Prehistoric blood points to victims

A Canadian researcher has discovered well-preserved human and animal blood deposits on the surfaces of prehistoric stone tools and weapons and has developed a technique that reliably identifies the species whose blood was spilled. Thomas H. Loy, an associate curator at the British Columbia Provincial Museum in Victoria, analyzed Canadian stone artifacts ranging in age from 1,000 to 6,000 years and found blood deposits on 86 percent of them. The blood deposits consisted of hemoglobin molecules, amino acid fragments of the hemoglobin protein and intact red blood cells, Loy reports in the June 17 SCIENCE.

Loy analyzed suspected blood deposits with a chemically coated paper strip, used routinely in hospital laboratories to detect serum albumin in urine, but also sensitive to hemoglobin. Confirmed blood deposits were crystallized and the crystals analyzed to find the species of origin.

Because the amino acid sequences of hemoglobin differ between species, blood can be characterized by observing the size and shape of hemoglobin crystals. Loy crystallized the prehistoric hemoglobin, then matched these crystals with hemoglobin of existing animals. He found residues from black-tailed deer, moose, snowshoe rabbits, California sea lions and Stone Mountain sheep. Caribou and grizzly bear blood were found on the artifact with the oldest verified date — 2,380 years old.

Loy found human blood on a few of the younger artifacts. This blood, he notes, probably came from the toolmaker accidentally cutting himself while adjusting an edge. "When I make my own tools to use in replication experiments," Loy says, "I invariably cut myself. I'm sure that happened in the past."

The finding of such well-preserved blood specimens contradicts a previous assumption by experts that blood residues readily decompose. But, as Loy points out, "the problem was that we never really thought to look for it." The key to preservation of these blood residues, Loy says, is the fact that they dry in the sun and then get buried in the soil, which protects them from degradation.

Now that scientists know what to look for, this technique may prove extremely useful, according to Loy. The most important application, he says, is in regions where acid soils interfere with the preservation of bone. The blood gleaned from tools can be analyzed to see what animals inhabited those sites. *— P. Taulbee*

Conflicting evidence for inborn schizophrenia

A government study has raised doubt about the well-publicized findings of two California researchers who recently reported that schizophrenia, a chronic mental disorder that strikes in early adulthood, may actually be linked to cellular disarray occurring in the brain before birth. The California scientists, who originally reported their findings three years ago, say they have accumulated further evidence of the dramatic structural abnormality in schizophrenic brains. But in the only attempt at replication, government researchers found the brain abnormality in both schizophrenics and healthy controls.

According to psychiatrist Arnold Scheibel and neuroanatomist Joyce Kovelman of the University of California at Los Angeles, a recent study of brain tissue of ten schizophrenics revealed that the pyramid-shaped cells of the hippocampus, which should be arranged very precisely in layers, were dramatically out of alignment. Although some mild disarray was also found in normal controls, Kovelman told SCIENCE NEWS, the hippocampal cells of the schizophrenics were turned as much as 90 degrees, and the degree of misalignment appeared to reflect the degree of illness. The earlier study of more severely disabled schizophrenics revealed cellular misalignment as great as 180 degrees. Because there is no room for the cells to rotate once the brain has started developing and making synaptic connections following birth, the findings suggest that schizophrenia may be linked to a prenatal condition.

But according to psychiatrist Daniel R. Weinberger of the National Institute of Mental Health, his own attempt to replicate Scheibel and Kovelman's earlier findings failed. As he reports in the current SCHIZOPHRENIA BULLETIN, his much larger study showed dramatic disarray in schizophrenic and normal brains. He notes, however, that he was looking only at the specific hippocampal region originally implicated; a more exhaustive analysis, he says, could very well reveal a structural abnormality among schizophrenics.

The hippocampus is of theoretical interest because it is part of the brain's limbic system, known to be involved in emotional processing. Kovelman speculates that the orderly lamination of the hippocampus is needed for proper processing of incoming information, so that a distortion would in turn distort messages going to other brain systems. The most dramatic disarray, she noted, was seen in the "subiculum," the main gateway from the hippocampus to other areas. Distorted messages to the amygdala (where emotions and memories are linked) might explain the emotional flatness seen in schizophrenia; similarly, Kovelman says, distorted messages to the cortex might be involved in such florid symptoms as hallucinations and paranoia. *— W. Herbert*

Spiders that shed poisoned legs

Certain lower animals, including lizards, crabs, spiders and insects, are known to relinquish a tail or leg when it is seized or injured by a predator. Now some spiders and insects have been found for the first time to engage in similar behavior when a leg is stung by a venomous insect.

If a leg of the orb-weaving spider (genus *Argiope*) is stung by a venomous bug called a phymatid, the spider will try to separate the poisoned leg from its body if at all possible, Thomas Eisner and Scott Camazine of Cornell University in Ithaca, N.Y. report in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (no. 11). The response occurs within seconds, before the venom can spread to the spider's body and kill it. Furthermore, honeybee or wasp venom, or one of various venom components, will also cause the spider to shed its poisoned leg. Spiders from three other families, as well as an insect called the katydid, also relinquish legs stung by phymatids. However, the common house spider, which belongs to yet another spider family, does not give up legs stung by phymatids, even though it usually dies from the venom.

Maria Eisner/PNAS

Spider leaves leg stung by phymatid and retreats.

The biologists believe that their results, while interesting in themselves, might constitute evidence that lower animals can experience pain. The reason is that four of the venom components that make orb-weaving spiders give up a leg — serotonin, histamine, phospholipase A_2 and melittin — are also known to cause pain in humans. As they write in the PNAS, "Whatever the neural basis of their detection in spiders — whether it be comparable to the pain-coupled venom-sensing mechanism in humans or not — it is clear that spiders are highly sensitive to these substances and that they respond defensively to them in a manner that prevents their systemic spread." The only other evidence that lower animals experience pain, Camazine said in an interview, consists of lower animals avoiding irritating chemicals and other noxious stimulants. *— J. A. Treichel*