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CONTACT: Sean B. Carroll, (608) 262-6191, sbcarrol@facstaff.wisc.edu

MICROBE GENES HELP SCIENTISTS RECONSTRUCT ANIMAL ORIGINS

MADISON - Without the help of fossils or any other record from the distant past, scientists have identified what they believe represents a common ancestor of all animals on Earth, a microscopic organism with key genetic traits that, until now, have been found only in true animals.

Writing in the Dec. 18 Proceedings of the National Academy of Sciences, a team of scientists from the Howard Hughes Medical Institute at the University of Wisconsin-Madison reports the discovery of a key cell communication gene in modern, single-celled microbes known as choanoflagellates.

Long suspected to be close relatives of animals, choanoflagellates have a lineage that dates to more than 600 million years ago, the time when animals - multicellular organisms with distinct body plans and systems of organs -are believed to have evolved in the ancient stew of microscopic protozoan life

Ancient microbes eventually gave rise not only to animals, but also plants, fungi, bacteria, and other living things, each going their separate ways to make up the tree of life as we know it today. The evolution of multicellular animals from a unicellular protozoan ancestor has long been recognized as a pivotal transition in the history of life.

"The question is, who were the ancestors of animals and what genetic tools did they pass down to the original animals," says Sean B. Carroll, a UW-Madison professor of genetics and the senior author of the PNAS study. "This is a difficult question to answer because the events are completely invisible in the fossil record."

Choanoflagellates represent an order of transparent, single-celled microbes that propel themselves with whiplike appendages. They exist in many forms today and, like animals, their lineage stretches back hundreds of millions of years ago to the mix of microscopic life that first evolved on Earth.

"Choanoflagellates thrive today and are the closest non-animal organisms to animals. They are to animals what chimps are to humans, and by studying some of their genetic characteristics, we can begin to make some strong inferences" about how animals evolved, Carroll says.

In recent years, biologists have come to understand that nature, in her use of genes, is thrifty. Instead of inventing new genes to accomplish new tasks, animals tend to redeploy existing genes in new ways. For example, genes used to make the very pedestrian wings of fruit flies are also those that butterflies use in different ways to make their far more colorful and shapely wings. Understanding this phenomenon has enabled scientists to track evolutionary relationships between animals by looking for common genetic themes.

Undertaking a similar exploration in choanoflagellates, Carroll and his colleague, Nicole King, also of the Howard Hughes Medical Institute at UW-Madison, discovered a signaling gene in a choanoflagellate that, until now, was known only in animals.

"To build a multicellular organism compatible with a multicellular lifestyle, is something that is very difficult," explains Carroll. "It takes a lot of genetic machinery to do that, and you have to ask the question, did it all arise when animals came along, or was some of it in place earlier?"

The current study, he says, strongly suggests that the key genes animals use today were indeed already available on the eve of animal evolution.

"We're starting to get a glimpse of the genetic tool kit we have in common. In choanoflagellates, we've found genes that heretofore were believed to exist only in animals. It's a confirmation of the idea that the genes come first, before their exploitation by organisms."

The gene-based signaling pathway found in extant choanoflagellates, Carroll says, resembles a similar pathway found in organisms as diverse as sponges and humans.

"Choanoflagellates express genes involved in animal development that are not found in other single-celled organisms, and that may be linked to the origin of animals. In other words, it looks like, walks like, and smells like genes that we are familiar with but that, apparently, evolved at the base of the node where animals split off the tree."

The identification of a common ancestor to all animals is important, according to Carroll, because it helps fill in the big picture of the evolution and diversity of life on Earth. It helps us understand, he says, how animals came to be and how nature creatively uses the same molecular tools to sculpt life in different ways.

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10/11/2000

CONTACT: Jerry L. Kermicle (608) 262-1253, 262-3286, Steven R. Gerrish (608) 262-3120, srgerrish@facstaff.wisc.edu

GENE BARRIER IN CORN MAY BOOST TRADE, ENVIRONMENT

MADISON -- Working with teosinte, a wild cousin of maize, a University of Wisconsin-Madison scientist has found a molecular barrier that, bred into modern hybrid corn, is capable of completely locking out foreign genes, including those from genetically modified corn.

The discovery is important because it means farmers will have access to a technology that can ensure the genetic integrity of their corn crop, making it easier to export to countries wary of recombinant DNA technology and providing a built-in buffer for potential environmental problems such as the threat to monarch butterflies from corn engineered to make its own biological insecticides.

"Governing the flow of genes between populations is what's at stake," says Jerry L. Kermicle, the UW-Madison professor of genetics who discovered teosinte's genetic barrier.

Corn varieties of all kinds -- from organic to genetically engineered -- are prolific traffickers in genes. Cross-fertilization between strains occurs as gene-laden pollen is carried by bees or blown with the wind from one field to another. The resulting contamination, especially from genetically modified corn, can ruin organic crops or make traditional hybrid corn worthless for export to countries where consumers are wary of the new technology.

The new discovery, however, could permit American farmers to recapture those profitable markets in Europe and Asia by ensuring that organic or traditional hybrid corn is uncontaminated by genes from genetically modified crops.

Moreover, the new technology can be used by farmers to plant buffers around fields of corn genetically modified to make their own insecticides and thereby limiting a highly-publicized threat to non-target species such as monarch butterflies.

For thousands of years, teosinte has co-existed as a weed with the maize cultivated in Mexican fields. Like corn, teosinte is a grass and its genetic makeup is so similar to that of cultivated maize that scientists suspect the genetic differences between the two plants may be confined to a mere handful of genes. Teosinte, in fact, is corn's likely ancestor.

Despite this genetic affinity -- and the ease with which cultivated corn plants exchanges genes through cross pollination -- the teosinte strains that grow as weeds within Mexican corn fields only rarely acquire genes from cultivated corn.

The reason, according to Kermicle, is that teosinte has a built-in barrier, governed by a single gene cluster, that keeps foreign maize genes out, enabling the plant to maintain its own unique genetic identity in an environment thick with gene-laden pollen.

The ability to build a genetic barrier into hybrid corn is a significant technological advance, one that would permit farmers to assure buyers that the corn from their fields has not been contaminated by genes from neighboring fields. The technology, according to Steve Gerrish, an agronomist and licensing associate with the Wisconsin Alumni Research Foundation, would have instant appeal to organic farmers and farmers whose corn or corn products might be marketed to countries that now bar imports of genetically modified grain.

"This technology can potentially solve the problem of contamination of regular hybrid corn and organic hybrid corn by any genetically modified organism (GMO) during the growing season," says Gerrish. "This technology could also allow a farmer to grow both types of maize crops and maintain a market segregated product."

Today, about 22.6 percent of the corn grown in the United States is exported to other countries, 8 percent is used for sweeteners, 2.6 percent for starch, 5 percent is used in the manufacture of alcohol, and 1.2 percent is used in products for human consumption. A little more than 50 percent of the U.S. corn crop is used for animal feed. But even in the animal feed market, according to Gerrish, there is a growing interest in corn certified as a non-genetically modified organism, especially for organic livestock production which requires grain produced by plants that are not genetically engineered.

The reluctance of key foreign trading partners, including the European Union, Australia, Japan and other nations, to import genetically modified products has become a significant problem for American farmers as they compete in the international marketplace. In the United States, genetically modified

crops, including corn and soybeans, are now planted on millions of acres of farmland.

Using traditional breeding methods, the genetic barrier is being transferred to hybrid corn and testing quantities of seed should be available through seed companies in 2002, Gerrish says. Commercial quantities for planting by farmers are possible by the year 2003, he says.

The new gene-barrier technology has been patented by WARF, a private, not-for-profit corporation that manages intellectual property in the interest of UW-Madison. It will be licensed non-exclusively for domestic and international use. Licensing terms will include a provision that GMO technology be kept out of maize varieties with the teosinte barrier.

In addition to its commercial potential, Kermicle's discovery may also provide new scientific insight into the genetic barriers that prevent other plant and animal species from acquiring foreign genes.

It may be that similar genetic barriers exist in nature for other commercially important plants, Gerrish says, and Kermicle's discovery is certain to inspire quests for those plants and their respective barrier genes.

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UNIVERSITY OF WISCONSIN MADISON

June 26, 2000

TO: Editors, news directors
FROM: Brian Mattmiller, 608/262-9772
RE: The road map to the human genome

The expected announcement today of the complete sequencing of the human genome will be one of the most profound milestones in science, one expected to open new pathways to curing and preventing disease.

The University of Wisconsin-Madison has an accomplished group of scientists working in the genomics field, including some who participated in the federal Human Genome Project. UW-Madison is home to the Genome Center of Wisconsin, which serves as a focal point for genetic research in plants, animals and people.

Scientists here also are studying the social and ethical implications of unlocking the human genome. A strategic hiring effort at UW-Madison has resulted in the addition last year of two new experts in bioethics.

The following is a sampling of UW-Madison expertise on this new frontier of science. For a more complete look at the university's genomics contributions, visit the Biotechnology site at: http://www.news.wisc.edu/packages/biotech/

• Fred Blattner, professor of genetics.

(608) 262-2534; fred@genetics.wisc.edu

Blattner is director of UW-Madison's new Genome Center of Wisconsin, a concentration of faculty who are developing tools to sequence the complete blueprints of life forms and determine the functions of individual genes. Blattner achieved a milestone in the field in 1997 by sequencing the complete genome of E. coli, at the time the most complex organism ever sequenced.

• Alta Charo, professor of law and history of medicine.

(608)262-5015; racharo@facstaff.wisc.edu

Charo is a leading scholar of bioethics and public policy on biotechnology. She has brought a unique interdisciplinary background to controversial topics such as cloning, reproductive technologies, research on human beings, and embryo research. She is currently serving by appointment of President Clinton on the President's National Bioethics Advisory Commission.

• Norman Fost, professor of pediatrics.

(608)263-8562; normfost@macc.wisc.edu

Fost is the founder of UW-Madison's program in medical ethics, and has garnered national recognition for his leadership in the field. He has served for years as the chair of the UW Hospital and Clinic's ethics and human subjects committees. His opinions are sought nationally on subjects such as health care access, testing for genetic diseases, cloning and patient's rights.

• David Schwartz, a professor of chemistry and genetics.

(608)265-0546; dcschwartz@facstaff.wisc.edu

Schwartz is a national leader in the development of better, faster ways to decipher genetic information in plants and animals. His optical mapping technology creates whole genome maps in a fraction of the time of comparable technologies. His technology is in use in mapping the human genome, the rice genome, and was recently used in completing the genome for malaria.

• Lloyd Smith, professor of chemistry.

(608)263-2594; smith@chem.wisc.edu

Smith is a world leader in the design and development of technologies used in the race to sequence the genetic material of plants and animals. He has recently made big advances in demonstrating the potential of DNA-based computing. He is also a co-founder of Third Wave Technologies, one of Wisconsin's most successful biotech companies.
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11/29/2000

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Artyom Kopp (608) 265-2004, akopp@facstaff.wisc.edu

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SCIENTISTS FIND GENE THAT FUELS 'SEXUAL ARMS RACE'

MADISON - In many animals, the difference between male and female is strikingly apparent. This is especially true in birds, fish and some insects where colors and other adornments can spell the difference between mating success and failure.

Now, thanks to the lowly fruit fly and a team of scientists at the University of Wisconsin-Madison and at Washington University in St. Louis, one genetic circuit that governs sexual dimorphism - the diagnostic differences between the sexes - has been found and characterized.

The discovery, described in the Thursday, Nov. 30, edition of the British scientific journal Nature, is important because it not only shows how and why animals dress for reproductive success, but provides a glimpse of the genetic changes that, over time, lead to the evolution of new animal species.

"Fundamentally, the difference between species is in their DNA," says Sean B. Carroll, a professor of genetics at the Howard Hughes Medical Institute at UW-Madison and an author of the Nature paper. "And this genetic circuit holds the gene that makes a key difference between fly species."

In the fruit fly, specifically the laboratory workhorse Drosophila melanogaster, one of the obvious visual signals of its sex is body pigmentation: the rear end of the melanogaster male is heavily pigmented and the female's is not. This new "fruit fly fashion" has evolved only recently in a relatively small subset of Drosophila species, according to Carroll, and co-authors Artyom Kopp, also of HHMI at UW-Madison, and Ian Duncan of Washington University.

The researchers found that a gene called "bric-a-brac" establishes the difference between melanogaster females and males by suppressing pigmentation in females. However, the same gene functions in both sexes in other fly species where male-specific pigmentation is absent and males and females look pretty much the same.

Beginning with Darwin, scientists have believed that animals assume gaudy colors to promote themselves as potential mates, and that this dressing up is a major force in animal evolution. The present role of bric-a-brac, says Carroll, has probably been shaped by the process of "sexual selection" because the pigmentation patterns specified by this gene affect mating preferences.

