

The India-Asia collision: What gives?

The Tibetan plateau rises above the rest of the planet's surface like a giant welt. And for scientists, this part of Asia is truly a bit of a sore spot. The plateau and mountains to the north reveal an apparent flaw in the elegant theory of plate tectonics, which holds that Earth's thin outer shell, or lithosphere, consists of a broken, shifting patchwork of large segments.

According to the theory, collisions between two plates should cause damage only near the point of contact — a rule followed nicely by oceanic lithosphere. But the continuing crash between India and Asia has somehow cracked and crinkled the land surface for thousands of kilometers from the plates' edges.

Does the theory of plate tectonics fail on the continents? Maybe not, say Sean D. Willett and Christopher Beaumont of Dalhousie University in Halifax, Nova Scotia. In the June 23 NATURE, they propose a new idea about the India-Asia collision that could rescue the concept that lithospheric plates deform only at their edges.

Over the last 20 years, scientists have tossed up several different ideas to explain how India has managed to dent Asia so severely. In one early scenario (figure 1), the lower part of the Indian lithosphere (left), made up of mantle rock, subducts beneath Asia (right) and then sinks down into the mantle. In another theory (figure 2), the Asian lithosphere is weak enough that it absorbs the impact by thickening, almost like a chunk of cheese squeezed in a vise.

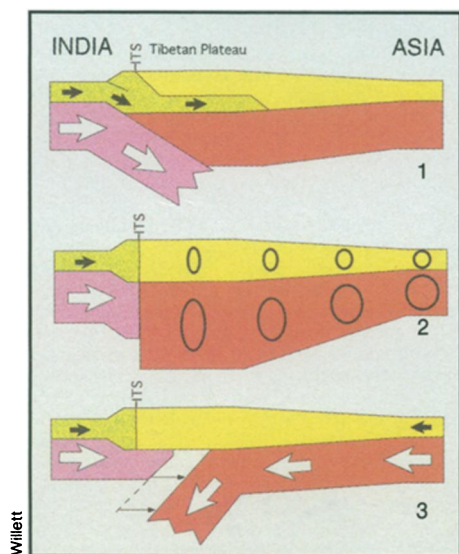
Willett and Beaumont suggest instead that the Asian lithosphere takes the impact by splitting apart. The upper coating, the crust, thickens and buckles because it is weak. That explains why the Tibetan plateau, Tien Shan Mountains, and Altai Mountains could form so far north of the collision point. But while the surface compacts, the bulk of the plate, made up of mantle rock, is too strong to give in such a way. Rather, the lower plate redirects its motion and subducts downward, just as an oceanic plate does when it collides with a continent (figure 3).

The scientists developed this theory while working with computer simulations of two colliding continents. Although they have little firm evidence that Asia ducks below India and plunges into the mantle, Willett and Beaumont say this pattern fits several observations about the geometry of the two continents.

If correct, their model would come to the rescue of plate tectonic theory. Although the crust behaves like a weak

material in their scenario, the mantle section of the lithosphere remains strong and does not squash.

"Most people working on continental tectonics say the theory stops working on the continents. We would say that plate tectonics continues to work, but you just don't see it," says Willett. The strong part of the Asian plate is hidden beneath the more easily deformed crust.



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Another emasculating pesticide found

Exposure in the womb to any of several chemicals can derail the normal sexual and behavioral development of male animals. Most of the agents scientists have identified as possessing this capacity — such as dioxin (SN: 5/30/92, p.359) — appear to exert their gender-bending properties by mimicking the actions of estrogen, a female sex hormone (SN: 1/8/94, p.24). But as described in the June TOXICOLOGY AND APPLIED PHARMACOLOGY, such changes also can result when a chemical blocks the activity of androgens, or male sex hormones.

A team of North Carolina-based researchers administered vinclozolin — a systemic fungicide used to protect fruits, vegetables, ornamental plants, and turf — to pregnant rats. Daily exposures of up to 200 milligrams per kilogram of body weight occurred from the 14th day of pregnancy through the third day following the birth of each rat's litter.

Year-old male offspring exhibited a range of reproductive abnormalities. Effects witnessed in those exposed to the highest doses included undescended testes, a cleft phallus, infertility, and hypospadias (a partially unfused phallus). The males also developed a "vaginal pouch" — a structure characteristic of the female reproductive tract. Overall, the most-exposed animals suffered not only demasculinization, but also feminization, explains L. Earl Gray Jr. of the Environmental Protection Agency's reproductive toxicology branch in Research Triangle Park, N.C., a coauthor of the new report.

Vinclozolin fostered the changes by binding to — and blocking — androgen receptors in reproductive tissue, notes another of the study's investigators, William R. Kelce of ManTech Environmental Technology in Research Triangle Park.

Though the fungicide can bind to these receptors, its breakdown products bind to them 10 to 100 times more effectively. Indeed, the concentration of these by-products needed to block the receptors appears to be the same as that found in the blood of the pregnant rats treated with vinclozolin. As such, the team argues, any assessment of this pesticide's health effects should consider not only the parent compound, but also its breakdown products in soil, leaves of treated plants, and animals exposed to the fungicide.

Some researchers suspect an increasing incidence of hypospadias, low sperm production, and undescended testes in men may trace to estrogen-mimicking pollutants (SN: 1/22/94, p.56). Because vinclozolin produces such effects in male animals without involving an estrogenic pathway, the new report suggests that toxicologists begin focusing more attention on this antiandrogenic route — and agents that employ it.

Smoking may offer one health benefit

Cigarette smoking appears to confer some protection against idiopathic Parkinson's disease, a debilitating disorder characterized by tremors and arising from no known cause. This finding, published in the June 15 AMERICAN JOURNAL OF EPIDEMIOLOGY, is based on diet and lifestyle data for 58 men with the disease. All were among 8,000 Oahu, Hawaii, men followed for 26 years as part of a larger study of heart disease.

Other studies — some dating to the late 1950s — had hinted at a protective role for cigarettes in Parkinson's. But this one, conducted by researchers at the University of Hawaii School of Public Health in Honolulu, is the largest prospective survey to investigate such an effect. It revealed a 27 percent reduction in Parkinson's risk for each 10 years a man smoked.

Nicotine can stimulate the brain's production of dopamine (SN: 5/14/94, p.314), a neurotransmitter in short supply among Parkinson's disease sufferers. Indeed, the Honolulu team notes, "Dopamine stimulation is consistent with reports that major signs of idiopathic Parkinson's disease ... are transiently relieved by cigarette smoking and nicotine gum chewing."

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