A Cell Divided: Pitt Team Illustrates Problems with Cancer Cell Division

Researchers at the University of Pittsburgh have provided the first graphic illustration of mechanisms by which chromosomes are distributed unevenly during cancer cell division. The results were published in the January 4, 2000, issue of the Proceedings of the National Academy of Sciences.

“This is really the first paper showing a mechanism by which chromosome segregation can go awry in cancer cell division, leading to genetic defects such as abnormal or missing chromosomes,” said William Saunders, principal investigator on the study, assistant professor of biological sciences and an investigator in the Oral Cancer Center at the University of Pittsburgh. “By witnessing these events, we can now target for study those activities within a cancer cell that become derailed during cell division. In this way, we can focus on ways to interrupt these abnormal processes with the potential to curb cancerous growth.”

During normal cell division, coils of genetic material called chromosomes align neatly in the middle of the cell into 23 pencil-shaped pairs of parallel strands called chromatids. At the same time, two centrioles form at opposite poles of the cell. Thread-like microtubules attach each of the chromatids to the centrioles, forming the spindle. When the cell divides, the chromatids separate and are pulled by the microtubules to opposite poles. Thus, two identical pools of chromatids, the inherited genetic instructions of the future daughter cells, form at the poles. The interior of the cell separates in barbell-like fashion with a narrow bridge that eventually pinches in two to form the two daughter cells.

Using fluorescent markers to label cell structures involved in the division of oral cancer cells, the Pittsburgh team is the first to capture the unusual activities that account for well-recognized genetic derangements characteristic of cancer cells.

In one set of experiments, the researchers found that an oral cancer cell could produce not two, but three or four spindle poles, each with its own set of microtubules, thus forming bizarre, Y-shaped or cruciform spindle structures. Specifically, the researchers found in the cancer cells that a protein within each spindle pole, called the nuclear mitotic apparatus protein (NuMA), split apart in renegade fashion, generating new poles in an apparently haphazard way. As a result, chromatids migrated to various parts of the cell. During cell division, the haphazard alignment of chromosomes will lead to daughters with different numbers and types of chromosomes.

“For years, scientists have recognized these bizarre mitotic spindle structures in pathology specimens, and we’ve known for some time that NuMA is involved in organizing the spindle poles. However, this study is the first to capture these activities,” said Saunders.

(Continued on p. 3)

The History of Pittsburgh, Through the Web

After browsing the new Historic Pittsburgh digital library launched by the University Library System (ULS), you might feel as though you actually inhaled the black soot from the steel mills during the 1920s, sipped tea with a small circle of elite at a party in Sewickley in the 1880s, trudged through the mud with a band of soldiers from Connecticut to Fort Pitt in 1785 or dodged a flaming stick of dynamite hurled at Pinkerton detectives by one of thousands of angry striking Homestead steelworkers in that now-infamous bloodbath of 1893.

This ground-breaking project makes accessible to a global audience the full text of rare books and documents on the history of Pittsburgh from the 17th, 18th and 19th centuries. Many of the volumes, which include personal accounts, journals, diaries and city planning records, are found in the ULS Darlington Room, but are too fragile to be checked out. Now, they’re available to everyone.

(Continued on p. 2)
UNITING THE YOUNG AND OLD AROUND THE WORLD

A n important seed has been planted by a new international organization linking the elderly with the younger generation in mutually beneficial programs. Generations Together, the intergenerational studies program at the University of Pittsburgh, is one of the leaders in the International Consortium of Intergenerational Programs (ICIP). It involves representatives from France, Germany, the Netherlands, Spain, the United Kingdom, Cuba, Canada, South Africa and Japan, and is backed by UNESCO. As ICIP flourishes, it will unite teachers, researchers, social workers and policy makers on intergenerational approaches to global social issues. An academic journal will be available in 2002.

PITT STUDIES OSTEOPOROSIS IN MEN

Osteoporosis, the bone-weakening condition long regarded as a women’s disease, is afflicting men in increasing numbers, and the University of Pittsburgh’s Graduate School of Public Health (GSPH) is part of a national study examining what predicts osteoporosis-related bone fractures in men. The project, named “Mr. OS,” is sponsored by the National Institute of Arthritis and Musculoskeletal and Skin Diseases in partnership with the National Institute on Aging and the National Cancer Institute at the National Institutes of Health.

Osteoporosis affects 28 million Americans, and while women are four times more likely to develop osteoporosis, one-third of disease-related hip fractures occur in men. Researchers will examine factors such as bone mass and structure, hormones, lifestyle and tendency to fall, as well as a possible link between bone mass and prostate cancer.