But in investigations of the genetic controls for gender-based pigmentation in fruit flies, the HHMI team at Wisconsin found that, for the female, the sex appeal of a pattern or color wears off over time.

In experiments with male flies engineered to have the same abdominal stripes as the female melanogaster, the courted females were smitten no less than when confronted with a male flying all the colors of machismo. According to Kopp, what this suggests is that the male is constantly under pressure to evolve something new in order to stay competitive in the mating game. It is very much a sexual arms race, he says.

"What we found was that the female didn't care, and that makes sense under the arms race scenario," says Kopp. "The pigmentation has lost its significance to the female - it is last year's fashion - and males are probably forced to evolve new ones all the time."

Accumulated over time, it is these kinds of wardrobe changes that lead to morphological evolution and the establishment of new species, Carroll argues.

The discovery moves science closer to understanding the genetic architecture of change, and "it gets us significantly closer to understanding when and how changes in DNA lead to phenotypic changes," Carroll says. "It is a reconstruction of the evolutionary process at the root of the tree, not the tip, the root."

Despite losing their power to sway the romantic interests of female fruit flies, the gender-based pigmentation patterns may still serve a useful purpose by allowing males, who have precious little time to find a mate and pass along their genes, to avoid wooing other males.

"Courtship, for a fruit fly, is a very expensive activity, and males don't want to waste their time approaching other males," says Carroll. "They want to find Jill, not Jack."

But the fundamental importance of the new discovery, Carroll maintains, is that it provides a window to ongoing evolutionary processes.

"Looking at these flies, we could see that this is something that evolved very quickly, and that it continues to evolve," says Kopp. "Such rapid change give us a chance to observe evolution in progress, rather than just look at the end result."

"It's like going from a vacation post card to a home video," says Carroll. "We've captured a genetic event responsible for morphological change and we're beginning to understand how changes at the molecular level affect development and translate into the diversity of forms we see around us."
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September 1, 1999
CONTACT: David Schwartz, (608) 265-0546

NEW DNA MAPPING TOOL MAY ACCELERATE HUMAN GENOME WORK

MADISON - A new technology that maps an organism's entire genome from single DNA molecules could ratchet up the race to decipher complex genomes, from food crops to human beings.

Researchers report in the Friday, Sept. 3, issue of the journal Science their completion of the first whole genome assembled by a process called shotgun optical mapping. Scientists developed a physical map of Deinococcus radiodurans, a bacteria with the unusual ability to resist high levels of radiation.

These new types of maps "may become an indispensable resource for large-scale genome sequencing projects," says David Schwartz, a professor of genetics and chemistry at the University of Wisconsin-Madison.

Schwartz joined UW-Madison this summer from New York University in Manhattan, where he spent the past decade as part of a team of scientists developing the system.

Schwartz says his laboratory is currently using optical mapping technology to map at high resolution the human genome, and predicts his process will reduce the amount of time required to achieve that monumental scientific goal.

Optical mapping can be done in a fraction of the time it takes conventional DNA mapping or sequencing, Schwartz says. The usual approach is to decode the chemical base pairs of individual genes and gradually put them all together, one by one. Optical mapping provides an automated process to create a single, complete snapshot of a genome with very small amounts of material.

Its advantages include the ability to analyze differences between individual genomes. By comparing maps of hundreds of individual human genomes, for example, scientists could pinpoint the origin of genetic diseases, understand the complexities of trait inheritance, or examine the dynamic process behind DNA repair.

"The goal is to develop the ultimate data base of genetic information, and a source of analysis that will help us make sense out of the whole thing," Schwartz says. "What's nice about optical mapping is you can look at the whole genome, not just little snippets."

One can think of optical mapping as an entire map of the United States, whereas conventional sequencing would be thousands of detailed maps of every city in the nation, he says. Optical mapping data works in concert with high-resolution DNA sequence data, linking both together in a complete and seamless description of a genome.

Optical mapping begins by preparing DNA molecules on a glass surface. Normally rolled like a ball of yarn, Schwartz uses a flow between two surfaces to straighten the DNA. He then applies an enzyme to the prepared molecules that literally clips the molecular strands into tiny segments, producing landmarks that reveal important features of genome organization.

Next, each segment of a DNA molecule can be measured and defined by an automated scanning technology that uses fluorescence microscopy. The process is repeated roughly 100 times in order to weed out errors and get overlapping results. Those measurements provide the raw material for the optical map.

The laboratory already has completed maps of two other organisms and has another project to map the rice genome, an important milestone since rice is the most relied-upon food crop in the world.

Schwartz says Jie-Yi Lin, his former NYU graduate student, was instrumental in the success of this project. Bud Mishra and Thomas Anantharaman, professors of computer science and mathematics at NYU, developed unique statistical and computational programs that helped overcome errors in the chemical outputs. Their contributions helped automate the process and make it more universally applicable to other genomes, Schwartz says.

Owen White and Craig Venter of the Institute for Genomic Research recognized the value of the optical map and leveraged this data for their own sequencing efforts. Ken Minton and Michael Daly at Uniformed Services University of the Health Sciences used optical mapping data in their studies of how DNA repairs itself after damage.

The D. radiodurans bacteria in Schwartz's study has long interested scientists. It was originally discovered in the 1950s thriving in canned meat that had been irradiated to supposedly kill bacteria. Because of its high resistance to radiation, the Department of Energy is interested in exploring its potential for naturally removing toxins from the environment.

Federal sponsors include the National Institutes of Health, the National Science Foundation and the U.S. Department of Energy.

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MOLECULAR STRUCTURE SUGGESTS HOW A GENE CAN "JUMP"

Article in Science shows how an enzyme binds to DNA; the complex may be a model that speeds the search for HIV inhibitors.

Nearly fifty years after a landmark paper proposed the existence of what later came to be called jumping genes, scientists are getting their first clear snapshot of one caught in midleap.

In the July 7 issue of the journal Science, a University of Wisconsin-Madison team describes the 3-dimensional, atomic structure of an enzyme that allows a transposable genetic element in a bacterium to "jump" from one part of DNA to another.

The structure of this complex — featured on the journal's cover — gives researchers a new framework for understanding how transposable elements operate, according to the paper's lead authors Ivan Rayment and Bill Reznikoff. The finding also may accelerate the search for new drugs to inhibit AIDS.

"Transposable elements have the potential to remodel genomes and to facilitate the movement of genetic information, such as antibiotic resistance," says Reznikoff, a molecular geneticist.

-more-

GENE JUMP — add one

The transposition of DNA is central to genetics and evolution. Transposable elements are an important source of the mutations on which natural selection operates. Scientists estimate that transposable elements make up as much as 30 percent of the human genome, for example.

In Science, the Wisconsin team describes the 3-dimensional structure of the *Escherischia coli* Tn5 transposase bound to the Tn5 transposable element. "Our discovery is an important step in understanding the structural basis for transposition," says Rayment, a crystallographer and molecular biologist.

The team's findings have implications for AIDS researchers because the human immunodeficiency virus-1 (HIV-1) uses a process similar to DNA transposition to insert itself into human DNA.

"Just as enzymes called transposases make transposition possible, enzymes called integrases catalyze similar events in retroviruses, including HIV-1," Rayment says. "Researchers have now studied the catalytic core of five different transposases and integrases, and they show remarkable similarity. Therefore, a clear image of one of them provides greater understanding of all similar ones."

To control AIDS, researchers in the pharmaceutical industry are screening compounds that can inhibit HIV-1 integrase, according to Rayment and Reznikoff. Because HIV-1 integrase and Tn5 transposase have similar structures, the Wisconsin scientists believe they now have a model system that can help scientists identify or design compounds effective in controlling HIV-1.

The paper's co-authors include Douglas Davies and Igor Goryshin. Davies worked with Rayment to develop the DNA-enzyme crystals and analyze them using X-ray crystallography. Goryshin, a molecular biologist, worked with Reznikoff in developing, isolating and purifying the transposase. The research team — all with the Department of Biochemistry Dept in the College of Agricultural and Life Sciences — worked together to solve the structure of the complex.

-more-

GENE JUMP — add two

In 1951, geneticist Barbara McClintock proposed "controlling elements" to explain genetic patterns she observed in corn. Many geneticists were slow to appreciate the importance McClintock's discovery, for which she received a Nobel Prize in 1983. However, researchers have since made remarkable progress in understanding the molecular nature transposable elements.

Past studies of the structure of the enzymes that trigger transposition have focused on the core region that cuts the element from DNA, Rayment says. Researchers have not known what the entire enzyme looks like or how it binds to and interacts with DNA. Capturing the 3-dimensional structure of the complex, allowed the UW-Madison team to present a much clearer view of how the enzyme and DNA interact at the molecular level.

Prior to transposition, one copy of Tn5 transposase binds to a specific region at one end of the transposon and a second copy binds to an identical region at the opposite end. Neither enzyme can cut DNA at the site to which it binds. When events produce a loop in the Tn5 transposable element the two enzymes at the ends come together. The Wisconsin research shows how the architecture of the resulting complex positions each enzyme so it can then cleave the opposite end of the transposable element DNA from its initial binding site. The Tn5-enzyme complex can then move freely before it inserts itself into a new location.

The research was supported by: state funding to the UW-Madison College of Agricultural and Life Sciences (College of) and grants from the National Institute of General Medical Sciences; National Institute of Arthritis and Musculoskeletal and Skin Diseases; the U.S. Department of Energy; and a Vilas Associates Award from the UW-Madison.

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jumping gene 7/00
Writer: George Gallepp (608) 262-3636

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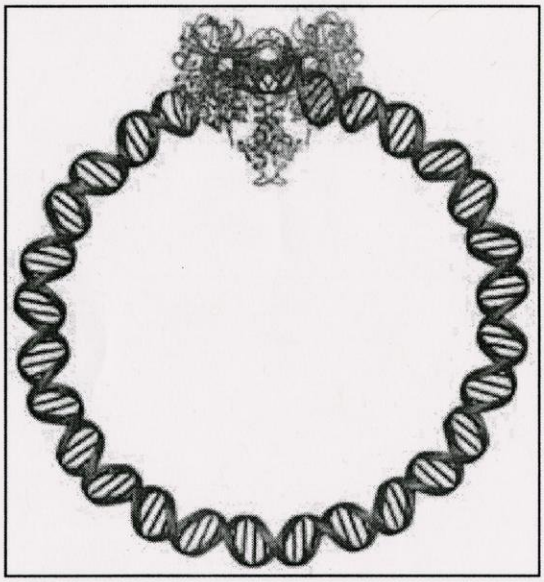

Caption: Ribbon diagram of the crystal structure of the Tn5 transposase/DNA complex, with the short pieces of DNA from the crystal structure extended to illustrate how the ends of the transposon bound to the protein/DNA complex are part of a continuous loop. One molecule of transposase is orange and the other is yellow, with the DNA shown in purple.
Image source: University of Wisconsin-Madison.
High-resolution 300 DPI JPEG

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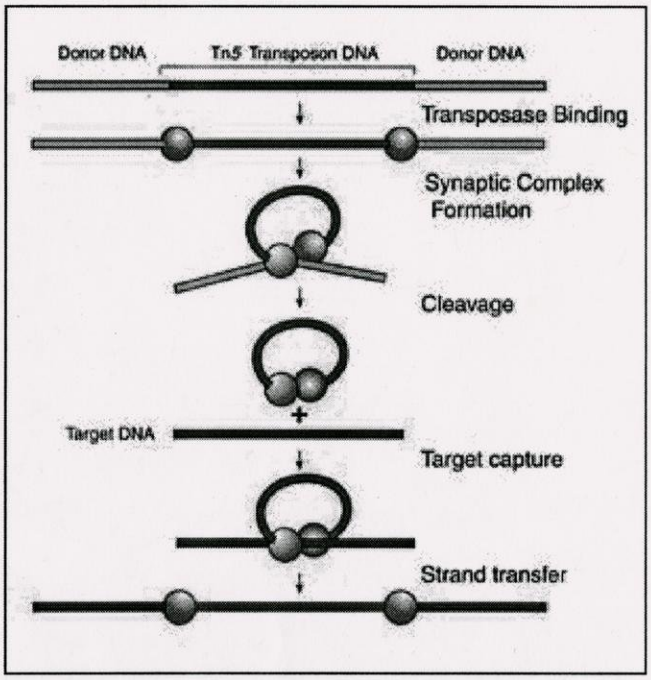


Caption: Schematic illustration of the mechanism of transposition catalyzed by the Tn5 transposase. In the first step, individual molecules of transposase (blue spheres) bind to specific sites at the ends of the transposon DNA (purple). In the next step, looping of the transposon DNA results in formation of a synaptic complex that brings the two ends of the transposable element close together. Once the synaptic complex has been formed, the Tn5 transposase cuts the transposon DNA away from the flanking "donor" DNA (green). After cleavage, the Tn5 transposase/DNA complex can move about freely until it encounters and binds to the "target" DNA (red). Through a process called strand transfer the transposase catalyzes insertion of the transposon DNA into the target DNA, completing the transposition process.
Image credit: © 2000 Science.
High-resolution 300 DPI JPEG

are using.

