anchoring to the placenta would have novel surface proteins that the woman's immune system had never "seen" before, and hence could not attack. By hiding out in the placenta, these cells could provide a persistent source of infection.

To find out whether infected cells really can home in on the placenta, the duo measured the ability of infected cells to bind to frozen sections of placentas from uninfected women. "We found that the infected cells bound to the sections in a pattern similar to that found with parasites bound in naturally infected placentas," says Duffy. Then the researchers tried to block this binding by adding different proteins to the infected cells. The only one that could do so was CSA, a well-known extracellular matrix protein. Last year, groups at the Pasteur Institute in France and the Walter and Eliza Hall Institute in Australia discovered that it acts as a receptor for parasite-infected cells. And in the current experiments, Fried and Duffy's work suggested, CSA apparently preempted the highly specific parasitic receptor proteins on the surface of the infected cells, suggesting that it was the target protein on placental cells.

And that specificity made these placental cells rather different from parasite-infected blood cells in nonpregnant women. In spite of the diversity of *var* genes, previous studies have found that most circulating infected cells bind to an endothelial cell surface molecule called CD36. Duffy and Fried found that, outside the placenta, the blood of infected pregnant women contained a mixture of parasitized cells that could bind either CD36 or CSA. But in nonpregnant women, they found that parasitized cells only bound to CD36. The results suggest that the parasites are able to exploit the opportunities presented by pregnancy. "It appears that the placental cells are a distinct subpopulation with a distinct binding phenotype," says Duffy. After these cells appear during a first pregnancy, the immune system may gradually learn to recognize them, so that it mounts a stronger response in subsequent pregnancies, he says.

The puzzle isn't completely solved, however: CSA is found widely in the body, so it's odd that infected cells bind to it only in the placenta. Duffy and Fried suggest that the tissue may be the only site where the protein can interact most effectively—through a presently unknown process—with red blood cells.

Nonetheless, researchers think these findings add to the potential new targets for therapeutic approaches to serious manifestations of the disease, says Wellems. In cerebral malaria, for instance, the infected cells may bind to a molecule called ICAM-1, which is expressed on blood-vessel walls within the brain. Blocking that target could help modify the course of the disease. Similarly, armed with knowledge about new targets such as CSA and the *var* genes that encode parasite receptor-binding molecules, researchers think it might be feasible to develop a drug treatment for pregnant women that would block the ability of infected red blood cells to grow in the placenta; this would lessen the damage to the fetus. First, however, they'll need to learn more about the interactions between CSA and the parasites.

Although a treatment along these lines wouldn't cure pregnant women (who would still have to cope with the larger population of parasites which have other types of binding molecules), it could have a major impact on the healthy development of babies in malaria-prone countries. "Up to 40% of recorded low birth weight in these areas may result from maternal malaria," says Bernard Brabin of the Liverpool School of Tropical Medicine. "It's a high priority for control." And with a better idea of where and how the parasites are hiding, scientists now have a better chance of flushing them out.

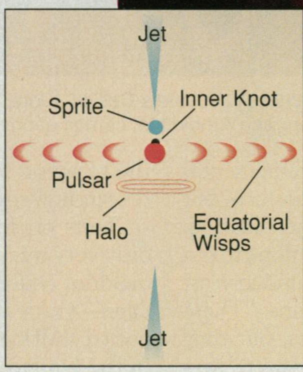
–Nigel Williams

ASTRONOMY

Movie Captures Dance of the Crab

Although nearly 1000 years have passed since Chinese astronomers recorded the supernova explosion that created the Crab Nebula, this cosmic dynamo still holds surprises. Over the past year, astronomers used NASA's Hubble Space Telescope to make time-lapse images of the Crab, creating a movie that reveals week-by-week changes in the glowing gases. The Crab shows "an awful lot more [going on] than anyone imagined," says Arizona State University (ASU) astronomer Jeff Hester, the team leader. The movie also poses a challenge to previous ideas about how the nebula is energized by the neutron star at its heart. "Ten years down the pike this will be the thing that sparked a lot of research," says Anne Kinney of the Space Telescope Science Institute in Baltimore.

SOURCE: STSCI



Scene from a movie. Waves of gas ripple outward along the equatorial plane of the Crab pulsar *(above)*. The complete image series revealed other features *(left)*.

The nebula, nearly 7000 light-years away, is a thin cloud of debris from the exploded star's outer layers; the spinning, magnetized neutron star, or pulsar, at its center is what remains of the star's core. The pulsar, a Manhattan-sized lump of matter with a density of about a billion tons per teaspoon, flings electrons and positrons outward along its whirling magnetic lines of force. Astronomers had thought that these particles would be cast outward in all directions. But by combining images made every few weeks over a period of months, the Hubble researchers found that the emission is confined to two regions. At the pulsar's equatorial plane, waves of ionized gas ripple outward at half the speed of light, while its south pole emits a wisplike jet of gas and dust. (Another jet probably streams from the north pole, which is blocked from view.) A bright, shifting shock wave forms where the polar jet runs into quieter parts of the nebula.

The Crab watchers themselves don't have a good explanation for these antics. One early hypothesis for the equatorial waves is that the charged particles clinging to the magnetic field lines only break free when they reach the speed of light, which happens most often at the equatorial plane, says ASU astronomer Paul Scowen. At the poles, the field lines get twisted up as the star spins, creating a funnel that shoots out particles. Scowen likens the effect to the behavior of an overwound clock spring, which snaps violently, relieving the tension.

But that's as far as the team's explanations go; the observers hopes that after watching the movie, theorists will take the next step. Says Hester, "From here on out, we've thrown down the gauntlet."

–Kim Peterson