“Bone is hormonally sensitive tissue, and we already know that high bone mass is related to breast cancer—a hormonally sensitive disease,” said Jane Cauley, the study’s principal investigator and associate professor of epidemiology at the GSPH. “The hypothesis is that if greater bone mass is related to breast cancer, there is a possibility that it also could be related to prostate cancer, another hormonally sensitive disease.”

CANCER CELLS (CONT. FROM P. 1)

chromosome bridge between the two newly forming daughter cells. Eventually, the abnormal chromatid breaks in two or may be left behind during cell division, producing a small micro-nucleus. If the chromosome ends are broken, they are likely to rejoin again, reforming the chromosome bridge at division. This process, called a breakage-fusion-bridge cycle, is repeated with each cell division, yielding chromosomes with ever-increasing copies of genetic material. These amplified segments may contain multiple copies of genes that drive cancer growth.

“We know that smoking somehow leads to micronuclei and chromosome damage. Our study shows how these events may occur in cancer cells. By understanding this process, we may be able to intervene and prevent additional gene amplification that contributes to cancer growth,” said Saunders.

This research was supported by an oral cancer center planning grant from the National Institute of Dental and Craniofacial Research, which has since awarded the University of Pittsburgh an $11.2 million grant to establish a comprehensive oral cancer center, the only such designated comprehensive center in the country. • LW
with the click of a mouse at http://digital.library.pitt.edu/pittsburgh/.

The books immediately conjure up the flavor, mood and politics of a bygone era, when Pittsburgh (spelled without the "h" until the 1890s) was the hub of just-emerging industries of steel, natural gas and glass production, as well as home to the largest pickling and preserving works in the world; when trading boats laden with merchandise floated down the Ohio River in the 1760s; when there were no newspapers to read—only the Bible and the Almanac—and when an evening’s entertainment in the 1840s was provided by the debating society or music school. Users can read about the construction of the city’s ten original inclines and the birth of Pittsburgh's famous trolleys, the old Citizens Passenger Railway, which began maneuvering the streets in 1859. There is a firsthand account of life at the H.J. Heinz plant, as Heinz became the first employer in the country to offer workers clean uniforms, locker rooms and free dental service and life insurance.

Available book titles include:
- Steel: The Diary of a Furnace Worker by Charles Rumford Walker (1922);
- The Social Mirror: A Character Sketch of the Women of Pittsburgh and Vicinity During the First Century of the Country’s Existence by Adelaide Nevin (1888);
- Henry J. Heinz: A Biography by E. D. McCafferty (1923); and four volumes of A Century and a Half of Pittsburgh and Her People by John Newton Boucher (1908).

“It's the Site of The Year for me,” wrote Kiraly Peter of the Hungarian National Library in the site’s feedback column. “It has a clear structure, unified and simple typography, and excellent search abilities.”

Historic Pittsburgh provides full-text search capabilities—by keyword, subject, author and title—which allow users to find specific passages within books or other records. The library has digitized land ownership maps, or plat maps, that depict churches, cemeteries, roads, railroads, lakes and streams. City plans and atlases show lot and block numbers, street widths and names of property owners. Users can click on portions of the map to zoom in on a street or building. “Everyone is a bit of a history buff, or will be, once they have found this site,” said Rush Miller, University librarian and director of the ULS, who has been receiving positive feedback from users around the world since the project went on-line in late 1999. “What a terrific surprise to find plat maps on-line,” wrote one user. “It’s the next best thing to owning them.” Another user, researching the architectural history of Pittsburgh houses and buildings, said the maps have saved her a lot of time. “It’s wonderful to be able to see them clearly, without the microfilm scratches, and in color,” she wrote.

A California user wrote that she had found 15 family names on the site, including those of her grandparents. “Genealogists love this resource,” said Miller. “There is a tremendous amount of information on Pittsburgh families. But it will be equally useful for teachers, historians and anyone interested in the role of Pittsburgh in the making of America’s industrial society.”

The books, some in very brittle condition, were scanned as high-resolution image files and were then rebound, using acid-free reprints of the original pages. “It’s really an access project and preservation project rolled into one, as well as a contributor to the virtual digital library we are working on as a profession,” noted Miller, who is collaborating with the Historical Society of Western Pennsylvania on the project. “Not only is this a large and significant digital library project, it is a test bed for research into digital library issues and use. We are helping establish standards that can be used in similar projects at other libraries.”

An advisory group of professors, teachers, librarians and archivists will guide the growth of Historic Pittsburgh, which is expected to include 400 on-line books by late 2000. • SSB
Ch-Ch-Ch-Changes: Vibrations Show Health of Machines

Every automobile owner has done it—and felt silly about it—at one time or another: “It’s making a pachinkity-pachinkity sound whenever I speed up.” Or “I hear screeches when I apply the brakes.”

