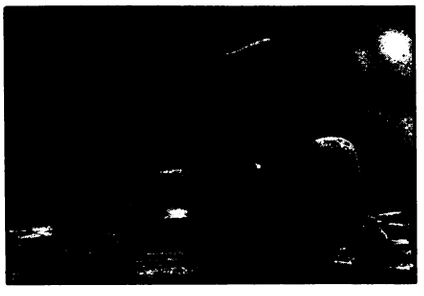
Reptilian fever: Burn, baby, burn

Fever—at least for lizards—is a defense mechanism that allows greater survival during infection. When lizards such as the desert iguana *(Dipsosaurus dorsalis)* catch certain bacterial infections, they crawl out into the sun, heat up to 41 or 42°C., and wait for the infection to subside. Only a few—0 to 33 percent—die. But a Michigan team found last year, that when the iguanas are infected and kept artificially at normal body temperature, 75 percent die. That same team now reports a new test in which sodium salicylate is used to artificially lower fever, and the results of this interference are even more deadly.

Physiologists Harry A. Bernheim and Matthew J. Kluger of the University of Michigan Medical Center at Ann Arbor present their new study in the July 16 SCIENCE. They determined last year that the desert iguana is more likely to die from infection by *Aeromonas hydrophila* if prevented from reaching medium or high grade fever, and concluded that fever is an evolved survival mechanism in those animals (SN: 4/12/75, p. 237). This time, they performed four experiments to test antipyretic drug effects.

Four groups of iguanas were injected:



one group with saline; one with live bacteria alone; one with sodium salicylate alone, and one with both live bacteria and sodium salicylate. Results from the first three groups showed that the injections themselves were not deadly, that the drug itself was not toxic and that most infected lizards with fevers do survive. In the fourth test group, 100 percent of those that responded to the drug (and thus did not develop fever) died from the bacterial infection, while 100 percent that did not respond (thus had fevers), survived.

Whether these findings can be extrapolated to higher vertebrates is unknown, the researchers state, but the characteristics of fever are similar in reptiles, birds and mammals and so are the responses to bacterial injections and to sodium salicylate. "It is tempting," they say, to suggest a common defense mechanism with a common evolutionary origin. □

New therapy for penicillin allergy

Three years ago a team of Harvard researchers had preliminary evidence that a new approach to treating allergies might work—namely the switching off of those antibodies that trigger an allergic response. They now have much stronger indications that the approach is feasible, and it looks as if the first patients to benefit may be those allergic to penicillin.

The only treatment now available for allergies is time-consuming, costly and too often ineffective. It consists of weekly shots of the allergen (chemical) to which a person is allergic. Clearly a more effective and economical treatment is needed, so David H. Katz and his colleagues at Harvard Medical School decided to look for one.

First they found that if a synthetic chemical called D-GL is linked with a chemical called Dnp and then this chemical packet is injected into animals, the packet blocks the production of those classes of antibodies involved in allergic responses, namely the IgM, IgG and IgE antibodies (SN: 11/10/73, p. 294). Next they discovered that if D-GL is coupled with a nucleoside, and this chemical packet is injected into animals, it too snuffs the production of these classes of antibodies. And now they have found that if the penicillin allergen is coupled with D-GL and injected into animals, the packet turns off antibodies in those classes. Even more significantly, it switches off only those antibodies that react specifically with the penicillin allergen, not those antibodies needed to fight infections. The allergy-triggering antibodies were also switched off for a long period—six months.

These results, Katz and his colleagues conclude in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, provide a direct demonstration of the potential application of the D-GL immunotherapeutic approach to penicillin allergy in people. They foresee that the treatment can be used on penicillin-allergic patients so that they can receive penicillin when they need it, and so that they can also be protected against inadvertent, life-threatening exposure to penicillin. The treatment, they believe, may also help victims of penicillin-induced, antibody-related hemolytic anemia which leads to the excessive destruction of blood cells.

