Charon formed in a tremendous interplanetary collision.

Most astronomers think that our own moon formed when a passing chunk of rock collided with Earth, knocking huge pieces of its surface rock into orbit, which later coalesced to form the moon. Because the surface rocks that formed the moon have a different composition from the rest of the planet, the two bodies should have a marked difference in elemental composition—and that's just what geochemists find. Astronomers have speculated that Charon—which was discovered in 1978, is about half the size of Pluto, and orbits its parent about once a week—also formed in a catastrophic impact. But although the spectrum of sunlight reflected from both objects has shown that they harbor molecules like ice and methane, Pluto and Charon are so faint and close together that astronomers couldn't always tell which elements are on which celestial body.

A team of astronomers led by Ryosuke Nakamura at the 8.3-meter Subaru Telescope took advantage of exceptionally good atmospheric conditions on 9 June to snap the first ground-based telescope image that shows Pluto and Charon as separate bodies. Nakamura's team produced spectra from the two bodies that showed differences in composition known from earlier measurements: Pluto is covered in nitrogen ice, while Charon is coated with water ice. The spectra also revealed small amounts of ethane on Pluto, but not on Charon.

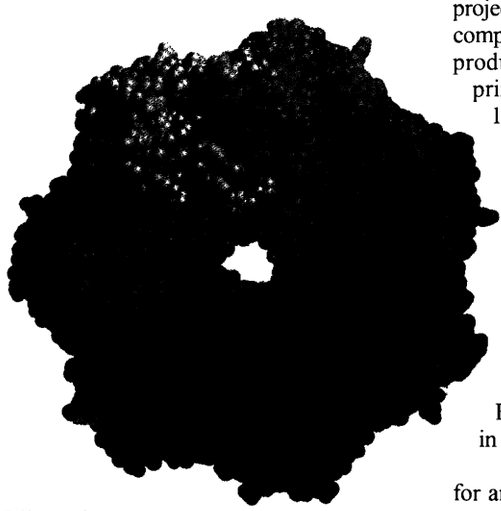
Astrophysicist Alan Stern of the Southwest Research Institute in Boulder, Colorado, says the detection of ethane "is a nice confirmation of theoretical predictions" that the compound would be found on Pluto, either left over from the solar system's formation or formed by sunlight-driven reactions. But it is probably too early to decide how Charon formed. "Right now I'd probably come down on the side of the impact hypothesis," says University of Hawaii, Manoa, astronomer Dave Tholen, "but more data will be necessary to try and tip the scales." Nakamura's team will be returning to gather those data in the near future, after the telescope has been adapted to better correct for atmospheric blurring. **–MARK SINCELL**

Mark Sincell is a free-lance science writer in Houston, Texas.

SYNCHROTRON RADIATION

NIH to Help Fund Big Physics Facilities

The National Institutes of Health (NIH) is getting into the synchrotron hardware business. Last week, NIH officials announced plans to spend $18 million this year to help pay for upgrades at California- and New York–based synchrotrons, which ricochet powerful beams of x-rays off materials to determine their atomic structure. NIH officials say they hope the money will help meet the burgeoning demand for "beamtime" among biologists looking to reveal the cell's secrets on the atomic scale.



Filling the gap. NIH funding should speed up work on determining such structures as ClpP proteasome.

The new money pales in comparison to the nearly $175 million that the Department of Energy (DOE) spends every year to operate the nation's four principal synchrotrons. Still, NIH's new direction is "tremendously significant," says Keith Hodgson, who heads the Stanford Synchrotron Radiation Laboratory (SSRL) in Menlo Park, California. A 1997 DOE advisory panel strongly backed a series of synchrotron upgrades (*Science*, 17 October 1997, p. 377). But the increasingly cash-strapped DOE has had a difficult time coming up with the extra money. "Given the difficult budget climate at DOE, I think the [upgrades] would have been difficult to pull off," says Hodgson.

NIH's support for the facilities comes in response to the mushrooming demand among biologists for access to the stadium-sized machines. According to a recent DOE advisory committee report, biologists have grown from about 5% of all synchrotron users in 1990 to nearly one-third in 1997. Among protein crystallographers, the growth is even more rapid: The number of protein structures solved with the help of synchrotron x-rays jumped from 16% to 40% in just 5 years. With the genome project churning out new protein sequences by the hundreds, demand is only projected to grow. "We said we have to do something about this," says Marvin Cassman, who heads the National Institute of General Medical Sciences in Bethesda, Maryland.