But there’s no reason to feel silly or self-conscious, because those sounds really can help the mechanic isolate the problem with the car.

In industry as well, seasoned machinists can identify many problems with their equipment by the changes in the sounds the machines create: the normal hum may develop into a constant high-pitched screech, or a metallic “clink” may emerge intermittently.

Identifying mechanical problems by analyzing changes in the frequency of the machine’s sounds is just one of the projects University of Pittsburgh professor Patrick Loughlin is studying using time-frequency analysis. He is also using the technique to measure human balance, and in acoustics, but Loughlin considers the applications for time-frequency analysis to be virtually boundless, because many signals change their frequency characteristics over time.

“Music and speech are the quintessential examples of signals whose frequencies change over time,” explained Loughlin. “How these frequencies change over time, how they are ordered in time, is important. It’s the changing frequencies that convey information—play a recording of speech backwards and it sounds nothing like the original, yet it has exactly the same frequencies, only in a different order.”

In machine analysis, the signal is often a vibration measurement or a sound created by the vibration. In human balance, the signal is postural sway. In acoustics, it is the sound pressure wave itself. All of these signals can exhibit spectral changes over time as the condition of the system that generated them—be it the man-made machine or the human machine—changes.

For instance, gear tooth wear and tear can show up as sidebands to the gearmesh frequency. If the machine is out of balance, it can generate a frequency at the rotor speed; loose rotors will generate harmonics of the gearmesh frequency; and loose gears can generate either harmonics or sidebands about the gearmesh frequency.

Skilled machinists on the factory floor know that the vibrations of their machine change as the health of the machine changes, and that is one of the cues they use to assess the condition of various machines. “We’re aiming to provide machinists with another tool that can assist them in machine diagnostics, by verifying what they’re hearing with a visual display of the vibration pattern, or by providing information about vibrations beyond the range of human hearing, for example,” said Loughlin. “This analysis can be very useful because it can provide the machinists with early indications of potential problems that they may have missed—for example, because it was drowned out by the noise from other machines, or because the machinist wasn’t standing next to the machine at the time because the operation was automated.”

“Usually, the machines don’t suddenly go bad. Typically there are transient vibrations, then the machine will go back to normal for a period. Time-frequency analysis will often catch the transient vibration early on, and flag it for the machinist to investigate further and decide whether or not there is in fact a problem developing.”

Catching problems early on can save manufacturers money in terms of damaged product, wasted operator time and missed deadlines. The accompanying charts, from work by Loughlin for Boeing, display the difference between a healthy drill (A) and one that has developed a chip (B).
Lost in the Translation

Professor Gets the Bugs Out of Software

Not all language translation is done in the foreign language departments; in fact, a lot of translation goes on inside your computer.

Software developers write their programs in high-level programming languages such as Basic, Fortran, C or C++. The high level program is then translated to machine language; each statement in the program is translated into a number of machine code instructions, specific to the type of computer. The computer then executes these instructions during the program’s execution. Java is a little different in that the Java statements are translated to a language called Java Byte code that is not at machine level. The translated Java program would thus need to be interpreted by software for its execution. None of these program languages, however, are recognizable to the computer user as he or she uses software to send an e-mail, write a report, or tries to top their previous high score in Tetris.

“Redundancy is built into programming languages to help make them easier to program and understand, but should be eliminated when a program executes because they rob a computer of time and memory,” said Mary Lou Soffa, Professor of Computer Science at the University of Pittsburgh. “Another problem today is that the size of programs is growing, making it more difficult to translate programs into efficient machine code.”

Finding ways to eliminate the redundancies and developing techniques that scale to large programs are the projects Soffa has been focusing on in her work on compiler technology.

Code optimization is a compiler technique that takes the translated code and improves on its execution time performance by removing the redundancies. Her current research is directed toward developing path- and resource-sensitive optimizations and scalable compiler techniques.

“The traditional approach is to analyze and apply code optimization uniformly over all parts of a program, the assumption being that all paths through the program are equally important,” Soffa said. “But it’s usually the case that a small number of paths through a program are executed frequently, while large numbers of other paths are seldom, if ever, executed.”

Determining which paths execute most frequently and ensuring that those paths are optimized is more productive and produces higher quality code than the traditional approach, Soffa said. However, optimizing frequently executed paths may require other paths to execute more slowly. Path- and resource-sensitive analysis is needed to identify the paths and to determine if it is worthwhile to apply an optimization on a path at the detriment of another path.