Cast members Michael Goodfriend, left, and university senior Allen Ebert, right, are two of the city and university actors collaborating on a campus production of "The Three Musketeers." Photo: Jeff Miller

Musketeers

continued from page one

just be a first reading of the script."

This theatrical discipline is something "Musketeers" director D. Scott Glasser of the Rep wants the professional cast members to underscore for the students. Glasser says the Rep feels a strong obligation to the educational mission of the University Theatre. He himself is quite familiar with the terrain, having been on the theater faculty at Willamette University in Salem, Ore., before becoming, artistic director of the Madison Rep in 1993.

"We want to teach by example," he says. "It's often quite challenging though — it's sometimes difficult to articulate the things those of us who work in the business take for granted," he says.

Despite the demands and breathless pace of the "Three Musketeers" rehearsal schedule, working on this production will only add to the skills he will be able to offer when he graduates in spring, Dwyer says. "The varied experiences I've had in the theatre department will give me a real advantage," he says, citing the many different classes he's taken — including three semesters of theatrical sword fighting, as well as courses he's helped to teach. This fall, for example, he's a teaching assistant for intermediate voice and speech, and Dwyer says insight he's gotten from "Musketeers" most assuredly will find its way into his classroom.

"In addition to the discipline I've seen, I'm impressed with how much the professional cast members trust their intuitions about the characters they play. I think students can think and over-analyze, sometimes to the detriment of their human impulses. I'm definitely going to encourage my students to trust their instincts," he says. ■

Rapier skill enhances UW student actors' job appeal

Should some 17th-century blackguard have besmirched any aspect of your honor, the rapier and dagger would have been essential allies in the defense of your good name.

If modern circumstances — a role in the University Theatre/Madison Repertory Theatre production of "The Three Musketeers," perhaps — should require you to wield a sword, you will want to be in touch with Paul Dennhardt.

You might also want to look him up to add to your collection of theatrical skills you can offer the marketplace.

Dennhardt, a faculty member in the Department of Theatre and Drama, is a master of theatrical sword fighting. As the "Musketeers" fight choreographer, he is a crucial resource to the production and its cast.

Dennhardt counts about five professional-caliber sword fighters among the "Musketeers" actors. He will be one of that number, appearing as d'Artagnan's father and a guard. Another pro in the making, MFA candidate and third-semester sword student Troy Dwyer, will play Musketeer Aramis, one of the leads. Drew Vidal, a former Dennhardt student, is working his first professional job as assistant fight choreographer on this production.

"Being proficient in sword fighting can give an actor quite an advantage in competing for jobs," Dennhardt says. He adds the skill also contributes to expertise in timing, teamwork, overall coordination and physical flexibility. The careful attention to the "Musketeers'" weaponry will enhance historical accuracy as well as give individual actors more market appeal, Dennhardt says.

"The play takes place in 1625, the golden age of sword fighting," he says. It also was the golden age of dueling: "In one 20-year period some 4,000 members of the French nobility were killed in duels. The weapons of choice in those days were the rapier and dagger. They were much more accurate than the pistols then available."

The slim precision of the rapier blade, combined with the decisive parry of the dagger, requires a particular physical approach, Dennhardt says. "We're looking for circular movement," he says. "As swords became shorter and lighter in the 18th and 19th centuries, fighters needed to adopt a more linear style."

After all, he adds, in sword fighting you never know what will give you that all-important ... edge.

— Barbara Wolff

Supreme Court hears student seg fees case

Erik Christianson, Washington, D.C.

The nation turned its attention on a long-running university issue Nov. 9 as lawyers defended the campus mandatory student fee system before the U.S. Supreme Court.

The student fees case, Board of Regents v. Southworth, has been closely followed nationally in higher education. The court's ruling, expected sometime next spring, could have a significant impact on how public colleges and universities collect and disburse student activity fees.

Arguing on the university's behalf, Assistant Attorney General Susan Ullman told the justices that universities are special places and should be allowed to use student fees to create an educational forum for all kinds of speech to flourish.

"The University of Wisconsin, like public and private universities across the country, has long encouraged a wide range of activities, and some of those activities are supported by [student fees]," Ullman explained.

Because student organizations are funded on a viewpoint-neutral basis, "the First Amendment does not require students to support speech," Ullman continued.

Jordan Lorence, attorney for the students who sued the university four years ago, argued that mandatory fees force students to support student groups they disagree with politically or ideologically. Lorence cited two Supreme Court decisions involving unions and a state bar association: in both cases, the court ruled that dues paid by members of those groups could not be used to support political speech.

"The university violates the principle against compelled speech," he argued.

The justices peppered the attorneys with numerous questions, from how the fees are distributed to the specific activities of student groups and whether those activities constitute compelled speech.

The unique nature of universities was commented on by Justice Anthony Kennedy, who stated that since "ancient times," institutions of higher education have been places that encouraged and fostered the robust debate of ideas. Justice Antonin Scalia countered by asking if universities "since the Middle Ages" had specifically used student fees to support student groups.

The university's position that the fees create an educational forum for speech received considerable attention from the court. Justice David Souter questioned Ullman on that point, stressing that most student groups do not receive funding from fees, but rather from membership dues. Yet when questioning Lorence, he also stated that "you can't have dialogue of voices without a forum to speak."

In a press conference following the arguments, UW System President Katharine Lyall defended the student fee system. She stressed that it is similar to citizens paying taxes to the federal government.

"The fees support the diversity of ideas on campuses," she said. ■

NEWSMAKERS

Here's a small sample of the faculty and staff who each week are spotlighted by the media. More: http://www.news.wisc.edu/inthenews/index.html.

Mapping bug genes

Reuters reports (Nov. 4) that a team of scientists, led by UW-Madison geneticist and chemist **David Schwartz**, has created a gene map of the bug that causes malaria, a breakthrough that may help researchers find and design drugs to combat the deadly disease. No one knows very much about the parasite that causes malaria, which is often carried by mosquitoes, but Schwartz's team used optical mapping methods to craft the most-complete blueprint yet of its genetic makeup. "Our maps have provided reliable landmarks for sequence assembly, where traditional maps are somewhat sparse," the team reports in the journal Nature Medicine.

Sesame opens minds

Seeking to explain how television might help to dispel prejudice, a Palestinian author cites studies by Nathan Fox of the University of Maryland and UW-Madison pediatrics professor **Lewis Leavitt**. The professors studied the reactions of Israeli and Palestinian children to television programming, finding that each group had developed strong negative images of the other by as early as four years of age. However, when the researchers asked their questions four months later, after the debut of a new children's program modeled after "Sesame Street," they found a notable change in attitudes. The Jerusalem Post (Nov. 4) says they reported that "viewing the series played an important role in promoting small positive changes in Palestinian and Israeli children's attitude toward each other, and in improving their social reasoning about conflict and cultural identification."

Stamping out sects?

The Chinese government is enacting a series of laws banning "superstitious sects and secret societies or use of superstition to violate laws or administrative regulations." Violators will be subject to prison terms of from three to seven years, harsh terms that many believe are targeted at the Falun Gong movement, a seemingly apolitical practice of exercise and spiritual reflection. In the San Jose Mercury News (Nov. 4), **Edward Friedman**, professor of political science who specializes in the study of China, says the laws demonstrate not only the intense fear Communists have of the Falun Gong, but of any organized threat to their authority. Friedman says that those threats also include Tibetan Buddhists, rebel Muslims and those pushing for Taiwanese independence.

Campus crime details

A few parts of campus — including the Camp Randall stadium area and Picnic Point — received 'modestly high risk' designation in national crime statistics posted Nov. 10 to the web site, APBnews.com. APBnews claims it has compiled the first national crime risk survey of all four-year colleges in the U.S.

On a 1-10 scale, with 10 as the most dangerous, UW-Madison is given a 7 for overall crime risk. UW police say campus crime is at a 23-year low. "It is a safe campus and it is a safe city," Capt. **Dale Burke** says. "There is absolutely nothing on the horizon that indicates that we should expect an increase in crime."

We've got it all

The Arts and Entertainment Network (A & E) broadcast a one-hour program Nov. 14 that featured UW-Madison campus in its Madison segment of the "Top Ten Cities To Have It All." On the segment, Mayor **Sue Bauman** credited the university with shaping much of the city's culture. The **Office of News and Public Affairs** furnished A & E with footage from the university's "Video Viewbook," to help round out the segment on Madison, which ranked fifth.

Res-
Genet

When teaching gets tough, students get going

Jeff Iseminger

When teachers get tougher in their assignments, the students get going, a university researcher has found.

A study of 12 elementary and middle schools in Chicago has revealed two important findings: In writing and mathematics, few teachers give challenging assignments. But those who do get higher-quality student work.

In other words, a strong relationship exists between the quality of teachers' assignments and quality of students' work.

"The average difference in student performance between the classes with the greatest challenge and the least challenge in assignments — an average of 46 percentile points — is amazing," says Fred Newmann of the Wisconsin Center for Education Research.

Newmann did the analysis with two colleagues from the Consortium on Chicago School Research, Anthony Bryk and Gudelia Lopez. The study's purpose: To document the baseline quality of teacher assignments and student performance for later comparison in 2001.

The schools are participating in the Chicago Annenberg Challenge, a five-year program designed to help schools offer students more intellectually meaningful work. It was created as part of a 1993 grant of $500 million to support school reform in the nation's largest cities.

In the study Newmann assisted, a separate group of teachers was trained to score others' assignments and the resulting student work. They used specific measures of the assignments' intellectual demands and the quality of work produced. The classes were in writing and math at the third-, sixth- and eighth-grade level.

Newmann defined intellectual challenge by what he calls "authentic intellectual work," which does the following:

- Involves original application of knowledge and skills, not just routine use of facts and procedures.
- Entails disciplined inquiry into the details of a particular problem, not just superficial exposure to many topics.
- Results in a product or presentation that has meaning or value beyond success in school.

"Such work is authentic," says Newmann, "because it reflects what adults do when they work with knowledge successfully. In contrast, much of the work in schools seems contrived and meaningless."

Here are some of his findings:

- Forty-three percent of assignments fell in the "no challenge" category in both third-grade writing and math.
- In eighth grade, 22 percent of writing assignments were "no challenge," compared to 56 percent of math assignments. (Overall, writing assignments demanded more than math did.)

Lump together "no challenge" and "minimal challenge," and the problem becomes even more apparent. In eighth grade, for example, 56 percent of writing assignments and 71 percent of math assignments fail to offer even moderate challenge.

The researchers also compared student performance in Chicago classrooms, based on how much authentic work teachers assign.

In third-grade math, for instance, the performance difference between the most- and least-demanding classrooms was 56 percentile points (on a 100-point scale) and 52 points in third-grade writing. The average advantage to students across all grades and subjects was 46 points.

"Of course, assigning challenging work does not by itself cause high levels of student performance," says Newmann. "But at a minimum, we have shown that high-quality assignments provide the opportunity for students to demonstrate such performance, which low-quality assignments do not." ■

Students in classrooms with the most-demanding assignments produced more authentic work than students in classrooms with the least-demanding assignments, according to a recent study. Photo: Jeff Miller

New method helps students learn evolution

A new take on teaching evolution in public schools — an issue stoked white-hot by the recent decision of the Kansas State Board of Education — can be found in a high school course developed at the university.

The difference between this course and those typically taught across America is the difference between learning by rote and by discovery. A team of researchers and teachers at the National Center for Improving Student Learning in Mathematics and Science has designed a nine-week course on evolutionary biology. The Monona Grove High School course is the focus of a study led by researcher Jim Stewart and teacher-researchers Cindy Passmore and Sue Johnson.

Unlike most instruction on evolution, this one teaches evolutionary biology as an investigative process — like real science — instead of the traditional read-and-memorize approach.The course taught at Monona Grove challenges students to grapple with three historical explanations for the origins of species. Working in teams, students fashion explanations of species diversity based on scientific data and Darwin's theory of natural selection.

In assessing the Monona Grove students taking the course, researchers have found that they clearly have a more sophisticated understanding of natural selection than do students in a traditional classroom. After further refining of the course this year, the university team will place the course materials on the Web for anyone to download.

Desktop gene chips?

Advance in technology should make DNA-mapping tool less expensive

Terry Devitt

The most insightful technology in modern genetics, the gene chip, which permits scientists to analyze thousands of genes at once, may soon come within easy reach of most biologists.

Writing in the October issue of the journal Nature Biotechnology, a group of university scientists describes a new way to cheaply and simply manufacture the customized chips capable of deconstructing long segments of DNA. The technique enables biologists to scour huge chunks of animal and plant genomes in search of the genes that promote disease, the genetic switches that govern such biological phenomena as aging, and the DNA codes that permit microorganisms to make antibiotics.

