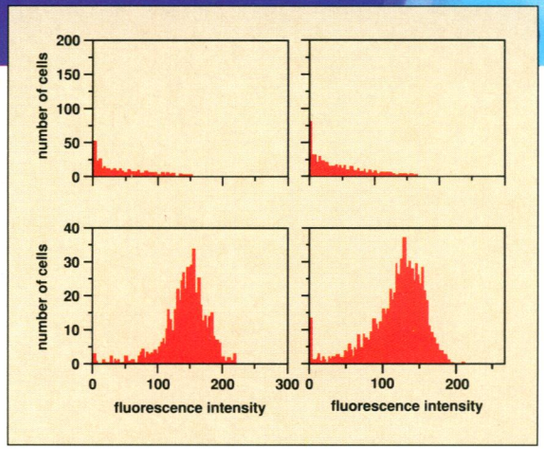

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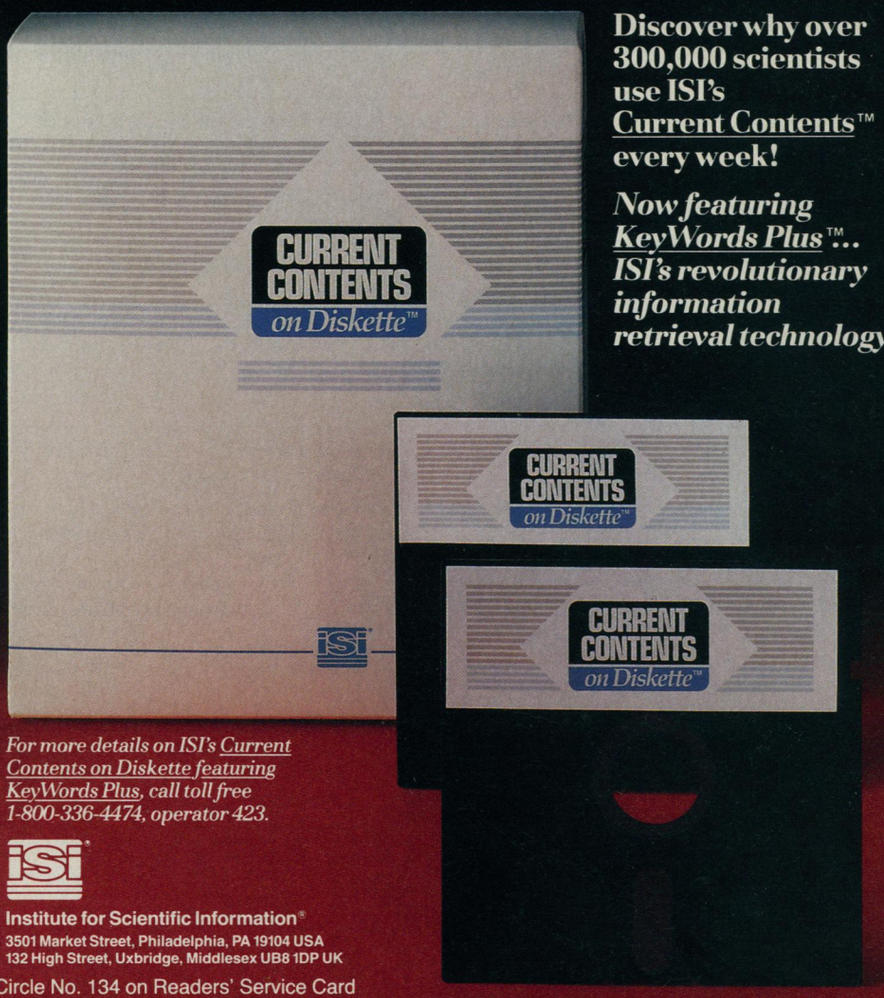

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COVER The Virginia opossum on the cover comes from a long-lived population on Sapelo Island, Georgia, that is being used to study mammalian aging. New animal models are an important part of current gerontology research (see news stories on page 622). Research on aging processes is critical, because even cures for heart disease and cancer probably would have little effect on overall life expectancy (see article on page 634). [Photograph by David Scott]

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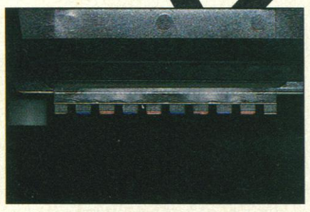

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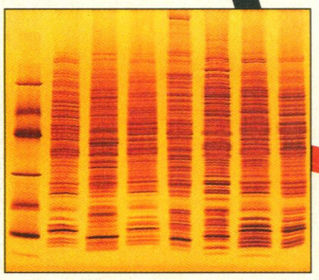

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This Week in SCIENCE

Aging

ALTHOUGH everybody's doing it, there is little understanding of exactly how it is done. What molecular changes accompany aging, and what does aging entail when it is stripped of disease? Gibbons addresses these issues (page 622), Morell describes a number of animal models (cover) that are shedding light on the aging process (page 622), and Olshansky *et al.* analyze human longevity statistics, noting that further increases in longevity may be undesirable without concomitant reductions in morbidity and disability for the aging population (page 634).