“One way to optimize is to identify which redundancies to target for elimination by identifying and optimizing the most frequently executed paths. If some statements on a path are executed 1000 times in a program, and you can eliminate one statement from this path, but you add another statement on a path that is executed 10 times, then you have saved time by not executing 990 instructions.”

Frequently, optimizers don’t take into account the amount of machine resources or other paths to execute more frequently. However, optimizing frequently executed paths still may result in higher quality code than the traditional approach.

PITT RELEASES REPORT ON THE STATE OF THE REGION

Pittsburgh’s population decline in the 1990s was lower than the rate of decline for the 1980s and 70s, according to the State of the Region Report released this fall by the University of Pittsburgh Center for Social and Urban Research (UCSUR). The report documents social and economic conditions and trends in the Pittsburgh region, and assesses and recommends policies for improvement. The report addresses population and employment trends, industrial change, welfare program trends, the status of women and children, the economic impact of the elderly, policies to improve African American economic conditions, transforming government from town to region and crime patterns.

Other study findings include:

• Private sector employment increased to a rate about equal to US growth.
• A smaller percentage of women than men were employed as executives, administrators and managers.
• The high school dropout rate declined while juvenile delinquency increased in the county.
• One health care job is created for every nine elderly residents in the region.
• Most African Americans locally remain at the margins of the economy.
• Crime rates, excluding drug crimes, dropped nationally, but rose locally.

(Cont. on p. 7)
Of Salamanders, Bryophytes & Invasive Plants

Research Underway At Pitt-Bradford’s New Allegheny Institute of Natural History

In many respects, ecological studies represent the most diverse, challenging and perhaps, consequential field of scientific inquiry for the new millennium. This academic arena holds great opportunities for theorists, natural historians and experimentalists, and requires broad, interdisciplinary logic and reasoning to guide its conclusions.

It is not surprising then, that the liberal arts ethos—at the core of the University of Pittsburgh at Bradford’s curricula—has spawned the birth of the Allegheny Institute of Natural History. And it is appropriate that the hardwood forests of northwestern and north-central Pennsylvania, which first drew settlers and industry to this part of the country, are the focus of important initial ecological research projects by students and faculty at Pitt-Bradford.

The perturbations, which have resulted from manmade disturbances such as logging, mining, oil exploration, agriculture, urbanization and resulting forest fragmentation, have given invasive and exotic plants strong footholds in the forests of northwestern Pennsylvania, affecting native vegetation and fauna. One particularly troubling plant, hay-scented fern (Dennstaedtia punctilobula), sometimes invades disturbed habitats, preventing other plants from reestablishing, and forms almost pure stands in the forest. The hay-scented fern is not especially palatable to native herbivores such as white-tailed deer, and due to selective browsing by deer and favorable environmental conditions, these ferns seem to be flourishing.

How the spread of hay-scented ferns affects salamander diversity is the subject of some of the new institute’s first studies. Thomas K. Pauley, director of the institute, says that amphibians are important components of ecosystems. Salamanders are particularly attractive subjects because they make up a large percentage of the vertebrate biomass in this forested region, and because they are important predators and prey in the ecosystem.

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Mary Puterbaugh, assistant professor of biology at Pitt-Bradford and a key researcher at the Allegheny Institute, notes that salamander and bryophyte (mosses) populations and diversity are important indicators in studying the habitat quality of a region. Because salamanders and bryophytes need both terrestrial and aquatic phases to reproduce, they are susceptible to habitat degradation in either environment. They can be affected by the relative humidity in the environment which, in turn, is partially determined by the amount of understory vegetation.

Few quantitative studies on the changes affected by invasive plants on natives exist, and fewer yet look at the effects of the exotic plant species on vertebrates. For one study, student researchers and faculty compared data from two sites, each surrounding a seep with standing water. One site had no hay-scented ferns and few other fern species, and the second site averaged approximately 1.1 hay-scented fern fronds per square meter. The soil pH at the site with high fern density was lower than that of the low fern density site. The mountain dusky salamander (Desmognathus ochrophaeus) was the most abundant salamander, but the terrestrial site with more ferns had only one-third as many individuals as the site lacking ferns.