At present, such chips are available only from a single company, Affymetrix of Santa Clara, Calif. Off-the-shelf versions of Affymetrix chips cost $2,500. Customized chips containing DNA from specific organisms or tissues can take months to make and cost as much as $12,000 each.

"Now, the chips are expensive. You use it one time and throw it away," says Roland Green, a UW-Madison post-doctoral fellow and a lead author of the Nature Biotechnology paper.

The new technique, according to Michael Sussman, a UW-Madison professor of horticulture and genetics, and a co-author of the paper, is known as MAS for Maskless Array Synthesizer. It promises to take the technology and put it in the laboratory of virtually any research biologist.

"This technology could sit on anyone's bench top," says Sussman. "It will give people the ability to make any array of synthetic compounds, any time."

Gene chip technology now depends on photolithography, a process that requires shining ultraviolet light through a series of stencil-like masks onto a glass chip, resulting in the synthesis of tens of thousands of DNA molecules of interest. Each DNA molecule synthesized on such a chip, says Sussman, is like a window to a wealth of genetic information, providing a glimpse of the workings of tens of thousands of genes found in living organisms.

A recent example of gene chip technology at work was the report of another group of Wisconsin scientists who used a gene chip to discover the genes involved in the process of aging in mice.

But making those chips and their masks, each customized to dissect a specific problem in genomic analysis, is a clumsy, time-consuming and expensive process. Sometimes, as many as 100 masks are required to make a single chip that has as many as 500,000 tiny, DNA-laden compartments.

The new technology reported by the Wisconsin team capitalizes on an off-the-shelf Texas Instruments technology used in overhead projection known as Digital Light Processors. At the heart of the technology is an array of 480,000 tiny aluminum mirrors arranged on a computer chip.

By manipulating the mirrors, the Wisconsin team, an unusual mix of molecular biologists and semiconductor engineers, found that they could shine light in very specific patterns, eliminating entirely the need for the delicate and expensive masks used in traditional DNA-chip technology.

The MAS process for making customized DNA chips, according to UW-Madison professor of electrical and computer engineering Franco Cerrina, can be likened to desktop publishing: "Instead of several weeks, it takes eight hours to make a chip," he says, and the cost of producing such chips is reduced significantly.

Moreover, MAS has the potential to be used to clinically diagnose genetic disease in humans and holds great promise for various drug discovery schemes and the testing of other biological building blocks such as proteins and carbohydrates.

The Wisconsin group has applied for a patent for the new technology through the Wisconsin Alumni Research Foundation, a not-for-profit corporation that manages intellectual property on behalf of UW-Madison scientists. Rights to the technology have been licensed to a Madison-based company known as NimbleGen Systems.

NimbleGen, founded by three of the paper's authors, will focus on development and commercialization of the new technology.

The Wisconsin team includes Green of the Environmental Toxicology Program; physicist Sangeet Singh-Gasson, now of the University of Illinois at Chicago; Yongjian Yue of the Department of Electrical and Computer Engineering; Clark Nelson of the Biotechnology Center; Fred Blattner, professor of genetics; Sussman; and Cerrina. ■

Advances gives a glimpse of the many significant research projects at the university. Tell us about your discoveries by e-mailing: wisweek@news.wisc.edu.

150th child enrolled in UW asthma project

A baby born at the end of August has joined 149 other children in a university-community project to help determine the causes of childhood asthma.

Known as COAST (Childhood Origins of Asthma), the project seeks to explain why some young children develop full-blown asthma and others don't. Robert Lemanske, a nationally recognized asthma expert and professor of pediatrics and medicine, oversees the federally funded COAST project, which is based on Lemanske's theory that children develop asthma because of a combination of bad genetic luck and a common childhood virus.

At the center of Lemanske's theory are immune system hormones called cytokines. Some children inherit a cytokine imbalance and, as a result, become allergic to environmental triggers like house dust or pet dander. Because not everyone who has allergies develops asthma, he believes that something has to direct the allergic response into the lower airway. If the COAST project shows Lemanske's theory to be correct, it would help physicians identify children at risk of developing asthma and to intervene aggressively at the first signs of the disease to forestall lung damage. The COAST project is a joint effort of area hospitals and clinics. Information: 263-8539.

Dane County land-use project touts UW technology

The kickoff of an innovative local land-use project will feature a newly developed suite of tools developed by the university's Land Information and Computer Graphics Facility.

"Planning Analyst" is a series of modules that help visualize alternative development patterns, evaluate impacts of proposed development and combine desired planning outcomes with relevant ordinances and standards. With the ability to better understand, forecast and visualize alternative land-use scenarios, communities will be able to make better informed land-use choices, says Ben Niemann, a professor in the College of Agricultural and Life Sciences.

Dane County Executive Kathleen Falk is scheduled to introduce the project, "Shaping Dane's Future: Community-Based Land Use Planning Demonstration Project," today, Sept. 8, in Verona, which has been selected as the pilot site for the project. The project will explore ways to engage Dane County citizens in the land use planning process.

Campus lab tests for soybeanpests

For a second year, the university will help soybean growers monitor their fields for the soybean cyst nematode. Soybean growers can mail in a soil sample for analysis. The soybean cyst nematode attacks soybean roots. It has become one of the crop's most serious pests, according to Ann MacGuidwin, a nematologist in the College of Agricultural and Life Sciences. The nematode can reduce soybean yields even when plants appear normal above the ground.

"The only way to know for sure if the nematode is limiting yields is to run a soil test," MacGuidwin says. "A soil test also shows the pest's population density in a field, which is important for deciding whether or not to plant a soybean variety with resistance to the nematode."

Satellite tools put hurricanes in sharper focus

Brian Mattmiller

A fleet of powerful new visualization tools developed at the university is giving forecasters an unprecedented look into the anatomy of typhoons and hurricanes, helping refine early warning systems.

Beyond better resolution, these satellite-based tools are helping scientists break tropical cyclones down into their component parts, dissecting some of the forces that create, fuel and steer these dangerous storms.

"What we're doing is fusing together images through the use of multiple satellites," says Chris Velden, a tropical cyclone researcher with the Cooperative Institute for Meteorological Satellite Studies (CIMSS). "Each satellite has its own view of the earth, and we're piecing many of them together for a more complete picture."

This "data fusion" technique is the source of several new university-based hurricane forecasting methods that are in daily use at the National Hurricane Center in Miami and the Joint Typhoon Warning Center in Pearl Harbor.

Velden says the new tools are designed to shed light on two of the biggest unknowns about tropical cyclones: Where they originate and how they gather and lose intensity. Just in the past five years, satellite technology has improved forecasting of the path of storms, but estimating their power has been difficult.

One new product introduced this year, called Wavetrak, combines data from five different satellites to create a 10-day movie loop of atmospheric waves sweeping out of central Africa, the birthplace of cyclones. Wavetrak is designed to study the atmospheric waves that act as a conveyor belt for conditions that cause cyclones.

"We're grappling with how and where these waves originate because about one in every 10 will form into a named tropical storm," Velden says. "This shows us the amplitude and strength of these waves as they come off Africa and into the Atlantic."

Wavetrak, created by Velden and research intern Jason Dunion, gives scientists a complete picture of a cyclone — from its birth over central Africa, to growth across the Atlantic and eventual fizzling out. It shows the succession of atmospheric waves moving along "like cars on a train."

This composite image showing hurricane Bret gives forecasters a clearer weather picture. Photo courtesy the Cooperative Institute for Meteorological Satellite Studies

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) tropical cyclone team posts recent and real-time movies and images of current cyclones in the Atlantic or Pacific Ocean. Visit: http://cimss.ssec.wisc.edu/tropic/tropic.html

The technology has great benefit in seeing the genesis of storms. "It gives us an idea of exactly where they initiate over the African continent and their convective structure as they track over the ocean," Velden says.

On the question of measuring tropical cyclone intensity, the CIMSS team has a number of products in use by forecasters. One product is helping to provide a better handle on wind shear, an important predictor of intensity.

Wind shear is essentially the difference in speed between high-level and low-lying winds. A strong wind shear will slice the tops off of cyclones and slash their power. The CIMSS site provides a multi-colored map of high-resolution satellite observations. Updated every three hours, it shows the levels of wind shear across the Atlantic.

The site gives forecasters a highly visual record of wind-shear patterns that will either break up or add fuel to a storm. Velden says scientists want to pinpoint the thresholds of wind-shear effects, good or bad, on cyclones.

Velden says CIMSS is working to combine satellite-based data with information from radar and aircraft to produce storm images in three dimensions. Such a tool could lead to more accurate forecasts and, ultimately, greater public safety.

"We develop these tools in tandem with the forecasters," Velden says. "They know what they're looking for from us to aid the forecasting problem."

CIMSS is part of the Space Science and Engineering Center, which specializes in atmospheric studies of earth and other planets. It is supported by NASA and the National Oceanic and Atmospheric Administration. ■

Team links genetic changes to aging process

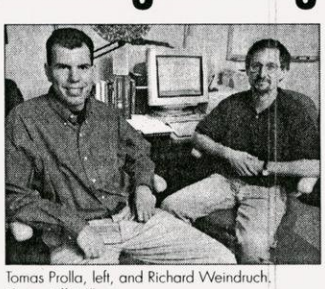
Terry Devitt

University scientists have, for the first time, profiled specific genetic changes during the aging of experimental animals, a discovery that could aid work to extend life span and preserve health.

The work conducted with mice combines a powerful new genetic technique with dietary restriction, the only known way to delay the aging process. The research was published recently in the journal Science.

The study is a milestone in aging research, providing scientists with an intimate look at the ebb and flow of genetic activity with age and the roles individual genes play in the process of growing old.

Moreover, it reveals how a low-calorie diet, the only known method of slowing aging in several animal species, works at the most basic level to extend life span and preserve health. Such knowledge, used in concert with new technologies capable of rapidly surveying the activity of thousands of genes at once, promises to accelerate the development of drugs that mimic the age-retarding effects of a low-calorie diet.



Tomas Prolla, left, and Richard Weindruch. Photo: Jeff Miller

The Wisconsin team, led by Tomas A. Prolla, an assistant professor of genetics, and Richard Weindruch, a professor of medicine, profiled the action of 6,347 genes.

"This study has analyzed more genes with regard to aging than all previous studies combined," Prolla says.

The study surveyed 5 to 10 percent of the mouse genome using a "gene chip" — a small glass plate containing DNA that, when read with a laser, quickly reveals activity levels for thousands of individual genes. "At the molecular level, normal aging looks like a state of chronic injury," says Prolla.

Many of the same genes that exhibited changes in activity with aging in mice on a standard diet remained almost completely intact in mice on a reduced diet.

The new study, saysWeindruch, is also important because it shows how gene-chip technology could be used to screen for the effects of drugs on the aging process. ■

Conservator to describe Abe's cleaning

Cameron Wilson, a professional conservator from New York City, will give the well-known statue of Abraham Lincoln a gentle cleaning Sept. 21-25, and he'll lead an informal on-site discussion of his work at noon Thursday, Sept. 23.

The Elvehjem Museum of Art will sponsor the free talk. The statue is about to be cleaned for the first time because the bronzed likeness of Lincoln is coated with a patina of corrosion that's very bad for its long-term survival.

Wilson was asked by the university to save Abe from eventual disfigurement. The statue is minutely corroding away with each drop of acid rain. If left to its own devices — and how many of those does a statue have? — Abe will start to lose his features to the predations of pollution.

"Maintenance of the Lincoln statue is part of our stewardship as its owners," says Russell Panczenko, director of the Elvehjem Museum.

Evacuation drills scheduled

Evacuation drills will be conducted on campus Sept. 14, 15 and 16. Exact times will not be announced.

Safety Department personnel and the Madison Fire Department will act as monitors on each floor of a building, and it will be necessary to run evacuations throughout class periods.

At the time of the evacuation, faculty members should direct students to an alternate exit, assuming the generally used exit is blocked because of fire or smoke.

"When the fire alarm sounds, we expect, and will appreciate, as complete an evacuation as possible, subject to the proper security of experiments in progress," says Rhonda Lenerz, Safety Department.

Building occupants should move at least 100 feet from their building and remain there until an all-clear signal is given. The total exercise should not take more than 10 minutes, Lenerz says.

UPDATE

Speakers hit the road

The Speakers Bureau, starting its first full school year of operation, has already given new voice to the Wisconsin Idea.

Based in the Chancellor's Office, the Speakers Bureau began last semester to send university speakers across the state. They have spoken to service clubs and other organizations of all kinds.

"We've selected a cadre of speakers on a host of topics," says Susan Stein, director of the Speakers Bureau. "The one thing they all have in common is their commitment to UW-Madison and its role in Wisconsin as a resource for a lifetime."

