CHEMISTRY

Jaws II

When we last left our heroes and heroines of the shark repellant saga, they had isolated pardaxin — the active ingredient in the Red Sea Moses Sole secretion that wards off shark attacks (SN: 1/10/81, p. 19). Because milking flatfish for mere milliliters of pardaxin is hardly the practical route to a marketable shark repellant, the researchers knew then that their chemical adventure had only just begun. Now, on with the story.

Chapter two opens with Eli Zlotkin of Hebrew University in Jerusalem. Studying the chemical structure of pardaxin, he noticed its similarity to industrial surfactants, a class of chemicals that includes detergents, wetting agents and emulsifiers — some of which sell for less than 5 cents a pound. Zlotkin discussed his observation with Samuel H. Gruber of the University of Miami's Rosenstiel School of Marine and Atmospheric Science. "To me," says Gruber, "saying that a surfactant would repel sharks was like saying catsup will cure cancer." He nonetheless suggested Zlotkin use his shark-equipped laboratory to test surfactants for potential shark-repelling properties.

Zlotkin took Gruber up on his offer last month and showed up in Miami with seven Israeli brands of surfactants. Much to Gruber's surprise, the substances mimicked pardaxin's activity, causing sharks to veer away, adjust their gills, shake their heads. One particular surfactant even proved to be 10 times more effective than a pardaxin extract.

Gruber declines to identify the substances already tested and *strongly* advises divers against conducting amateur experiments with surfactants. "We have to screen the more than 100 different kinds of surfactants that exist," he says. The saga continues.

On second thought, make mine rare

Beware the charred parts of broiled meat and fish. For years, that warning has been based on findings that certain protein-containing foods form mutagenic compounds when heated. Now, an exclamation point has been added to the warning. In the July 17 SCIENCE, Shozo Takayama of the Cancer Institute in Tokyo and colleagues report that Trp-P-1 and Trp-P-2, pyrolysis products of the amino acid tryptophan, cause liver cancer in mice when given orally at concentrations of 200 parts per million in a pellet diet. The effect of both compounds was more pronounced in female mice, the researchers add.

Trp-P-1 and Trp-P-2 have been found in broiled sardines — a dish that contains confirmed mutagens. "Thus," the researchers conclude, "we report evidence of the carcinogenicity on oral administration of mutagenic compounds produced by cooking."

Photosynthesis: On a not-so-clear day

The central England summer air can host not only 10 to 30 parts per billion of sulfur dioxide (SO_2), but also 80 parts per billion of the pollutant ozone (O_3). This convinced D. P. Ormrod and colleagues of the University of Nottingham at Sutton Bonington that most laboratory studies of plant responses to air pollution are inadequate — such studies involve exposing plants to only a single gas pollutant per test. In addition, the researchers report, documented plant responses to pollutant mixtures "seem to have been studied only at higher concentrations atypical of the natural environment." To begin filling the resulting gap in research of plant response to air pollution, Ormrod and colleagues chose to study the field bean *Vicia faba L.*'s response, measured by the plant's photosynthetic activity, to an O_3-SO_2 mixture typical of rural central England. The results — published in the June 18 NATURE — indicate that the synergistic effect of the two pollutants leads to a decrease in photosynthetic activity larger than that observed with either gas alone.

'Watt' photovoltaic systems can't do

The solar photovoltaic system is not a "peaking technology," report Ronald O. Mueller and colleagues of Argonne National Laboratory near Chicago. Mueller and co-workers simulated augmenting Mid-Atlantic and Southwest utilities with a residential, flat-paneled, passively cooled silicon array that converts sun-light into electricity with 12 percent efficiency (admittedly, an optimistic forecast of conversion efficiency). The results of their simulation — published in the July 10 SCIENCE — indicate that while solar photovoltaic power systems may one day displace base-load (steady-output) and intermediate generating plants, they will not compete with peaking plants — even when such plants are run by oil-fired turbines.

The charge of the light brigade

The trickiest step on the road to copying photosynthesis, the green-plant method of converting solar energy into a chemically useful form, is step two — charge separation. While researchers have identified several molecules that will absorb light and emit an excited electron (SN: 8/2/80, p. 68), step one in photosynthesis, they have yet to perfect a means of keeping the resulting charged species (ions) from instantly recombining. But if model photosynthesis systems are to work, these ions must be kept from back reacting — at least long enough to feed them into other electron transfer reactions that eventually yield stored chemical energy.

Recently several photochemists reported their latest studies of different systems designed to delay back reacting of charged products. Samir S. Atik and J. Kerry Thomas of the University of Notre Dame in Indiana compared the effectiveness of three "organized assemblies" that resemble the natural membranes of plants: micelles, microemulsions and bilayer structures called vesicles. The results of their comparison — published in the June 17 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY (JACS) — indicate that the smaller the system, the longer that back reacting can be delayed. Spherical micelles are therefore more effective than microemulsions, which in turn are more effective than vesicles. In the May 20 JACS, however, Janos H. Fendler and Mohammad S. Tunuli of Texas A&M University in College Station report success using an innovative vesicle system to separate charged products.

Finally, in two separate but related reports published in the June 3 JACS, Melvin Calvin and colleagues of the University of California at Berkeley and Michael Grätzel and co-workers of the Ecole Polytechnique Fédérale de Lausanne in Switzerland report progress in inhibiting the charged products formed in their respective water-splitting systems from back reacting (SN: 8/9/80, p. 84; 8/16/80, p. 103).

Chemistry capsules

- During the predawn hours of Jan. 2, 1979, the temperature dropped to 28°F in a Weslaco, Tex., grove of Valencia orange trees. There, U.S. Department of Agriculture researchers took advantage of a tragic freeze to answer a long-standing question: What are those little white spots that form on freeze-damaged orange sections? The spots, report Raymond D. Bennett and Roger F. Albach in the May-June JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, are caused by the freeze-induced crystallization of a substance called hesperidin — a citrus compound that can be made into an ultrasweet sugar substitute currently being researched.
- The U.S. Senate recently approved a two-year extension of the moratorium on any saccharin ban. The legislation will be sent to the House.