Arthropod evolution

THE record of arthropods goes back some 600 million years to the "Cambrian explosion" when diverse fauna, including arthropods, all appeared around the same time. One of the puzzles of arthropod phylogeny centers on limb evolution and whether organisms with branched (biramous) limbs evolved into or from uniramous organisms. Emerson and Schramm propose that branched appendages evolved by consolidation of pairs of appendages on separate but adjacent body segments (page 667); Grosberg elaborates on this proposal in a Perspective that deals with this and other aspects of arthropod evolution (page 632). Jeram *et al.* present new fossil evidence that places the arrival of predatory arthropods onto land as far back as 414 million years ago (page 658).

Protein splicing

THE central dogma of molecular biology—that DNA encodes RNA which encodes proteins—has a new twist: a protein can be made by the splicing together of two pieces of protein rather than as the directly translated product of a single messenger RNA molecule that preceded it in the biosynthetic pathway. Kane *et al.* found this example of "protein splicing" in a study of the production of protein from the *TFP1* gene of yeast (page 651). After the *TFP1*-encoded protein was made, breaks occurred at two points that were roughly one-third and two-thirds the distance along the molecule. The central third encoded a "spacer" protein; the two end segments then linked together into a protein that is a subunit of a vacuolar proton-translocating adenosine triphosphatase. Because the production of these two products from one protein could be demonstrated in diverse test systems, the splicing process appears to be self catalytic. The biochemistry and genetics of protein splicing and an assessment of how prevalent this mechanism is for producing proteins are amenable to study in the yeast experimental system.

Radical events

HYDROXYL radicals are highly reactive chemical species. Their tremendous influence on atmospheric chemistry is well documented; evidence is also accumulating that they have a major impact on chemistry and biology at the sea surface. Mopper and Zhou show that hydroxyl radicals are generated when ultraviolet light at wavelengths from 280 to 320 nanometers hits dissolved organic matter (DOM) in the water, particularly in coastal surface waters (page 661). In addition to serving as a source of hydroxyl radicals, DOM can also act as a sink for those radicals that have not been scavenged by bromide ions. The DOM at the sea surface is less susceptible to radical-driven degradation than is DOM in the deep sea, a difference that may reflect both physical and chemical properties of DOM in different parts of the water column. Growth and productivity of marine organisms can be affected in both negative and positive ways by radicals and the low molecular weight products that they generate, and this affects global carbon cycling. As ozone depletion increases and more light in the ultraviolet B region reaches the sea surface, the effects of reactive radicals on the environment are also likely to increase.

Dystrophic muscles

IN Duchenne muscular dystrophy (DMD) and in an animal model of DMD (the *mdx* mouse), cells in the muscles have overactive calcium-selective leak channels (page 673). These channels stay open more of the time than do channels of normal muscle cells, permitting calcium ions to flow into and accumulate in muscle fiber cells. Fong *et al.* propose that, in DMD patients and in *mdx* mice, absence of the membrane protein dystrophin alters the properties of leak channels. The excess intracellular calcium leads to accelerated protein degradation (this was established in previous experiments), and this causes muscle necrosis and eventually death. The observation that leak channels in muscle fibers of patients were much more active than those of *mdx* mice may explain why the human disease is more intense than the disease produced in mice. Thus, for DMD as for cystic fibrosis, pathology is closely linked to dysfunctional ion channels.

Organ organization

AN organ-specific gene has been identified in roundworms: it appears to be expressed in diverse cell types in pharynges of nematodes (and not in cells of other organs) and to play a role in the later stages of pharynx development (page 686). Schnabel and Schnabel show that the gene *pha-1* is not important in the early proliferative stages (the first 430 minutes after first cleavage) of pharynx development; this is the period during which the precursors of diverse pharyngeal cell types—muscle, marginal, epithelial, nerve, and gland cells—are generated from distinct lineages. During the next stages of development, however, normal *pha-1* gene expression is crucial; without it, the pharynx does not elongate or mature morphologically and physiologically. The pharynx is a vital organ, responsible for the uptake and transport of food; clues to its organization and functioning should come from studies of how the *pha-1* gene orchestrates its development. ■ RUTH LEVY GUYER