How does D-GL combined with penicillin allergen or another molecule switch off antibodies to the allergen or molecule? Katz and his co-workers aren't sure. D-GL may hook up with those lymphocytes (B cells) that make the offending antibodies and thereby prevent the B cells from making them. Or possibly D-GL interferes with some enzymatic step involved in the production of antibodies by the B cells. □

Measuring ocean bumps and hollows

Tides and waves aside, the ocean's surface turns out to be rather lumpy, according to the latest satellite information. The GEOS-3 satellite, launched last year, can measure the distance down to the ocean's surface to an accuracy of 50 centimeters and has begun measuring its rather complex topography.

One major result of this discovery, says Ron Mather, associate professor in the Department of Geodesy at the University of New South Wales, Australia, may be a better understanding of ocean currents. Along the 2,000-mile eastern coast of Australia, for example, the "sea level" at the north end is fully two meters higher than at the south end—and the prevailing offshore current is strongly southerly.

In mid-1978, a new satellite called Seasat, may help clarify the picture even more, by providing topographical data accurate to within 10 centimeters. Mather believes Seasat may be able to provide clues to the cause of the irregularities. □

Marijuana for better breathing

Marijuana does have some positive medical effects, and now that the debate over the uses and abuses of the drug has cooled, researchers are beginning to examine more closely the implications of using marijuana as medicine. The most recent reports concern marijuana's effects on the bronchial passages. According to two research teams, marijuana may prove effective in the treatment of asthma and other respiratory ailments. The reports are in the July/August RESPIRATORY THERAPY.

Working with male volunteers, Louis Vachon of Boston University School of Medicine found that THC (one of marijuana's active ingredients) opened the bronchial tubes and increased air flow by 44 percent. Similar findings come from Donald Tashkin of the University of California. Work done with 32 healthy, experienced marijuana smokers showed that bronchial passages opened significantly after smoking marijuana, reached a peak in 15 minutes and still showed marked improvement one hour later. Tashkin warns, however, that continued heavy marijuana smoking might lead to respiratory complications. Steven Szara of the National Institute of Drug Abuse says, "We are just now beginning to do research that may eventually reveal some therapeutic applications of marijuana." But he too has reservations. In addition to possible respiratory complications from heavy smoking, he warns that marijuana

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smoking, like tobacco smoking, may be related to lung cancer (though the relationship has not been documented).

Increased risks of lung cancer and other respiratory problems associated with smoking have led researchers to seek alternate methods of administering marijuana. One method being investigated is the delivery of THC in aerosol form. Tests show that this method has a more pronounced effect than smoked marijuana. Even so, because of possible side effects (including legal as well as psychological implications), it is not likely that marijuana will become a medically recommended therapy for asthma or other respiratory ailments in the near future. □

A sloth and a moth deserve each other

Three-toed sloth: Snout moth habitat.

The dung-eating snout moth and the three-toed sloth may be two of the grubbiest animals on earth. Their eating habits and life cycles are guaranteed to decrease the appetite and to offend polite people of all political and moral persuasions. But they are, nevertheless, first-rate examples of symbiosis and the adaptibility protoplasm is famous for, and are, moreover, the subject of a recent study.

The three-toed sloth is a primitive mammal that lives—very quietly—in the forests of Central and South America. It is known, of course, for its extreme lethargy, hence, its common name. It hangs in the forest canopy, and reaches out occasionally to pluck leaves from three favorite tree species, and is thus classified an "arboreal folivore" (a tree-dwelling leaf eater).

It is no surprise then, considering this classification, that a Smithsonian Institution mammalogist who specializes in arboreal folivores and is stationed at the Smithsonian's laboratory in the Panama Canal Zone, should choose to study the three-toed sloth. G. Gene Montgomery and his student Jeffrey K. Waage from Princeton University, decided to look more closely at a favorite entomological legend—the moth that lives on the three-toed sloth.