The first part of that something—$14 million of the $18 million of NIH funds—will kick off a $53 million upgrade of the central electron storage ring at SSRL, a project expected to take almost 4 years. When complete in 2002, the upgraded ring, which produces the tightly focused x-ray beams prized by users, is expected to generate 10 to 100 times its current x-ray power, enough to boost the facility from a "second-generation" to a "third-generation" machine. That newfound power will enable researchers to collect data faster and study smaller protein crystals than they can now, says Hodgson. NIH's other $4 million will support new x-ray detectors and storage ring improvements at the National Synchrotron Light Source at Brookhaven National Laboratory (BNL) in Upton, New York.

Although NIH has long helped pay for analytical equipment used by biological user groups at synchrotrons, the new money marks the first time the biomedical agency has paid for general capital improvements at any of the facilities. But DOE physicist Bill Oosterhuis notes that the new upgrades will benefit more than just biologists. "Most of the improvements will improve the quality of the x-ray beams for all the scientists," he says. **–ROBERT F. SERVICE**

EMBRYO RESEARCH

Stem Cells as Potential Nerve Therapy

Last November, U.S.–based researchers announced, with much fanfare, that they had isolated an "immortal" line of human embryonic stem cells—a type of universal cell extracted from an embryo, which can, in the right environment, transform itself into any type of human tissue (*Science*, 6 November 1998, p. 1014). The press was soon full of predictions that researchers would be able to grow new tissue, or even organs, from these cells for transplantation into sick people. Already, evidence that such therapies may be possible is emerging.

The best example so far comes from Oliver Brüstle of the University of Bonn Medical Center and his U.S. colleagues. On page 754, they report that they've taken embryonic stem (ES) cells from mice and coaxed them to form glial cells, a type of support cell in the brain that also produces myelin, an insulating sheath for neurons. When the researchers injected the glial cells into the spinal cords of rats with a genetic defect that leaves them unable to make myelin, the glia soon got to work coating the rats' neurons with myelin. "Our myelination experiments are a first example of an appli-

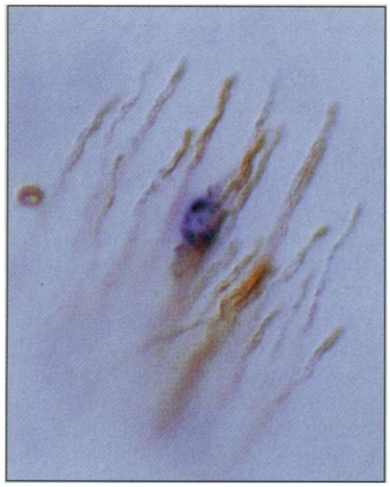
CREDIT: BNL

cation of this [stem cell] technique to a neurological disorder," Brüstle says.

Developmental biologist Davor Solter of the Max Planck Institute for Immunobiology in Freiburg, Germany, describes the work as "promising," adding: "It is nice that they put the pieces together and substantiated what everyone is believing"—that ES cells may have therapeutic uses. They might, for example, be used to treat people with multiple sclerosis or other conditions in which myelination is defective. Brüstle cautions, however, that much more work needs to be done with animal models before attempting such transplants in humans. But he adds, "if the experiments are successful in animal models, it is worthwhile considering whether the results are applicable to humans."

Consideration may be all the technique gets, however, because of legal barriers to this type of embryo-based research. In the United States, current law forbids the use of public funds for deriving stem cells from human embryos. In Germany, restrictions are even tougher. The human embryo is protected by law from fertilization to implantation, and any research on or with human embryos is prohibited unless the embryo is the immediate beneficiary. "Particularly in Germany it will be difficult to advance research in this field," says Brüstle.

For their experiments, Brüstle and his team took cells from 3.5-day-old mouse embryos and coaxed them to grow and bunch together into embryoid bodies, a first step toward differentiation, which is when individual cells become committed to forming different cell types. Then the researchers cultivated the embryoid bodies in a medium that favors the survival of precursors to nerve cells and finally applied growth factors known to promote the proliferation of precursors to glial cells. Ultimately, the glial precursors formed the two major types of glial cells, known as oligodendrocytes and astrocytes. Five days later, the team detected the expression of CNP, a protein characteristic of the myelin sheaths of neurons, by the cells.