Venues so far have been diverse, including the Geological Society in Racine, the Brown County Bar Association in Green Bay and the Appleton Evening Lions Club. The topics vary with the speakers, but a consistent message has been the value of UW-Madison to the state.

Stein says the feedback from groups has been very positive: In fact, several clubs have sent second and third requests to the Speakers Bureau.

Other benefits of speaker placement, says Stein, have been positive local press coverage and a strengthening of the university's ties to community leaders.

Participants in the Speakers Bureau since its inception in January include: David Armstrong, Stephen Barclay, Pat Berry, Will Bleam, Bob Bock, John Bollinger, Bradford Brown, Nick Cahill, Kevin Check, J. Frank Cook, Ken Davis, Werner De Bondt, Joy Dohr, Pete Dorner, Eugene Farley, Linda Farley, Susan Farmer, Phil Farrell, Betty Ferris, Laura Hartman, Marcy Heim, Dianne McAfee Hopkins, Charles Hoslet, Art Hove, David Jarrard, John Kaminski, Phil Keillor, George Kliminski, Beth Knetter, Tim Kratz, Jim Leary, Roger Maclean, John Mathis, Mike Moss, Bruce Murray, Ron Numbers, Linda Oakley, Jean O'Leary, Ruth Olson, Steve Price, Bob Pricer, Noel Radomski, Charles Read, Ann Schensky, Megan Schliesman, Don Schutt, Rob Seltzer, Bill Sonzogni, Noel Stanton, Bill Strang, Monica Theis, Joe Von Elbe, David Ward, Klaus Westphal, Eric Wilcots, John Wiley, Ann Zanzig and Tom Zinnen.

Simon says

With a slide of his 36-foot sailboat displayed behind him, Arctic explorer Alvah Simon delivers the Chancellor's Convocation address to new students and others Sept. 1 at the Kohl Center. Simon, author of "North to the Night: A Year in the Arctic Ice," discussed his experiences surviving five months of isolation high above the Arctic Circle. The slides come from images made by his wife, Diana White Simon. Photo: Jeff Miller

Biotechnology training renewed

A National Institutes of Health grant that promotes graduate training in biotechnology has been renewed for an additional five years, says bacteriologist Timothy Donohue, who directs the program.

At more than $980,000 per year, the UW-Madison grant is the largest program of its kind in the country. Funded by the National Institute of General Medical Sciences, the program supports 33 graduate students each year. Those students come from the College of Agricultural and Life Sciences, the College of Engineering, the Graduate School, the College of Letters and Science, and the Medical School. The UW-Madison Graduate School provides matching support to help administer the training program.

"The program's objective is to develop a new cadre of scientists and engineers whose training and experience cross traditional academic boundaries," Donohue says. "As we enter the 21st century, there is an increasing need for cross-disciplinary teams of scientists and engineers to work closely on biomedical and agricultural problems. This program prepares students to function at the interface between the biological and physical sciences."

Graduate School Dean Virginia Hinshaw said the program is "highly successful in many dimensions," including its cross-disciplinary emphasis, strong partnerships with industry, diversity, enthusiastic leadership and research.

During the past 10 years, more than 120 UW-Madison doctoral students from more than 20 different graduate programs have been trained by the program.

Recent sightings by Jeff Miller: Hitting a high note

Cathy Ross and the UW Gospel Choir led the audience "to church" and a standing ovation at the Multicultural Orientation and Reception last week at the Wisconsin Union Theater. The annual event, sponsored by the Multicultural Student Center, welcomes students of color to campus.

ALMANAC

Almanac lists facts, figures and miscellany of campus interest. Know something or want to know? Call us: 262-3846, or e-mail: wisweek@news.wisc.edu.

How we stack up

The university heads a national list of institutions recognized for efforts to create a "disability-friendly" atmosphere for their students, visitors and staff. WE magazine (July-August 1999, page 91) cites UW-Madison for "superior services and facilities (paratransit vans, accessible and well-lit lecture halls, TDD pay phones), avid students in the School of Engineering (who) have designated assistive listening devices for fellow students in the community, home to the McBurney Disability Resource Center."

How we don't stack up

The university, once the nation's No. 2 "party school" as ranked by the Princeton Review, didn't even crack the top 10 this year. Florida universities rule the top two spots.

Help for tech problems

Reading the paper because your computer crashed again? The Division of Information Technology now answers to your computing questions four ways:

- http://www.wisc.edu/helpdesk/ offers online assistance 24 hours a day, seven days a week. You can search the DoIT knowledge base for solutions.
- E-mail help@doit.wisc.edu. Someone will get back to you by the next weekday.
- Walk over to 1210 W. Dayton St., where the techies work.
- Call 264-HELP anytime with questions about e-mail, Internet access, modems, getting connected and using your computers. But be aware that DoIT gets up to 1,000 calls a day in September, so you might want to try an alternate method first.

Mark your calendars

Run, don't walk, to register for the Homecoming Charity 5K Run/3K Walk set for Sunday, Oct. 10, at noon, starting on Library Mall. The entry fee is $12 until Friday, Oct. 1, and $15 from Oct. 1 to the day of the event. A T-shirt is guaranteed with pre-registration. For information or an entry form, call 265-2731 or stop in at the Below Alumni Center, 650 N. Lake St. All proceeds from Homecoming events go to the Dean of Students Crisis Fund.

Did you know?

Youngblood, Room 302, Union South, is the only permanent Red Cross blood donation center on any campus in the country. The All-Campus Blood Drive runs Thursdays and Fridays while classes are in session, from 10 a.m. - 4 p.m. Jennifer Suemnicht, donor recruitment representative, says about 3,000 blood donations are given at the campus center each year. Red blood cells only last 42 days and platelets only five days, so the Red Cross needs a constant flow of blood donors to ensure the availability of life-giving fluids to hospital patients. Appointments: 227-1357.

Backward glance

From Wisconsin Week, Sept. 13, 1989: Scholars Ted Finman and Gordon Baldwin say new UW System student conduct rules present no threat to free speech because the rules focus on behavior, not talk. ... Distance education gets a boost with the debut of a satellite system that will link students and UW Extension instructors. ... In her State of the University speech, Chancellor Donna Shalala says research into bovine growth hormone has been caught up in a "web of political, economic and social controversy," but says only further research will prove its feasibility.

Quotable

"There are lots of implications."
Richard Weindruch, professor of medicine, on research that identifies specific genetic changes in the aging process.
(See page 6)

New tool may speed genome mapping

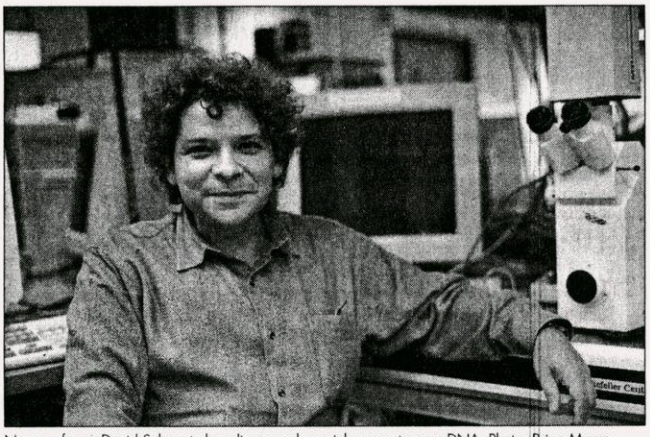
Brian Mattmiller

New technology that maps an organism's entire genome from single DNA molecules could ratchet up the race to decipher complex genomes, from food crops to human beings.

University researchers report in the journal Science their completion of the first whole genome assembled by a process called shotgun optical mapping. Scientists developed a physical map of Deinococcus radiodurans, a bacteria with the unusual ability to resist high levels of radiation.

These new types of maps "may become an indispensable resource for large-scale genome sequencing projects," says David Schwartz, a professor of genetics and chemistry.

Schwartz joined the university this summer, coming from New York University in Manhattan, where he spent the past decade as part of a team of scientists developing the system.



New professor David Schwartz has discovered a quicker way to map DNA. Photo: Brian Moore

Schwartz says his laboratory currently uses optical mapping technology to map at high resolution the human genome, and predicts his process will reduce the amount of time required to achieve that monumental scientific goal.

Optical mapping can be done in a fraction of the time it takes conventional DNA mapping or sequencing, Schwartz says. The usual approach is to decode the chemical base pairs of individual genes and gradually put them all together, one by one. Optical mapping provides an automated process to create a single, complete snapshot of a genome with very small amounts of material.

Its advantages include the ability to analyze differences between individual genomes. By comparing maps of hundreds of individual human genomes, for example, scientists could pinpoint the origin of genetic diseases, understand the complexities of trait inheritance or examine the dynamic process behind DNA repair.

"The goal is to develop the ultimate data base of genetic information and a source of analysis that will help us make sense out of the whole thing," Schwartz says. "What's nice about optical mapping is you can look at the whole genome, not just little snippets."

One can think of optical mapping as an entire map of the United States, whereas conventional sequencing would be thousands of detailed maps of every city in the nation, he says. Optical mapping data works in concert with high-resolution DNA sequence data, linking both together in a complete and seamless description of a genome.

Optical mapping begins by preparing DNA molecules on a glass surface. Normally rolled like a ball of yarn, Schwartz uses a flow between two surfaces to straighten the DNA. He then applies an enzyme to the prepared molecules that literally clips the molecular strands into tiny segments, producing landmarks that reveal important features of genome organization.

Next, each segment of a DNA molecule can be measured and defined by an automated scanning technology that uses fluorescence microscopy. The process is repeated roughly 100 times to weed out errors and get overlapping results. Those measurements provide the raw material for the optical map.

The laboratory already has completed maps of two other organisms and has another project to map the rice genome, an important milestone since rice is the most relied-upon food crop in the world.

Schwartz says Jie-Yi Lin, his former NYU graduate student, was instrumental in the success of this project. Bud Mishra and Thomas Anantharaman, professors of computer science and mathematics at NYU, developed unique statistical and computational programs that helped overcome errors in the chemical outputs. Their contributions helped automate the process and make it more universally applicable to other genomes, Schwartz says.

Owen White and Craig Venter of the Institute for Genomic Research recognized the value of the optical map and leveraged this data for their own sequencing efforts. Ken Minton and Michael Daly at Uniformed Services University of the Health Sciences used optical mapping data in their studies of how DNA repairs itself after damage.

The D. radiodurans bacteria in Schwartz's study has long interested scientists. It was originally discovered in the 1950s thriving in canned meat that had been irradiated to supposedly kill bacteria. Because of its high resistance to radiation, the Department of Energy is interested in exploring its potential for naturally removing toxins from the environment.■

To keep top employees, UW increases their pay

Erik Christianson

The university reallocated more than $900,000 last year for pay increases needed to fend off offers from other institutions and retain nearly 100 top faculty and staff.

The pay raises for 99 university employees totaled $911,657, comprising the majority of 1998-99 salary adjustments made for competitive purposes in the UW System. Combined, seven UW System institutions spent $1,085,689 to retain 152 employees.

The salary adjustments demonstrate that the cost of retaining talented professors and academic staff members is a challenge at UW-Madison, says Carla Raatz, director of the Office of Human Resources.

"Market base adjustments are granted either when there is a specific outside offer, or there is evidence of a retention problem," Raatz says. "They have to come from base budget funds. We do not get any additional funding from the state or from tuition to provide those increases."

At UW-Madison, 60 faculty received pay raises for competitive purposes. Most had been offered positions at other universities or were recruited by other institutions or private firms. The other raises went to academic staff, administrators and coaches.

Salaries at the university continue to stay competitive for assistant professors compared to peer institutions, but drop slightly for associate professors and sharply for full professors, according to the Office of Budget, Planning and Analysis.

Average starting pay for assistant professors in 1998-99 was $52,110, fifth out of 12 public research universities that make up the university's official peer group. Associate professors ranked sixth at $58,695, while full professors ranked 10th at $77,623. Those rankings have stayed about the same over the past four years.

To reach the median of its peers for salaries, the state would have had to provide 9.4 percent pay raises last year, according to OBPA.

The salary adjustment data is included in a report the Board of Regents will review at its meeting Thursday and Friday, Sept. 9-10.

For the 1999-2001 state budget, the Board of Regents recommended, and Gov. Tommy Thompson supports, 5.2 percent pay raises for faculty and staff. But the Legislature has not yet passed the spending plan, and the Joint Commission on Employment Relations has not approved pay raises for the next two years.

Recruiting and retaining top faculty are top goals of Chancellor David Ward's Madison Initiative public-private partnership, part of the pending state budget. ■

NEWSMAKERS

Every week faculty and staff from across campus are featured or cited in newspapers, magazines, broadcasts and other media, from around the country. The items that follow represent a small sample of the many stories that spotlight UW-Madison and its people. More newsmakers: http://www.news.wisc.edu/inthenews/index.html.