In another study, four sites were compared by researchers: one terrestrial and one seep with an average of 1.1 hay-scented fern fronds per square meter, and one terrestrial and one seep with no invasive ferns. Both seep sites had more spatial heterogeneity

Two University of Pittsburgh professors have been named Fellows by the American Association for the Advancement of Science (AAAS) in recognition of their contributions to their fields. John S. Earman, professor and chairman of the Department of the History and Philosophy of Science, was honored for his distinguished contributions to the philosophy of physics. Marwan Simaan, the Bell of PA and Bell Atlantic professor of electrical engineering in the School of Engineering, was honored for his contributions to signal processing methods for imaging the Earth’s subsurface zone, for inspired teaching and for pioneering work in Stackelberg strategies for dynamic systems.
and greater bryophyte and salamander diversity than the terrestrial sites. The invasive-fern sites had an average soil pH of 3.91 and one-third fewer salamanders and fewer bryophytes than the no-invasive-fern sites, with a higher average soil pH. The terrestrial-invasive-fern site had 34 bryophyte censuses, with none on bare soil, compared to 43 censuses, with 6 on soil, in the fern-free site.

Both of these studies, as well as others in the planning process, are expected to provide important information on amphibian species diversity, reproductive biology, natural history and distribution patterns. Few, if any, previous investigations have been conducted that attempt to provide such a comprehensive study of northern Pennsylvanian amphibians.

Working in collaboration with the University of Pittsburgh’s Pymatuning Laboratory of Ecology, Pitt-Bradford’s Allegheny Institute of Natural History will play a key role in conducting a biotic inventory in western Pennsylvania over the next several years.

Veiga Singh, associate chancellor and professor of sociology in the Graduate School of Public and International Affairs at the University of Pittsburgh, has been named one of three senior research fellows by the Centre d’Etudes de Populations, de Fauvete et de Politiques Socio-Economiques (CEPS/INSTEAD) in Luxembourg.

Gaston Schaber, CEPS/INSTEAD director, made the announcement this fall during a visit to Pittsburgh by Luxembourg Prime Minister Jean-Claude Juncker.

Schaber cited Singh’s 15-year association with CEPS/INSTEAD, shared common research, and emerging new opportunities for cooperation between his institute and Pitt as reasons for the appointment.

As a senior research fellow, Singh will participate in the annual meeting of the institute to evaluate current research programs, research infrastructure and funding sources. He may develop his own research project while collaborating with other CEPS/INSTEAD researchers when appropriate.

Additionally, Singh will serve as one of the major links between the US and European scholars in trans-Atlantic policy research.

Reuben Slesinger, professor emeritus of economics at the University of Pittsburgh, was named to the Executive Board of Scientific and Technical Advisors of the American Board of Forensic Examiners (ACFE).

In his new position, Slesinger will help develop policy and qualifications for examiners seeking the designation of diplomat in the ACFE, and will write articles for The Forensic Examiner, the ACFE’s official journal.

During Slesinger’s 50-year career teaching economics at Pitt, he has authored eight books, and served as a consultant to the Federal Power Commission, the Department of Justice, and to corporations and law firms in the fields of wrongful death, disabilities and employee termination. A specialist in economic policy, he issues an economic forecast every January, which includes predictions on inflation, consumer spending, interest rates and unemployment.

Slesinger received his bachelor’s, master’s, and doctorate degrees from Pitt and completed graduate work at Harvard University and the University of Wisconsin.
Two heads are better than one; at least, that’s the old adage. Nevertheless, for Ellice Forman, associate professor in the University of Pittsburgh’s Department of Psychology in Education, the question is whether putting two or more students together to discuss their ideas enhances their learning of mathematics or science.

Forman’s research deals with children’s learning in a social context, either in small peer groups or the entire classroom. Peer collaboration and whole class discussion present different intellectual and social challenges for teachers and students, and understanding how interactions with classmates and the teacher can foster student learning is a central aim of her investigations.

Her two major projects involve examining discussions in elementary school mathematics lessons and studying peer collaborations in a scientific problem-solving task. She has directed similar investigations for 20 years, focusing on students from 6 to 15 years of age. Currently, these projects are funded by grants from the Spencer Foundation, the National Center for Improving Student Learning and Achievement in Mathematics and Science (NCISLA), and the Faculty Research Fund at Pitt’s School of Education.

Forman’s long-time interest in argumentation has recently been directed to the disciplines surrounding argumentation, such as linguistics, rhetoric, discursive psychology, mathematics and science education. This shift in focus came, in part, through her affiliation with the NCISLA, where she has worked with other psychologists, sociolinguists, and mathematics and science educators to study classroom learning.

In the past eight years, Forman’s research has examined the teacher’s role in guiding classroom discussion. “It’s not just the teacher helping students explain their ideas or be analytic, but ... how the teacher orchestrates arguments about scientific phenomena,” said Forman. “I’m looking at what the teacher does to encourage and, in some cases, constrain learning.”

Engaging in scientific arguments in the classroom can be initially difficult for children because of social, as well as cognitive and linguistic, demands. Children learn to argue about social conflicts before they learn to engage in intellectual debates, she explained.