CREDIT: BRÜSTLE *ET AL.*

Gotcha covered. A mouse glial cell (with dark-stained nucleus), derived from an embryonic stem cell, coats axons in a rat's spinal cord with myelin (brown stain).

Earlier transplant studies had shown that oligodendrocyte precursors injected into animals suffering from myelin diseases had succeeded in coating the host animals' neurons. So Brüstle and his team transplanted their stem cell–derived oligodendrocytes into the brains and spinal cords of fetal and week-old rats who have the same mutation as humans with Pelizaeus-Merzbacher disease (PMD), a rare genetic disorder in which the myelin is defective. A few weeks later, the donor cells had generated numerous myelin sheaths on the rats' brain and spinal neurons. That suggests that similar transplants might help patients with PMD, which is usually fatal, or other demyelinating conditions.

Such promise for stem cell therapies has prompted much soul searching on both sides of the Atlantic over current legislation banning embryo research. Earlier this month, the White House's National Bioethics Advisory Commission recommended that the U.S. government lift its restrictions on research on human embryonic stem cells (*Science*, 23 July, p. 502), while in the United Kingdom two advisory committees recommended relaxing the rules on embryo research, but the government decided in June to put off the decision for 6 months [*Science*NOW, 25 June (see the Archives at www.sciencenow.org)].

German researchers can't expect the green light for human ES cell research anytime soon, however. In March, Germany's main research funding agency, the DFG, published a policy statement on research with human embryonic stem cells, which advised German policymakers not to change the embryo protection law now. "I do not think it is possible to change the embryo protection law within an adequate time period, even if this aim was desired," says DFG president Ernst-Ludwig Winnacker.

The DFG calls instead for more public discussion of the issue and suggests establishing a central commission to assess the ethical, legal, and scientific basis of research with human embryonic stem cells. The agency also wants to see uniform European standards in this matter, which will preserve fundamental values of human dignity and health. "Other countries in Europe are more liberal about research on embryos within certain time limits and permit individual decisions for research projects by bioethics panels," says Jochen Taupitz of the Institute for German, European, and International Medical Law, Public Health Law, and Bioethics at the universities of Heidelberg and Mannheim. Winnacker is confident that some order can be brought to the situation. "We shall present our ideas [to the European Parliament]. Up to now we have had a good response from European committees.

–SABINE STEGHAUS-KOVAC

Sabine Steghaus-Kovac is a writer in Frankfurt, Germany. With additional reporting by Gretchen Vogel.

MEDICAL PHILANTHROPY

Keck Gives $110 Million For USC Initiatives

The W. M. Keck Foundation, best known for funding giant telescopes that help scientists peer into the distant universe, has decided to invest $110 million to help life on Earth. Yesterday the foundation announced its second-largest grant ever to bolster the University of Southern California's (USC's) medical school and to advance the field of neurogenetics. USC hopes the money will "help propel USC into the first ranks of medical research," says Robert A. Day, president of the $1.5 billion foundation, which along with USC is located in Los Angeles.

About $50 million of the grant, by far Keck's largest contribution to biomedicine, will fund studies of the genetic roots of diseases such as Alzheimer's, Parkinson's, and glaucoma, and the research will span everything from gene sequencing to mouse knockouts, drug development, and molecular epidemiology. Thirty researchers will be hired in the next 5 years to join 50 current USC faculty in the initiative, to be headed by USC cancer epidemiologist Brian Henderson.

A former president of the Salk Institute for Biological Studies in La Jolla, California, Henderson says he plans to take advantage of the university's strengths in clinical medicine and epidemiology, including a long-term health study of a multiethnic group of 215,000 people. "We're really hoping to use the fruits of the human genome project," Henderson says. A portion of the initiative will be housed in a $40 million neurosciences center to open in 2001. Neuroscientist Ira Black of the Robert Wood Johnson Medical School in New Brunswick, New Jersey, says the Keck grant should help USC move into the front ranks of neurogenetics now occupied by Johns Hopkins, Harvard, and other universities.

The remaining $60 million will help USC expand what will be renamed the Keck School of Medicine, strengthening the school's endowment, scholarship funds, and faculty. "The money is going to move us toward the 200-plus people we need to be a top-ranked center," says Henderson. The university has promised to raise $330 million to complement the grant.

–JOCELYN KAISER