'Bad science' prevails

The decision last week by the Kansas Board of Education to effectively discontinue teaching evolution has given rise to fresh debate of Darwin's theory and its social ramifications. **Ronald Numbers**, professor of the history of science and medicine, argues "the overwhelming impulse against (the teaching of evolution) is religious." In an interview with the Christian Science Monitor (Aug. 16), Numbers says that high school biology teachers who present evolution as theory rather than fact are damaging science education in the U.S. "It's just plain bad science," he says.

Blindness blocker studied

Lauran Neergaard, Associated Press national medical writer, consulted university ophthalmologist **Paul Kaufman** for a wire dispatch (Aug. 17) exploring how scientists have discovered a possible new way to slow, if not prevent, the blindness caused by glaucoma: fighting a chemical called nitric oxide. So far, the method has worked only in rats. But the research is so promising that its discoverers already are talking with pharmaceutical companies about creating a drug glaucoma patients could one day use. The work "will likely be considered classic in years to come," Kaufman declares in reviewing the research published in the Proceedings of the National Academy of Sciences.

Capitalism at its best

A School of Pharmacy study on the salaries of new pharmacy graduates in the area shows an increase in base salaries by 11 percent in the past two years. That's because there are more prescriptions being written, which requires more pharmacists to fill them, according to **David Mott**, an assistant professor of pharmacy administration who conducted the study. "It's economics 101," he tells the Milwaukee Journal Sentinel (Aug. 22), referring to the law of supply and demand. Salaries for entry-level pharmacists are more than $70,000 a year in the Milwaukee area, the study says. "It's crazy. It's capitalism at its best," Mott says. Despite the growing need for pharmacists, however, the School of Pharmacy has no plans to expand.

Action and reaction

Ellis

Scientists today stand on a threshold like never before, as they gain a new and deeper understanding of how matter acts and reacts. **Art Ellis**, professor of chemistry and education, tells the Christian Science Monitor (Aug. 3) that the latest advances in materials science are incredible because they enable scientists to create materials that are not static, but rather reactive and malleable in relation to factors such as temperature, electrical currents or physical stress. "A 'smart material' can tell you something about a situation or a state of affairs by responding in a predictable way to some kind of stimulus," Ellis says. And that is appealing to a wide range of industries, which are beginning to use "smart materials" to enhance performance, safety and efficiency. Embedding hybrid ceramic materials into snow skis to dampen vibrations and smooth out the ride on the slopes is one small example. "We have this unprecedented control over matter on this nanoscale," says Ellis. "The idea of being able to make materials in a controlled way on this scale is just remarkable."

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NEWS

UNIVERSITY OF WISCONSIN–MADISON

Phone: 608/262–3571
Fax: 608/262–2331

Office of News and Public Affairs
28 Bascom Hall • 500 Lincoln Drive
Madison, Wisconsin 53706-1380

Res-
Genetics

Embargoed for release after 2 p.m. Eastern Time, Thursday, Sept. 2, 1999

CONTACT: David Schwartz, (608) 265-0546

NEW DNA MAPPING TOOL MAY ACCELERATE HUMAN GENOME WORK

MADISON — A new technology that maps an organism's entire genome from single DNA molecules could ratchet up the race to decipher complex genomes, from food crops to human beings.

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These new types of maps "may become an indispensable resource for large-scale genome sequencing projects," says David Schwartz, a professor of genetics and chemistry at the University of Wisconsin-Madison.

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Federal sponsors include the National Institutes of Health, the National Science Foundation and the U.S. Department of Energy.

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--- Brian Mattmiller, (608) 262-9772

Res-
Genetics

THE WISCONSIN WEEK WIRE - September 1, 1999
for UW-Madison faculty and staff
(Full issue: http://www.news.wisc.edu/wire/01-Sep-1999/)

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The Wisconsin Week Wire is now delivered weekly. For updates of campus news as it happens and for the full content of Wisconsin Week's print edition, check our redesigned web site: http://www.news.wisc.edu/wisweek/

TOP NEWS
- o Study details genetic basis of aging
- o Physics team studies atomic life at 'absolute zero'
- o Convocation today features adventurer

RESEARCH
- o Tools sharpen focus on hurricanes

ON CAMPUS
- o Bliss-whirling at Union Theater
- o Fall blood drive gets underway
- o Events calendar: http://calendar.news.wisc.edu

NEWS IN BRIEF
- o Construction: Fluno project advances
- o Changes: New ID for PD
- o Notable: Department marks 50 years with volunteer work
- o Backward glance: 10 years ago in Wisconsin Week

RESOURCES
- o Automated e-mail eases course communication
- o Instructional technology grants available

NEWSMAKERS
- o Sports Illustrated: UW leads Big Ten in women's sports
- o More newsmakers: http://www.news.wisc.edu/inthenews/

UW-ELSEWHERE: NEWS FROM AROUND THE SYSTEM
- o Recent news from River Falls, Superior and Eau Claire

TIP
- o Training available for biological materials shipping

(Full issue: http://www.news.wisc.edu/wire/01-Sep-1999/)

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Top news

STUDY DETAILS GENETIC BASIS OF AGING
University scientists have, for the first time, profiled specific genetic changes during the aging of experimental animals, a discovery that could aid work to extend life span and preserve health. The work conducted with mice combines a powerful new genetic technique with dietary restriction, the only known way to delay the aging process.
Full story: http://www.news.wisc.edu/wisweek/view.msql?id=1210

PHYSICS TEAM STUDIES ATOMIC LIFE AT 'ABSOLUTE ZERO'
With a lab full of lasers to corral and chill atoms, physicist Thad Walker is plunging into the frigid domain of "absolute zero." It's not just cold there. It's weird. In this chilly climate, physics professor Walker and his team of "atom trainers" work to ultimately control the behavior of atoms -- the physics equivalent of transforming a heavy-metal mosh pit into a military parade.
Full story: http://www.news.wisc.edu/wisweek/view.msql?id=1184

CONVOCATION TODAY FEATURES ADVENTURER
Arctic explorer Alvah Simon will give the Chancellor's Convocation address to new students today (Sept. 1) at 2 p.m. in the Kohl Center. Simon, author of "North to the Night: A Year in the Arctic Ice," will talk about his experiences surviving five months of isolation on his 36-foot sailboat high above the Arctic Circle. Faculty and staff are welcome to attend the free event.

Research

TOOLS SHARPEN FOCUS ON HURRICANES
A fleet of powerful new visualization tools is giving forecasters an unprecedented look into the anatomy of typhoons and hurricanes, helping refine early-warning systems and dissecting some of the forces that create, fuel and steer these dangerous storms. Several new hurricane forecasting methods developed at UW-Madison that are in daily use at the National Hurricane Center in Miami and the Joint Typhoon Warning Center in Pearl Harbor.
Full story: http://www.news.wisc.edu/wisweek/view.msql?id=1214

On Campus
(Events calendar: http://calendar.news.wisc.edu)

BLISS-WHIRLING AT UNION THEATER
Tibetan Buddhist nuns of Khachoe Ghakyil Nunnery in Kathmandu, Nepal, will present "Women's Freedom and Spiritual Liberation: An Evening of Sacred Performance" at Memorial Union Theater at 7:30 p.m. Wednesday, Sept. 8. Tickets: $12 adults, $8/students, seniors, children. Information: 262-2201. Full story: http://www.news.wisc.edu/wisweek/view.msql?id=721

FALL BLOOD DRIVE GETS UNDERWAY
The Red Cross and the UW will kick off a semester of giving the gift of life with the All Campus Blood Drive. The blood drive will run Thursdays and Fridays while classes are in session, beginning Sept. 2-3. Room 302, Union South, 10 a.m. to 4 p.m. Appointments: 227-1357.

News in brief

CONSTRUCTION: FLUNO PROJECT ADVANCES
A "topping out" ceremony - the tradition of placing an evergreen tree on top of a new construction project when it reaches its highest point - will be held today (Wednesday, Sept. 1) at the Fluno Center for Executive Education at UW-Madison. The ceremony is for invitees only. The $24 million, eight-floor building taking shape on University Avenue will be the primary site for the Executive Education program of the School of Business. The Fluno Center for Executive Education is now scheduling programs to be held starting in March 2000.

CHANGES: NEW ID FOR PD
Since 1976, campus law enforcement has been known as University Police and Security -- "P & S" for short. The name officially changes today (Wednesday, Sept. 1) to University of Wisconsin-Madison Police Department, or UWPD. Police Captain Dale Burke asks the university community to revise mailing lists and other references to the department to reflect the new name.

NOTABLE: DEPARTMENT MARKS 50 YEARS WITH VOLUNTEER WORK
The Department of Engineering Professional Development is celebrating not only 50 years of continuing education but also, through several volunteer projects, its community ties. The service projects are a way of saying thank you to the community for its longtime support of the department's outreach mission, says EPD Chair Phil O'Leary. "We felt that as a group we had many capabilities that could be used to benefit the community," he says.

BACKWARD GLANCE: 10 YEARS AGO IN WISCONSIN WEEK
Frautschi Point will be preserved thanks to an arrangement that transfers the land to the university. ... Fall enrollment is expected to be 42,600, a drop of about 1,000. ... Office paper recycling is getting underway campuswide following a successful pilot project. ... Two scholars have produced a book of instructional strategies for teaching assistants.

Resources

AUTOMATED E-MAIL EASES COURSE COMMUNICATION
Faculty members and TAs can quickly and easily communicate with their students using an automated email distribution list based on course enrollment. The Classlist service from DoIT is fast, requires no address maintenance, and it's free. Using Registrar data throughout the semester, Classlist automatically updates e-mail distribution lists for your courses. To set up the Classlist, you submit forms through the Web or by e-mail.
For more see: http://wiscinfo.doit.wisc.edu/euc/classlist/

INSTRUCTIONAL TECHNOLOGY GRANTS AVAILABLE
A new grant called Web Works is available to UW-Madison faculty and instructional staff who wish to incorporate instructional technology more fully into their curriculum. Grant recipients will be offered customized training classes, as well as the option of hiring an assistant from a pool of 15 students training in instructional technology support. Any UW-Madison faculty or instructional staff member teaching courses is eligible to apply.
For more information:
http://www.wisc.edu/learntech/grants/webworks.htm

Newsmakers

SPORTS ILLUSTRATED: UW LEADS BIG TEN IN WOMEN'S SPORTS
http://cnnsi.com/siforwomen/issue_three/jock_schools/main/

More newsmakers: http://www.news.wisc.edu/inthenews/

UW-Elsewhere: News from around the system

RIVER FALLS: Chancellor Gary A. Thibodeau will retire by the start of the 2000 academic year. He has been diagnosed with colon cancer and says the health condition influenced his decision.

SUPERIOR: Richard Stewart will direct the university's new Superior Transportation Center.
http://www.uwsuper.edu/news/stories/center.htm

EAU CLAIRE: U.S. News & World Report has named UWEC as one of the best public regional universities in the Midwest.
http://www.uwec.edu/Admin/NewsBureau/release/current/082099us_news.html

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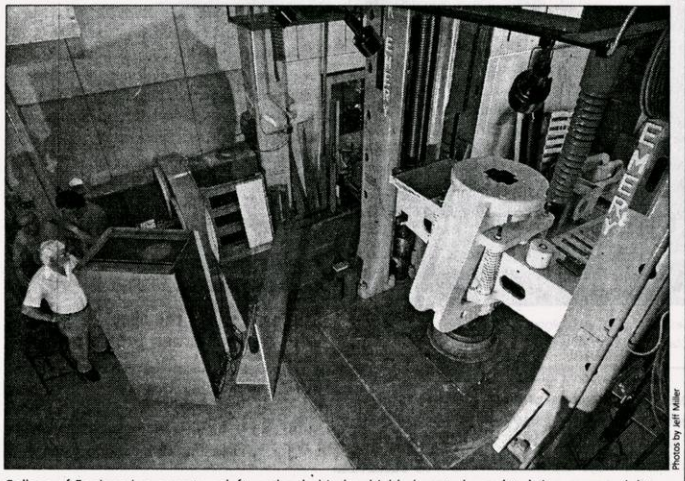
Tip

TRAINING AVAILABLE FOR BIOLOGICAL MATERIALS SHIPPING
If your office ships biological materials, check out training and certification from the Office of Biological Safety. The U.S. Department of Transportation requires that all persons involved in shipping hazardous materials in commerce be trained and certified in proper handling of these materials. For information on training sessions, call 263-9026.

WisconsinWeek

For Faculty and Staff of the University of Wisconsin-Madison

May 12, 1999



Photos by Jeff Miller

College of Engineering operators, left, gather behind a shielded control panel to bring some weight to bear using the college's unique load-testing device, a sort of slow-motion hammer that can bear down with a maximum million pounds of force. That's enough to squash just about anything, say testers who have used it to crush items ranging from a 1964 Ford Fairlane to materials used to support stadiums and other structures.