“The teacher can help in the whole class discussions by ... making it clear that it’s not a personal attack, it’s an attack or support of ideas,” Forman said.

When teachers orchestrate arguments, they assist students in identifying the central concepts in an argument, aligning themselves with different positions, listening to and evaluating the claims and evidence of their peers, and articulating their own positions.

Teachers also have a role to play in small group work—a role that researchers are still trying to depict. “If you put kids in small groups and give them a task where there might be multiple ways of solving a problem, it doesn’t necessarily mean that they are really going to have a meeting of the minds,” Forman explained.

One student, who may not be the most knowledgeable member of the group, could exert social control of the situation, she said. The teacher needs to identify the groups where productive discussion and cooperation are occurring, and those where the interactions are less positive, both socially and cognitively.

In her investigations of small group work, students are paired with a familiar partner outside of the classroom and asked to conduct scientific experiments under the supervision of an adult examiner. The adult doesn’t intervene except to ask questions and to encourage the students to discuss their ideas and come to some kind of agreement. How the students interact and what they learn as a result are the focus of this work.

Whole class argumentation has been studied less than argumentation in small groups, according to Forman. “We have very limited information on students’ scientific arguments in classrooms for a variety of reasons.” She explained that until recently, students in math and science were not encouraged to discuss their strategies for solving problems. Instead, students were expected to learn the one “correct” way to solve a problem and then to apply that knowledge to their individual seat work. Today, however,
educational reform movements in mathematics and science education are encouraging students to use strategies that make sense to them and to explain those strategies to the teacher and to their peers. Content-focused communication in classrooms is being encouraged, not discouraged.

Whereas the activities of classrooms have changed, the notion that students should be involved in intellectual arguments is not new. Jean Piaget, for example, wrote about the importance of peer argumentation as early as the 1920s. More recent research supports many of Piaget’s claims about the role of peers in the development of argumentation skills in children. Certainly, children first learn to argue in their families with their parents, but the power differential makes it hard for children to learn how to really be effective arguers, explained Forman. “So, among their peers seems to be one of the best places for children to learn this important skill.”

Forman’s research seeks to identify and describe the most productive discussions in classroom and small group settings so that teachers will know how to intervene. Interventions can be as subtle as changing the types of tasks or materials provided, reorganizing the small groups, or taking a less directive but still supervisory role in the classroom, such as discussion orchestration.

“The new professional standards in math and science encourage discussion in classrooms, yet teachers don’t really have a lot of good examples of what it looks like when it’s productive and what it looks like when it’s really just chit chat,” explained Forman. “The goal is to have the discussion be a learning tool, not just a feel-good tool. There’s nothing wrong with feeling good, but that’s only a part of the learning process.” • PLW

**Mapping Mars**

In the blockbuster film *Star Wars*, one of the favorite sayings of smuggler/mercenary Han Solo was: “It’s not my fault!” And, despite his role on the National Aeronautics and Space Administration’s (NASA) Mars Site Selection Steering Committee, David Crown, assistant professor of geology and planetary science, can say that about the latest mishap with the $165 million Mars Polar Lander. This mission wasn’t one of the Site Selection Committee’s, and Crown hopes that public opinion over the Polar Lander’s problems doesn’t derail the entire project.

The Site Selection Committee was formed to provide advice and assistance on landing site selection for the Mars Surveyor program, primarily for the planned Mars 2001 mission, and those that follow. “Despite several recent setbacks, there is a really exciting program of exploring the surface of Mars, leading up to returning to Earth with samples from its surface in 2008.”

“We haven’t yet had the opportunity to study the detailed chemistry of rocks that we know haven’t travelled from Mars through space in the form of meteorites.”

Crown is referring to the 1996 study of a meteorite, thought to be from Mars, that some scientists believe held fossilized remains of primitive life forms. “Since 1996, NASA has geared its exploration program around finding environments in which life could have existed,” said Crown. “The real thread of that is looking for evidence of water on the surface, or near the surface, and how that may have changed over time.”

“That’s one of the goals of the program, looking at the data that’s coming back from the Mars Global Surveyor, the spacecraft that’s orbiting right now. We’re trying to get a very detailed view of where water may have been.”

