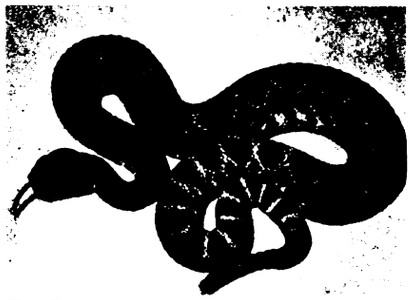
bodies are shaped like the letter Y, he explains. The arms perform the work of venom neutralization, while the bottom leg, known as the Fc fragment, triggers the unwanted immune reactions in people. Papain not only dismembers the Fc fragment, but also divides the remaining V into two individual arms. The arms still do their job, but their individually small size allows them to spread more efficiently through the body.

In contrast, the Wisconsin team injects venoms into chickens, which produce antibodies that become concentrated in the yolks of those chickens' eggs. To purify the relevant antibodies, says Carroll, "you separate the yolks from the whites, just like you would in your kitchen."

After several steps of protein purification, the researchers pour the antibody-rich solution through a column lined with venom proteins. Only the venom-specific antibodies stick to this column, while extraneous proteins wash straight through. Later, by adding a special solvent, the researchers flush out and collect the retained, highly purified venom antibodies.

The process, called affinity purification, is state-of-the-art in antibody purification. Moreover, while egg proteins can trigger allergic reactions in some people, and the egg antivenins still retain their Fc fragments, the Wisconsin team anticipates no serious reactions to their product. That's because chicken Fc fragments can't trigger the so-called complement cascade in humans – the intense inflammatory reaction that underlies many of the more serious symptoms of serum sickness and anaphylaxis.



Russell

The Southern Pacific rattlesnake (Crotalus viridis helleri) *lurks among rocky crevices and tree roots in California.*

That's a real advantage of using chickens, concedes Egen, who is working on the competing system in sheep. "The method could have a lot going for it," he says. "But how the hell do you get enough antibody? This could take a lot of eggs."

In fact, says Bruce S. Thalley, who works with Carroll on the chicken-based antivenin, the Wisconsin team has already tripled their yield to about 3.3 milligrams of specific antibody per egg, and yields continue to improve. Still, with the average snakebite victim requiring 500 to 1,000 milligrams, that means the researchers need 12 to 25 dozen eggs to produce one therapeutic dose.

Not everybody agrees the Wisconsin approach will work. "People are more allergic to chickens than they are to horses," asserts John B. Sullivan Jr., a University of Arizona antivenin authority involved in the new sheep antivenin. "This whole thing with chickens may not hatch."

But the Wisconsin team defends their method. "Lots of those allergies are to things in egg whites," says Thalley. "We're pretty optimistic that so long as [our antivenin] is from egg yolk and it's highly purified, we won't have any problems."

Researchers in Australia and elsewhere say they hope *some* improved product gains U.S. market approval before long. Already, Sutherland says, researchers at his lab are looking beyond animal antibodies to an entirely new generation of antivenins made from genetically engineered proteins.

Of course, he adds – with a little pride coming through his tangy accent – it makes sense that Australians are hell-bent on developing extremely high-quality antivenins. "I don't mean to brag, but our antivenins have to be the finest," he says. "Australia is home to the 10 most dangerous snakes in the world." □

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tients, ophthalmic emissary veins do not operate to regulate brain temperature. We think (but this hypothesis has yet to be checked) that clonidine may "open" emissary veins, and that this mechanism may correct the lowering of the setpoint of temperature regulation during hot flashes. The brain-cooling mechanisms operate only in the state of hyperthermia. It is therefore not surprising that hot flushes induced by manipulation of the thermal state, as is the case in Freedmann's patients through the use of hot water pads, can be accessible to clonidine, whereas in other studies this was not the case.

A better knowledge of the physiological mechanisms of brain-temperature regulation will have important consequences not only in physiology and anthropology, but also in many fields of clinical medicine. In my opinion, a general review of selective brain cooling in a multidisciplinary journal is urgently needed.

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Lyon, France

Saturn's spots

The statement "Astronomers observing the ringed planet have not glimpsed a comparable phenomenon on Saturn in 57 years" ("Spotting an ephemeral artifact on Saturn," SN: 10/13/90, p.228) is incorrect.

In 1960, J.H. Botham and A. Dollfus discovered a similar spot lasting five to six weeks. After it disappeared in May of that year, another large spot broke out in August at the same latitude, as confirmed by members of the British Astronomical Association. The 1933 spot you mention was discovered by British comedian W.T. Hay. Similar spots were seen in 1876 by Asaph Hall and in 1903 by E.E. Barnard. The only major difference in the spots of 1933, 1960 and 1990 was that the 1960 spots were in a latitude some 20° higher.

The periodicity of these events is well established – so much so that both Sky and Telescope and the Saturn section of the Association of Lunar and Planetary Observers were able to predict some time ago the appearance of a large spot in either 1989 or 1990. I saw the spot well displayed on Oct. 6 with 3-inch and 5½-inch refracting telescopes.

On the basis of the periodicity of these events, we can confidently state that a similar phenomenon will repeat itself around 2019 to 2021.

Rodger W. Gordon
Nazareth, Pa.

You are certainly correct that significant white spots on Saturn have occurred as recently as 1960. My statement that no comparable event has been seen since 1933 was based on an interview with astronomer Reta Beebe of New Mexico State University, who pointed out that the size of the current spot, even before its most recent expansion (documented by Hubble images), significantly exceeded that of the 1960 phenomenon.

It may well be true that the white spot was visible in October with a telescope smaller than 6 inches in diameter. But the astronomers I interviewed in October thought that amateur astronomers would likely need a 6-inch instrument to easily view the spot. – R. Cowen

Twilight musings

"Reflections on Refraction" (SN: 10/13/90, p.236) reminds me of a musing I often have when I see the sky at twilight: How much have atmospheric pollutants changed the visual impact of sunsets? I first had this thought while watching a particularly breathtaking sunset in air so clear that the boundary of sky and sea seemed like a razor slice.

If atmospheric pollution contributes significantly to the refractive process Bradley Schaefer is documenting, it seems this might have some bearing on the archeoastronomy questions discussed in your article.

Richard H. Tew
Encinitas, Calif.

Letter choice contested

Why would an editor devote precious space to a lecture on the gospel according to C.S. Lewis? I am referring to Peter H. Shaw's letter to the editor, titled "Altruism: A simpler explanation?" (SN: 9/15/90, p.163).

Shaw's objection to evolutionary explanations for altruism is obviously based on a fundamentalist interpretation of the Bible. In his letter, he quotes C.S. Lewis, author of fundamentalist Christian sword-and-sorcery novels and guru to creationist young-Earthers.

I am only an amateur paleontologist, but I have nothing to learn in the way of science from C.S. Lewis. None of us does.

Tom Cole
Chandler, Ariz.

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