SONOGRAMS IN SPACE

Irregularly shaped 'envelopes' could mean the birth of twin stars.

"It's going to be twins" can be shocking news for parents, but not so much for astronomers.

Binary stars—or twin stars—are much more common than single stars, says Leslie Looney, an LAS astronomer. What's more, he says they now have the first observational evidence supporting the theory that an irregularly shaped cloud of dust in space stands a good chance of dividing into two stars. Think of it as a sonogram in space, predicting the birth of twin stars.

Using images from the Spitzer telescope orbiting in space, the research team looked at 20 clouds, or envelopes of dust and gas, and found that 17 of them were irregular or "blob-shaped." Most of these irregularly shaped envelopes were thought to contain twin stars in development, while the other three envelopes were much more spherical and were believed to hold single stars.

"We think that asymmetrical envelopes mean we are seeing the early stages of the formation of binary systems," Looney says. "We're seeing asymmetries that we've never seen before."

Stars form within a spinning envelope of dust, he explains. This is the "egg" in which the single star or twin stars will be born. The dust falls onto a disk encircling the developing star, and then it drops down onto the surface of the fattening star. Eventually, the gathering material will get so hot and dense that fusion happens and the star begins burning hydrogen and helium.

A star is born. But it takes a gestation period of about 10 million years to reach this point, and that's one long pregnancy.

Scholar Chosen to Lead Chicago Humanities Festival

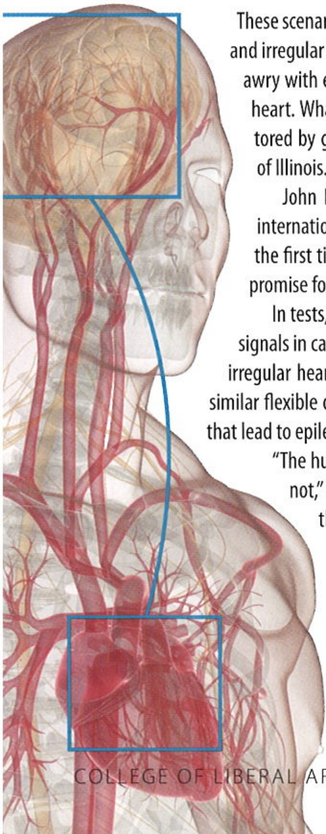
Matti Bunzl, a professor of anthropology and the director of the Program in Jewish Culture and Society in the College of Liberal Arts and Sciences, has been appointed as the next artistic director of The Chicago Humanities Festival, the largest humanities festival in the U.S. The appointment was effective at the conclusion of the 2010 festival. The three-week-long festival, first held in 1989, attracts thousands of visitors to Chicago each fall for a celebration of ideas. The festival brings together novelists, scholars, musicians, archaeologists, historians, artists, performers, playwrights, theologians, poets, architects, policy makers, and others to offer performances, screenings, exhibits and discussions on a theme of universal interest.

A HEARTBEAT AWAY

FLEXIBLE DEVICE MAPS ELECTRICAL PROBLEMS IN THE HEART AND THE BRAIN

— *Elisa was only 12 when the first seizure struck. "I felt like someone was choking me," she writes on the Epilepsy Foundation website. "I thought, 'I'm gonna die at 12.'"*

— *An elderly woman said it felt like her heart was going to burst from her chest. Out of the blue, one or two times a year, her heart would begin racing, beating close to 300 times per minute, rather than the normal range of 60 to 100.*



These scenarios describe two dramatically different problems—epileptic seizures and irregular heartbeats. But at the core, both conditions involve something going awry with electrical signals in the body—one in the brain and the other in the heart. What these conditions also share in common is that they can be monitored by groundbreaking new flexible electronics developed at the University of Illinois.

John Rogers, a researcher in chemistry and materials science, is known internationally for his work on flexible, stretchable electronics. But now, for the first time, this technology has proven successful in animal trials that show promise for new modes of medical treatment.

In tests, the U of I's ultrathin electronic array has been able to track electrical signals in cardiac tissue in beating hearts to determine which regions are causing irregular heartbeats. Researchers also recently announced the development of a similar flexible device that maps electrical signals in the brain to pinpoint problems that lead to epileptic seizures.

"The human body is soft and elastic and curvilinear, while silicon wafers are not," says Rogers. "We thought that if you can create a flexible technology that is more compatible to the human body, then you can bring high-quality electronics to bear on all kinds of problems in human health."

Out of this idea emerged a collaboration with the Penn School of Medicine, where flexible electronics, fabricated at Illinois, are being used in both the heart and brain.

In the heart, a thin sheet of plastic—like high-tech plastic wrap—sits directly on top of the heart during surgery to correct arrhythmic hearts. This thin plastic holds 2,000 transistors grouped among 288 different sensors. Each sensor measures and maps out electrical activity in the heart, helping the surgeon pinpoint the aberrant heart cells behind the irregular heartbeat.

Once the aberrant cells are identified, the surgeon removes them through a procedure known as cardiac ablation.

Currently, surgeons identify problematic cells using a single probe, moving it to various locations of the heart. This process is mechanical, less precise, and more time-consuming than using thin, flexible electronics. And as Rogers points out, time is of the essence during open-heart surgery.

The toughest part in developing the device, he says, was creating waterproof electronics that wouldn't be damaged by bodily fluids or by the saline solution used during open-heart surgeries.

Rogers's team is now working with a Boston startup company and the University of Arizona to adapt the same electronics for a catheter approach to irregular heartbeat problems. Instead of opening up the chest, doctors feed the flexible sensors into the heart on a catheter, where they can do much the same thing—identify problem cells.

In the epilepsy case, researchers are using flexible electronics to map out electrical signals in the brain. All of the folds and fissures in the brain pose an even greater challenge than the smoother surface of the heart, but so far Rogers says they have been successful in overcoming this obstacle.

"We have devices that can fold up and insert into the gap between the right and left hemisphere of the brain so you can monitor electrical activities on both inner surfaces at the same time," he says.