The insect is a member of the large snout moth group and lives in the sloth's fur. That fur is practically a self-contained ecosystem: Two species of blue-green algae grow on the long, thick hairs and provide the sloth with protective coloration as it hangs, back toward its predators. The algae, in turn, have a handy substrate on which to grow, and also feed the sloth moth.

Before the Smithsonian study, biologists thought the moth lived out its entire life cycle—from egg to imago (adult)—on the sloth's back. They also thought the moths lived on eye and nasal secretions as well as algae. By careful observation and laboratory work, however, the team was able to predict what is probably the moth's actual life cycle in the July 7 SCIENCE.

Pregnant female moths probably climb off the sloth's back and lay eggs in sloth dung as it is deposited on the forest floor. Larvae grow and feed there, then, as young adults, find a new sloth and nestle into its fur. There, they eat sebaceous secretions from the hair roots and maybe some trapped rainwater enriched with skin secretions and algae by-products.

The moth isn't really a parasite, they state, but derives three advantages from its slow-moving habitat: a good nutritious place to lay its eggs, a place to hide from birds and other predators and an enhanced diet. Advantages to the sloth are unknown but the ecological microcosm of sloth-fur-algae-moth-dung makes a good—albeit a touch distasteful—study in natural adaptation. □

The multiply-spinning proton

Spin is a basic characteristic of physical particles. The peculiarities in the way that one particle's spin interacts with another's and with the force fields that surround them, play a determining role in the structure of atoms and atomic nuclei. These structures are low-energy phenomena. In them, the small energy differences derived from spin effects are important, but physicists had generally thought that in high energy phenomena, these small differences would have an increasingly negligible effect.

A recent experiment at Argonne National Laboratory seems to show the contrary. Spin appears to be at least as important and possibly even more important in high-energy phenomena as in low-energy ones. The experiment was done with protons, and one of the particular things it appears to show is that different parts of the proton spin at different rates—at high energies at least. Alan Krisch, K. Abe, R. C. Fernow, T. A. Mulera and K. M. Terwilliger of the University of Michigan and W. DeBoer of the Max Planck Institute in Munich did the experiment with a beam of polarized protons from Argonne's 12-billion-electron-volt Zero Gradient Synchrotron.

Polarization is the key to the experiment. When two spinning particles strike each other and scatter apart, the orientations of their spins will have some effect on just how they scatter. (This can be verified on a billiard table.) What kept physicists thinking for years that the spin-spin interaction between two colliding particles at high energy didn't have much effect was that they could not sort out the spin-spin effect, and it didn't seem to matter much that they couldn't.

The reason for that is that in the usual high-energy accelerator, the protons in the beam come out with their spins randomly oriented. In collision experiments the spin effects went every which way and tended to cancel or wash each other out. If one could get a polarized beam, a beam in which all the spins were going in the same direction, then all the spin-spin effects would go the same way, and it might be possible to find out what they were at high energy.

In recent years technological improvements have enabled Argonne to provide such a thing. The ZGS can accelerate a beam of polarized protons, and they happen to be the highest energy polarized protons in the world.

The data from the present experiment show a parallel to those of an experiment done ten years ago, in which Krisch was also involved, one that appeared to find a layered structure in the proton. The older experiment investigated the proton's structure by scattering probe particles of ever-increasing energy off it. As the energy of the probes went up, two points were found at which the probability of scattering (the cross section) jumped up in a suddenly discontinuous manner. These points can be interpreted as boundaries within the proton and as evidence for a layered structure inside it.

In the present experiment, the spin-spin effects show abrupt changes at the same boundaries, and the interpretation of that is that the different "layers" of the proton spin at different rates. The results also seem to indicate that the effect of the spin of the inner core of the proton grows as the energy goes up, while the outer layer seems to spin more slowly.

The results are expected to have an important bearing on the understanding of the forces that hold atomic nuclei together. Exactly what changes theorists will make in the theory of high-energy interactions is not yet clear. Meanwhile, according to a spokesman, similar studies of the proton's partner in nuclear structure, the neutron, are contemplated. □