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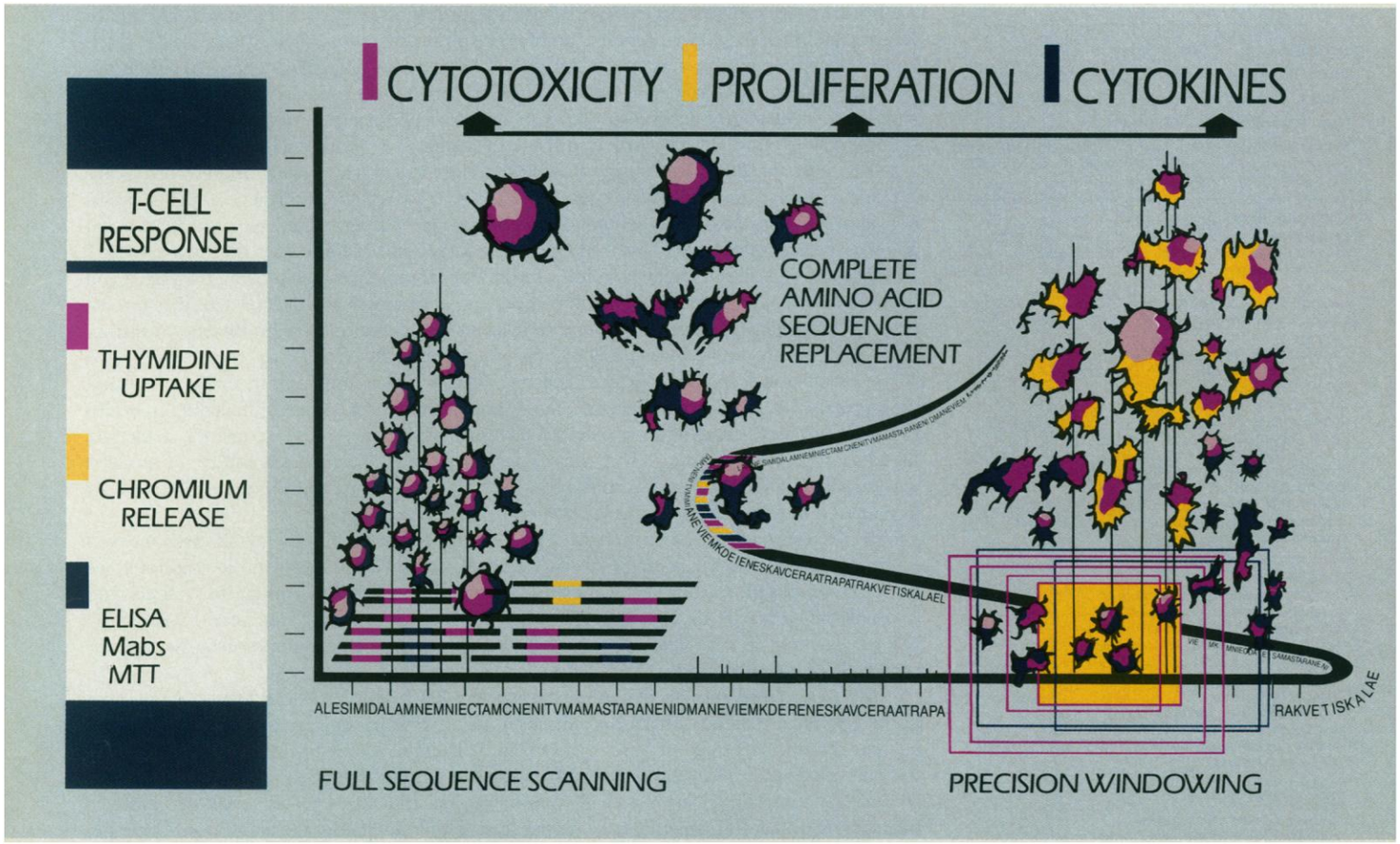

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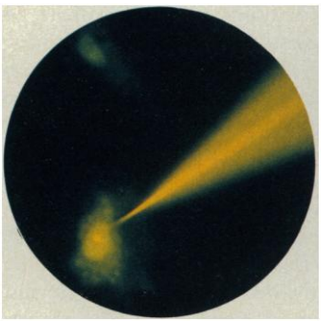

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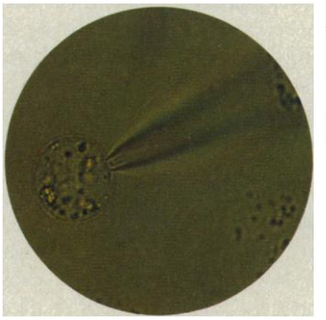

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