**Ideas Gelling in ChemE**

A team led by University of Pittsburgh Chemical Engineering Professors Eric Beckman and Robert Enick and colleagues at Yale University is the first to transform carbon dioxide, CO₂, into a gel form. Much of Beckman’s work with CO₂ has centered on its “green” properties, especially its potential use as a solvent, replacing organic compounds in polymerization. Recent findings, published in the November 19 edition of Science, demonstrate that CO₂ can be fashioned into a gel or a foam with many potential applications, including:

- as an agent in oil well drilling, replacing water pumped into older wells to facilitate oil recovery;
- for foam insulation;
- for CO₂-based coating processes; and
- as microscopic building blocks for bioengineers, who could use the CO₂ as scaffolding with which to build tissue. The foams also have electrical properties, which could offer potential applications in electronics.

**In Brief**

That’s a lava flow in Hawaii, not Mars, that David Crown is standing atop.
IN BRIEF

The University of Pittsburgh and Carnegie Mellon University have received a $10 million, five-year grant from the National Institutes of Health (NIH) to establish a Center for the Study of Mind-Body Interactions and Health.

The center, one of five being funded nationwide, will explore how the mind influences the development and recovery from diverse diseases, including infectious diseases, osteoarthritis, early cardiovascular disease and breast cancer.

The grant reinforces the strong ties between the universities that have helped to produce breakthroughs, and enhances their reputations as world leaders in scientific and medical research.

“The fact that Pittsburgh will become the home to one of only five such centers to be established nationally is a tribute to its scientific leaders, provides further evidence of the strength of the city’s two great research universities and is a victory for the entire community,” said University of Pittsburgh Chancellor Mark A. Nordenberg. “The selection decision underscores two very significant facts. The first is that this region’s international reputation for pioneering medical research continues to grow. The second is that Pitt and Carnegie Mellon have a record of effective partnering that is virtually unique in American higher education. This very large and well-targeted grant gives us a special opportunity to build on that record in ways that should benefit people around the world.”

“The new Mind-Body Center is built on the strengths of two outstanding research universities,” said Carnegie Mellon President Jared L. Cohon. “Like other research collaborations between Carnegie Mellon and the University of Pittsburgh, it brings together world-class scientists to address the complex problems of our day. This latest collaboration will foster research breakthroughs that will broaden medical knowledge and improve mental and physical health outlooks for people everywhere.”

“There is a growing realization that many of the ideas about mind-body relationships are similar across diseases and that knowledge learned about one disease may help us understand another,” said Karen A. Matthews, professor of psychiatry, epidemiology and psychology at the University of Pittsburgh School of Medicine and Pitt principal investigator. “This is the first time the NIH has funded centers to study how beliefs, attitudes and emotions affect different diseases and how those can be developed, maintained and changed.”

“The center is something in it for everyone—researchers, theorists and patients,” added Michael F. Scheier, professor of psychology and co-principal investigator from Carnegie Mellon. “On one hand, it will allow us to test theoretical notions about how the mind and body interact to affect health. It also will allow us to develop interventions that are designed to enhance the quality and duration of life among people suffering from different kinds of chronic illnesses.”

The grant recognizes the leading role that researchers at Pitt and Carnegie Mellon have played in studying mind-body interactions and health. For example, individual studies done at the schools have shown that women with increased anger or hostility have a greater risk for coronary artery disease; people who have a larger support network of friends and relatives get sick less often than those who lead solitary lives; and osteoarthritis has the potential to compromise the health of family members as a result of the patient’s negative responses to symptoms and the family’s burden of providing emotional support and task assistance to the patient. The projects to be completed under the auspices of the new center will build upon knowledge obtained through these studies and others. They are:

- The risk for respiratory illnesses such as the flu may be affected by the health of an individual’s marital and non-marital relationships. Researchers hope to identify the most potent aspects of these relationships for health;
- Focusing on older adults with osteoarthritis (OA), researchers will determine if OA patients and their spousal caregivers experience greater health benefits from an educational intervention targeted at both rather than just at the patient;
- Doctors will examine women’s perceptions of stress, their attitudes and coping responses, as well as physiologically reactions to the stress in their lives, as potential markers of risk for cardiovascular disease; and
- Researchers hope to learn whether psychosocial interventions can be designed to enhance adjustment and lower recurrence and mortality among women with early-vs. late-stage breast cancer, and to find out the psychological, behavioral and biological mechanisms through which the interventions operate.

In addition to providing support for research projects, the Mind-Body Center will offer training for health care professionals and researchers through summer institutes, lectures and small grants to stimulate new research projects. Supporting the work of the center are cores for data management, measurement and statistical resources and biological assessment.
In evaluating landing sites for future missions, we’re trying to explore parts of the planet that may have been affected by water. So, one potential kind of landing site we’re looking for is a hydrothermal spring deposit," he explained. “We know there has been volcanic activity on Mars, and we know that’s an environment where you have heat and water coming together.