The million-pound hammer

Device squashes stuff in the name of science

Brian Mattmiller

Of all the devices that pulverize, crush, vibrate, flatten and stretch in the name of materials testing, one university machine separates the tools from the toys.

By its name alone, one can easily appreciate the gravity of a "Million-Pound Test Machine." The device, housed at Engineering Hall, is a James Bond movie villain's dream: It stands five stories tall with two towering side rails, a circular staircase and catwalk. Its giant hydraulic head moves suspensefully slow, crushing its target at one inch per minute.

The machine is one of only about a

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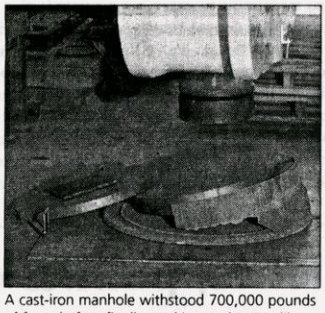


A cast-iron manhole withstood 700,000 pounds of force before finally cracking under steadily increasing pressure applied by the relentless load-testing device.

Program seeks to untangle knots of teaching dilemmas

Brian Mattmiller

After another year of classroom triumphs and frustrations, summer presents time for teachers to work the kinks out of their curricula.

UW-Madison faculty and teaching staff mulling course reforms might want to eavesdrop on a vibrant online discussion called "Innovation in Teaching: Novel Approaches to Knotty Problems." The Web site features proceedings from two years of workshops exploring universal dilemmas in teaching, from personalizing lecture formats to inspiring better classroom discussion.

"A lot of people are doing wonderful things in the classroom; they're just not talking about it," says Lillian Tong, a staff member with the Center for Biology Education who co-founded the program. "Our whole aim is to celebrate some of the really innovative things happening in departments."

Visit the teaching innovations Web site at: www.cals.wisc.edu/iic/innovation.html. Information: Lillian Tong, 265-3003; tong@facstaff.wisc.edu.

The workshop series, co-sponsored by the College of Agricultural and Life Sciences Instructional Improvement Committee, meets monthly and brings together teams of four faculty within a department. Presenters spend a brief period describing their "knotty problem" and possible solutions.

So far, Tong says, the program has gener-

continued on page twelve

Software deals in making

Site licenses with Microsoft, others could bring more products to more people for less money

Jeff Iseminger

There's been a lot of buzz on campus about the UW System's negotiation with Microsoft Corp. over a new software buying agreement, buzz set off by the market domination of Bill Gates' behemoth.

But what often isn't noted is this: UW-Madison is negotiating with other vendors regarding similar agreements for what is called a "site license." These negotiations, which also will involve other UW System campuses, aren't as far along, so let's look at Microsoft's proposal to get a flavor of what the future may hold.

The current contract with Microsoft expires Tuesday, June 1, which makes negotiation an imperative, not a choice. Under current terms, UW-Madison faculty and staff can buy discounted Microsoft products from the Division of Information Technology (DoIT). Depending on the purpose, they use either departmental or personal money.

Now Microsoft has proposed a three-year site license for which the university would pay an annual fee. In exchange, faculty and staff could download Microsoft products onto their campus computers.

They also could obtain copies for their home computers, at no cost if they can tolerate a modem's slow download, or for a fee not yet determined if they prefer CDs. Students, too, could get copies for their home computers.

"In other words, the incremental cost of another copy of a Microsoft product would be zero," says Tad Pinkerton, acting chief information officer of DoIT.

The word "free" must be qualified, however, because the annual fee has to be paid somehow. Payment could come from any of several sources, including the system, UW-Madison central funds and departments, but the issue hasn't been resolved.

continued on page thirteen

4,000 to graduate May 14-16

A weekend of beginnings commences Friday, May 14, for 4,000 students eligible to graduate this spring. Five ceremonies will be held at the Kohl Center.

Honorary degrees will be conferred Friday, May 14, at the 5:30 p.m. ceremony for advanced degrees.

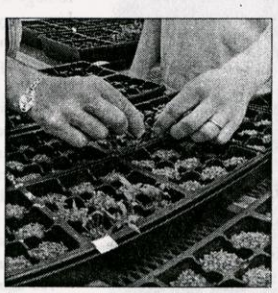
Nadine Strossen, president of the American Civil Liberties Union and law professor at New York Law School, will speak at ceremonies at 10 a.m. and 2 p.m. Saturday, May 15, for Letters and Science graduates. Strossen has written, lectured and practiced extensively in the areas of constitutional law, civil liberties and international human rights.

Elzie Higginbottom, UW-Madison alumnus (B.S. '65), now a Chicago real estate entrepreneur who has distinguished himself by improving city neighborhoods, will speak Sunday, May 16, at the 10 a.m. ceremony for bachelor's and master's degrees in the College of Agricultural and Life Sciences; schools of Education, Human Ecology, Medicine, Nursing and Pharmacy; and the Institute for Environmental Studies.

Jim Berbee, owner of the Madison-based Berbee Information Networks Corporation and a triple graduate, will speak Sunday, May 16, at the 2 p.m. ceremony for bachelor's and master's degrees in the College of Engineering and School of Business.

For more information, call the Commencement Hotline: 262-9076. ■

Inside



The cavalry is in there.
Page 6

RESEARCH DIGEST

ENVIRONMENTAL STUDY TAKES A LEAP INTO ORBIT

In July of this year, if all goes according to plan, the first of NASA's Earth Observing Satellites (EOS) will sweep into a polar orbit 900 miles above the Earth. Aboard will be MODIS, the Moderate-Resolution Imaging Spectroradiometer, a device whose capabilities are now being tested at UW-Madison's Space Science and Engineering Center.

MODIS will enable scientists to study such things as ocean currents, clouds and land formations from space. Measuring clouds and the energy they reflect back into space or help trap in the atmosphere, for example, is an essential element in the study of climate change and global warming. MODIS will provide a new long-term record, in unprecedented detail, of such phenomena.

RENEWABLE ENERGY: ON THE CUSP OF RENEWAL?

Whatever happened to solar power? After a burst of interest in the 1970s, solar energy applications have never reached more than a fraction of their potential in America.

William Beckman, director of the Solar Energy Laboratory, says the relative cheapness of fossil fuels through the 1980s and '90s has reduced interest in renewable energy sources. But it shouldn't: Beckman says that increasing solar usage could have a greater impact on reversing global warming than almost any other remedy.

For example, Beckman says a third of the country uses electricity for home water heaters. If those homes switched to a combination electric-solar water heating source, it would result in more carbon dioxide-reduction than doubling the gas mileage of every American car.

KEEPING AN EYE ON THE MERCURY

The Water Chemistry Program is studying why some watersheds are more vulnerable than others to mercury contamination. The research team is comparing notes from two diverse landscapes: Rivers of the Lake Superior Basin and the Florida Everglades.

Program director David Armstrong says researchers are finding that watersheds with high proportions of wetlands and forest tend to be more vulnerable to mercury moving downstream. In the Everglades, they are studying how management practices affect mercury's accumulation in the food chain. Mercury pollution, primarily from burning fossil fuels and deposited by air onto the landscape, has been linked to neurological problems and is frequently cited in fish advisories.

GETTING INDUSTRIAL WASTE OUT OF THE LANDFILL

Heavy industry generates millions of tons of solid waste every year, and campus engineers would like to keep it out of already-swelling landfills.

A group of civil engineers has recently created the Beneficial Reuse Program, a research campaign designed to find alternative uses for foundry sand, fly ash, reclaimed pavement, shredded tires and paper sludge – most of which gets entombed in landfills.

Civil engineer Craig Benson says dumping industrial waste in landfills is very costly. But the waste makes good, cheap and abundant materials for the construction and transportation industries. For example, the university researchers found that foundry sand makes effective barriers for landfills, embankments and retaining walls for highways, and supplements for asphalt. They are also exploring road construction uses for shredded tires and plastic.

Calling the microbial cavalry

Plants found to use genes to recruit help from friendly microorganisms

Terry Devitt

In the battle against the legions of lethal soil pathogens that beset crops, plants, apparently, have the ability to summon the microbial cavalry.

Scientists have long known that beneficial soil microorganisms tend to flock to plant roots — along with their detrimental bacterial and fungal counterparts. But they've never known how.

Now university scientists, writing in the current issue of the Proceedings of the National Academy of Sciences, report that the ability to call for help is genetically wired into plants. The finding chips away at a fundamental mystery of symbiotic behavior and suggests that through careful breeding, the battle against devastating soil microbes can be turned.

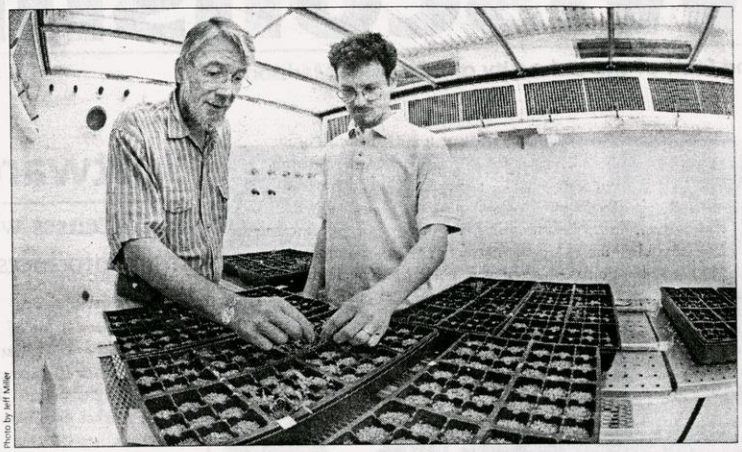


Photo by Jeff Miller

Robert M. Goodman, left, professor of plant pathology, and graduate student Marek Sliwinski examine tomato plants growing at the climate-controlled Biotron research center.

"We now have genetic evidence that plants contribute significantly" to the activity of beneficial soil microorganisms, says Robert M. Goodman, plant pathology professor and co-author of the paper. "Genes somehow play a role in terms of what kinds of microbes are recruited."

The work suggests that the tools are now available to breed plants that are good hosts for beneficial microorganisms.

Soil is host to a zoo of microorganisms, some good and some bad. Soil pathogens — bacteria, fungi and other microbes — infect nearly all cultivated plants, reducing yields and in some instances wiping out entire crops.

More recently, chemical pesticides have been used to successfully control such blights. But microbes may develop resistance to the chemical agents, which also pose the threat of pollution to ground water and soil. By finding that plants themselves have the ability to recruit microbes that combat other disease-causing organisms, scientists have opened a new front in a battle that is as old as agriculture.

"This work is a start," says Goodman. More discoveries could enable plant breeders to create plants that act as magnets not only for disease-fighting microbes, but also for other beneficial microorganisms such as nitrogen-fixing bacteria.

The problem of how microbes of all kinds are drawn to the roots of plants is an old one, says Goodman. "What we are no longer ignoring is the contribution of the plant to these associations," he says.

The discovery was made using an experimental population of plants derived from a cross between a cultivated tomato and a related wild species to create plants with varying genetic abilities. Those plants were then exposed to a pathogen that causes seed and seedling diseases, and then to a disease-suppressing bacterium known as UW85. The Wisconsin team observed that the combined effects of several tomato genes contributed to the ability of plants to support populations of the disease-thwarting UW85 bacterium.

The catch, says Goodman, is that while the team was able to demonstrate the influence of genes and roughly locate where those genes lie on tomato chromosomes, more work is needed to precisely identify the genes involved and find out exactly what they do to attract good microbes.

It is likely, Goodman explaines, that there are a number of genes at work and that they initiate a chain of biochemical communication that somehow signals microbes and draws them to the plants. Other factors, such as the physical features of plant roots, probably play a role as well.

Goodman and co-authors Kevin P. Smith, now on the faculty at the University of Minnesota, and Jo Handelsman, a UW-Madison professor of plant pathology, are now extending the research to corn. ■

Professor explores science, politics of dams

Brian Mattmiller

Love 'em or hate 'em, there is one indisputable fact about dams in America: Thousands of them are aging, obsolete and dangerous, and await either a repair bill or a wrecking ball.

In towns across the country, the emotional question of whether a dam is a community asset or an environmental scourge will be frequently debated in coming years. But a university ecologist hopes to ground the question on a sound scientific footing.

Emily Stanley, an assistant professor of zoology and scientist with the Center for Limnology, plans to use a dam removal project on Wisconsin's Baraboo River as a unique opportunity to gather important ecological data before and after the breach.

Surprisingly, Stanley says, there is little detailed scientific information about dam removal and all of the cascading effects it creates on water quality, landscapes, fish and wildlife. The Baraboo River could serve as a national model for biologists of how rivers respond to this great unleashing of their currents.

An aging dam on the upper Baraboo River in LaValle is scheduled for removal in 2001. The Sand County Foundation, a regional environmental group, purchased an option on the dam and is leading removal plans, along with the Wisconsin Department of Natural Resources.