“It’s as if you took Yellowstone National Park and turned it off for a billion years—you’d find that kind of environment preserved on Mars. That’s one potential area. Another area is where we see drainage networks on the planet. Those networks may have had water running through them for quite a long period of time.”

Crown, who has been creating maps of Mars since 1997, was appointed to the Site Selection Committee in the fall of 1994. Prior to joining Pitt in 1994, he served a two-year post-doctoral research fellowship with NASA’s Jet Propulsion Lab.

“I do comparative planetology, and I look at volcanoes on Earth, and volcanoes on other planets. You use your knowledge of Earth and apply it to other planets. You think you know what goes on on Earth, and you can view what goes on on other planets as experiments that are run under different conditions. Each of the planets has its own unique set of starting points. We can learn a lot about Earth in a comparative mode.”

This is a real opportunity to increase our understanding of how lavas and magmas work on the Martian surface and to understand the general evolution of the planet, according to Crown.

He says that the Mars program is geared in stages, and the initial stage is to use some of the advanced technology to bring back samples. Eventually, he says, they hope to put human explorers on Mars.

“First, we need to build our confidence in getting spacecraft there, getting things into orbit, and learning more about the surface. In the 2001 mission, there is a segment designed by the human exploration component of NASA that’s going to do some soil testing as a precursor for putting people down on the planet.”

This story is based on an interview by Sharon Blake and Ken Service that originally aired on H.E.R. is broadcast the first Monday of every month at 7:00 p.m. • JF
JURIST Site Promotes "Neteracy"

A sk Professor Bernard Hibbitts about JURIST: "The Law Professors’ Network, and expect fascinating insights on the role of the World Wide Web in academia, the potential demise of the law review as we know it and the importance of “Neteracy”—internet literacy.

For a teacher whose area of expertise is legal history, Professor Hibbitts might seem an unlikely candidate to extol the virtues of the Internet and its technology. However, his own introduction to the Web in 1995 seemed to demonstrate a certain synergy between the new and the old. "My work as a legal historian revolves around ancient and medieval legal ceremonies," said Hibbitts. "Much of what I teach is unwritten—it’s more about the importance of what people said and did. With sounds, images and video, the Web allows me to explain and illustrate legal rites in ways words alone never could." Hibbitts also found the medium very attractive because of its international and interdisciplinary capabilities. "People interested in philosophy, religion, history and sociology—anywhere in the world—can now access information on the Web that previously was available only to law professors or students in printed law reviews."

Hibbitts’ manifesto, "Last Writes? Re-Assessing the Law Review in the Age of Cyberspace," appeared on the Web in February 1996. At that time, he began to search for Web sites created by other law professors and was surprised by what he found. Only a handful of law professors throughout the United States had their own Web sites. Some had resource pages and course links, and only a couple posted on-line articles.

Consequently, Hibbitts launched "Law Professors on the Web" as a clearinghouse for law professors on-line. By the fall of 1996, however, he saw an increase in the number of professors with sites, as well as the response to his own Web site. With the help of a single law student working part time, he expanded, revamped and advertised the site, culminating in its "reintroduction" as JURIST in March 1997. Today, the site provides an on-line forum where "professors can find information important to their daily work as teachers and scholars, and where they can share knowledge with colleagues, law students, lawyers and interested citizens," Hibbitts said.

JURIST brings readers the latest domestic and foreign legal news, US Supreme Court news and national law school news. It offers the only monthly law book review service available on-line or in print, and carries special features on legal education and technology. In addition to its core listings of law professors’ home pages, course pages and on-line articles, it provides a series of Subject Guides highlighting the best on-line legal resources across a core curriculum of 25 basic legal topics. It also offers a series of guides to ongoing national and international legal issues, including "Gun Laws & Gun Control" and "Kosovo & Yugoslavia."

JURIST’s free weekly e-mail newsletter, JURIST Update, reaches more than 4,500 subscribers in more than 85 countries. In addition to its Pittsburgh site, JURIST has affiliates in the United Kingdom, Australia and Canada, and future affiliates are planned for Japan and Germany. While JURIST drew 300 to 400 visitors a month in its “early days,” it’s now regularly accessed more than 17,000 times a week. Hibbitts attributes JURIST’s tremendous growth to the site’s academic quality and objectivity, its new features and an increase in national and international press coverage, including stories in The New York Times and The Wall Street Journal. He says that he’s learned from experience what does and what doesn’t work on-line from a design perspective. "We, as professors and presenters of information, have to think in terms of layout, sound and color—not just text," he said. "This medium’s capabilities are almost unlimited. It’s like being given a boxful of new toys!”

JURIST: The Law Professors’ Network can be found at http://www.jurist.law.pitt.edu/.