The Baraboo River will be a particularly compelling case study, Stanley says, because the river faces three dam removals. After LaValle, another two dams are expected to be removed in the city of Baraboo. In addition, two dams were removed earlier, one in the 1970s and one just two years ago.

"We can look at changes with respect to the entire river basin," she says.

Among the questions: Will native plants, trees and wetlands return to the land that was underwater? Will the flushing of sediment reintroduce some agricultural chemicals that compromise water quality? Will the aquatic food chain look completely different before and after the dam? Will river-dependent species of fish make a comeback, and what species will they replace?

"One thing people would love to see in the Baraboo is sturgeon running again," Stanley says. "The area in downtown Baraboo was an historically important sturgeon breeding area."

But some potential losses would need to be prevented by the project. For example, the mill pond currently attracts great bird populations, including a pair of nesting bald eagles, she says.

On a national scale, dam removal is being driven by economic and legal reasons, Stanley says. Most dams were built between 1860 and the 1920s and have a life expectancy of about 100 years. As inspections turn up safety problems, some towns are faced with six-figure price tags for repairs. The DNR says 30 dams may be razed in the next five years alone.

Economics aside, many environmental groups are taking this opportunity to push dam removal as a national priority.

"There is a campaign to return rivers to what they ought to be, which is a free-flowing water course, to get native fish back in, to circulate the water and flush out the sediment," she says. "This is what rivers do, they flow through channels and don't get stuck behind dams."

Yet many residents use and appreciate the impoundments created by dams. Removing them may leave homes along the quiet, glassy waters high and dry, and some recreational opportunities may be lost.

Stanley says she believes baseline scientific information will be useful to all the stakeholders in these debates. And it could give land managers "a potentially powerful tool for river restoration." ■

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NEWS

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Res - Genetics

THE WISCONSIN WEEK WIRE - June 30, 1999
for UW-Madison faculty and staff
(issue on Web at http://www.news.wisc.edu/wire/i063099/)

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Wisconsin Week's print edition is on vacation until Wednesday, Aug. 25, but the Wire will continue to keep you updated through the summer.

TOP NEWS
- o African language instruction center to open in fall
- o Two faculty members get "genius grants"
- o Car crash in South Africa kills program leader, family

RESEARCH
- o Nursing lands big research training grant
- o Study looks to nuclear energy as micro-scale fuel
- o Common genes form new family tree for animals

LEARNING
- o Scholarship to enhance engineering diversity

ON CAMPUS
- o New students get first taste of campus life
- o High schoolers learn about higher education
- o Events calendar: http://calendar.news.wisc.edu

MILESTONES
- o Kemnitz to lead Regional Primate Research Center
- o Director named for ag research stations
- o Census work earns sociologist a White House 'Hammer'
- o Research park association honors Wayne McGown

OUTREACH
- o Med School combats mental stress in farm families

NEWS IN BRIEF
- o UW budget action moves to full Legislature
- o Veterans' education requirement proposed
- o UW-Elsewhere: News from around the system

TIP
o Support for older WiscWorld versions to end

(issue on Web at http://www.news.wisc.edu/wire/i063099/)
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Top news

AFRICAN LANGUAGE INSTRUCTION CENTER TO OPEN IN FALL
A new, first-of-its-kind national resource center devoted to the teaching of African languages will open this fall at the university. The National African Languages Resource Center will be established under an almost-$900,000 grant from the United States Department of Education. Under the auspices of the Department of African Languages and Literature, the center will tap the expertise of a national pool of scholars and teachers of African languages from Arabic to Zulu.
(Full story: http://www.news.wisc.edu/wire/i063099/alic.html)

TWO FACULTY MEMBERS GET "GENIUS GRANTS"
In a rare event, two faculty members have received word that they'll get national fellowships awarded to individuals whose work and accomplishments set lofty standards for creativity and promise. Jill Banfield, a geologist, and Laura Kiessling, a chemist, have been named MacArthur Fellows, which provide stipends ranging from $200,000 to $375,000 over five years. The fellowships are popularly known as "genius grants."
(Full story: http://www.news.wisc.edu/wire/i063099/macarthur.html)

CAR CRASH IN SOUTH AFRICA KILLS PROGRAM LEADER, FAMILY
A multi-car accident in South Africa has claimed the life of a family of four stationed in the region as part of a campus international program. Scott Kloeck-Jenson, 34, a UW-Madison Ph.D. candidate and leader of a Land Tenure Center program in Mozambique, was killed in the accident Wednesday, June 23. Also killed was Scott's wife, Barbara, 34, their daughter Zoe, 5, and their son Noah, 2.
(Full story: http://www.news.wisc.edu/wire/i063099/jenson.html)

Research

NURSING LANDS BIG RESEARCH TRAINING GRANT
The School of Nursing will get just over $1 million from the National Institutes of Health to develop a comprehensive training program in nursing research. The grant is one of fewer than a dozen training grants of this type awarded this year to nursing schools nationwide. "This grant is significant because it signals a maturity in the school's research status," says Nursing School Dean Vivian Littlefield.
(Full story: http://www.news.wisc.edu/wire/i063099/nursing.html)

STUDY LOOKS TO NUCLEAR ENERGY AS MICRO-SCALE FUEL
A trio of university engineers has a new scale in mind for nuclear energy: Rather than huge plants powering entire cities, they envision tiny batteries turning a single microscopic gear using extremely small amounts of radioactive material.
(Full story: http://www.news.wisc.edu/wire/i063099/mems.html)

COMMON GENES FORM NEW FAMILY TREE FOR ANIMALS
Looking deep within the genes of three very different kinds of animals, scientists have found enough molecular evidence to finally fell the animal kingdom's old family tree. Writing last week in the British journal Nature, scientists from UW-Madison and elsewhere reported the discovery of a common genetic theme that provides powerful new evidence to firmly place nearly all animals -- from mollusks to humans -- on a simplified, three-limbed tree of life.
(Full story: http://www.news.wisc.edu/wire/i063099/a_tree.html)

Learning

SCHOLARSHIP TO ENHANCE ENGINEERING DIVERSITY
Cargill, Inc., Minneapolis, Minn. has established the Cargill Diversity Scholarship to enhance diversity in the engineering profession by supporting students from traditionally under-represented communities. The scholarship provides $11,000 per year for a student to attend the UW-Madison College of Engineering. Thomas Dinkins, a spring 1999 graduate of Rufus King High School in Milwaukee, has been selected as the first recipient of the new scholarship.

On Campus
(Events calendar: http://calendar.news.wisc.edu)

NEW STUDENTS GET FIRST TASTE OF CAMPUS LIFE
More than 5,800 students plan to visit campus between now and Friday, Aug. 13, during continuous two-day sessions of a summer orientation program for new and transferring students. A higher-than-usual number of parents -- nearly 6,600 – also have accepted UW-Madison's invitation to attend SOAR sessions designed specifically for them. The 30-year old program is coordinated by the university's Office of Admissions; Campus Information, Assistance and Orientation; and academic advisors from all schools, colleges and the Cross College Advising Service.

HIGH SCHOOLERS LEARN ABOUT HIGHER EDUCATION

Sixty-six ninth graders from 11 Milwaukee-area high schools are spending three weeks on campus through a new pre-college program targeting minority and disadvantaged students. The students are the first group enrolled in the Pre-College Enrollment Opportunity Program for Learning Excellence, known as PEOPLE. They will be on campus through Friday, July 2, taking part in science experiments and honing their writing and communication skills.

Milestones

KEMNITZ TO LEAD REGIONAL PRIMATE RESEARCH CENTER

Joseph W. Kemnitz, a Medical School professor and an authority on the physiology of aging, has been named director of the Wisconsin Regional Primate Research Center. Kemnitz has been interim director since fall 1996 of the key university research center, which has a staff of 133, an annual budget of nearly $15 million, and world-renowned programs of research in developmental and reproductive biology, AIDS, aging and primate conservation, among others.

(Full story: http://www.news.wisc.edu/wire/i063099/kemnitz.html)

DIRECTOR NAMED FOR AG RESEARCH STATIONS

Richard J. Straub, chairman of the Department of Biological Systems Engineering at the College of Agricultural and Life Sciences, has been named the new director of Agricultural Research Stations. Straub replaces Dale Schlough, who will retire July 1 after 30 years with the stations. Schlough has overseen operations on 12 stations and other assorted parcels totaling about 6,100 acres - about two-thirds of the land used for all UW-Madison programs.

(Full stories: http://www.news.wisc.edu/wire/i063099/straub.html)

CENSUS WORK EARNS SOCIOLOGIST A WHITE HOUSE 'HAMMER'

Taking inventory of 275 million people may never come easy, but a rural sociologist was honored Wednesday, June 23, for helping make it more efficient. Paul Voss, a professor of rural sociology, is part of a U.S. Census Bureau team that received a "Hammer Award" from the National Partnership for Reinventing Government. The award is Vice President Al Gore's effort to recognize federal employees and collaborators who are making government run better and cost less.

RESEARCH PARK ASSOCIATION HONORS WAYNE MCGOWN

University research park director Wayne McGown has received a career achievement award from the Association of University Related Research Parks for "developing one of America's most innovative research parks." McGown will be retiring in July after 16 years at the helm of the University Research Park, which began as just an idea and an

open plot of west-side property in 1984. Today, the 251-acre park is home to 76 companies employing more than 2,200 people. He received the award Friday, June 11. AURRP is the nation's largest organization promoting the growth of university research parks and technology-based developments.

Outreach

MED SCHOOL COMBATS MENTAL STRESS IN FARM FAMILIES

The Medical School is participating in a federally funded initiative to reduce stress among farm families. Extreme weather and unusually dire economic conditions have produced crises on many northern Midwest family farms. Health officials in seven states have received a $370,000 federal grant to create an interstate network to better provide mental health services in rural areas.
(Full story: http://www.news.wisc.edu/wire/i063099/farmstress.html)

News in brief

UW BUDGET ACTION MOVES TO FULL LEGISLATURE

The full Assembly began debating the state's $41 billion budget, which includes overall spending plans for UW-Madison. Recently added proposals would restore about $6.9 million in tuition revenue for the Madison Initiative that was deleted by the Joint Finance Committee; match financial aid increases to tuition increases for resident undergraduates; and cut UW tobacco research funding in half. The measure includes many other items of departmental and individual interest. For an overview of recent action, visit: http://www.news.wisc.edu/chancellor/staterelations/

VETERANS' EDUCATION REQUIREMENT PROPOSED

Rep. Stephen Nass, R-Whitewater, has introduced legislation (AB 384) that would require the Board of Regents to admit Wisconsin veterans who apply for admission to a UW System school within two years of release or discharge from the U.S. armed forces. The legislation provides that a campus would not be required to admit, under this provision, a number of students that is greater than .03% of the number of undergraduates enrolled at the campus. The bill has been referred to the Committee on Colleges and Universities.

UW-ELSEWHERE: NEWS FROM AROUND THE SYSTEM

* Superior: The campus this fall launches the Ronald E. McNair Post-Baccalaureate Program aimed at helping students from low-income families earn advanced academic degrees.

* Eau Claire: A system grant will allow UW-Eau Claire and UW-Madison to put six graduate nursing practitioner courses online, giving students from rural areas the chance to further their education from a convenient location.

* Whitewater: Nearly 300 people gathered Saturday, June 19, to honor Chancellor H. Gaylon Greenhill as he retired after 37 years of service.

* System: The state Senate has confirmed the appointment of Guy Gottschalk to the UW Board of Regents.

Tip

SUPPORT FOR OLDER WISCWORLD VERSIONS TO END
DoIT is ending support for older WiscWorld versions as new configurations and versions of WiscWorld are developed. The older versions have declined in usage and resources available for the support of older versions have declined as well.
(More information: http://pubs.doit.wisc.edu/f/news/newsitem.cfm?filename=210)

Res-
Genetics

THE WISCONSIN WEEK WIRE - June 16, 1999
for UW-Madison faculty and staff
(issue on Web at http://www.news.wisc.edu/wire/i061699/)

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Wisconsin Week's print edition is on vacation until Wednesday, Aug. 25, but the Wire will continue to keep you updated through the summer. If you are submitting content for Wisconsin Week or the Wire, please note our new email address: wisweek@news.wisc.edu

TOP NEWS
- o Barrows to oversee student affairs
- o Historic Bascom elms getting special treatment
- o UW's 'Future Car' first again in national competition

RESEARCH
- o UW scientists find gene that controls organ shape
- o Study shows unrelenting grip of nicotine withdrawal

LEARNING
- o Course examines how sports shows influence culture
- o Engineering debuts online-only graduate study

ON CAMPUS
- o Motorized ducks to return to campus
- o Chancellor honors partnership participants
- o Events calendar: http://calendar.news.wisc.edu

MILESTONES
- o Associate dean named to coordinate humanities
- o Director chosen for L&S career advising program

NEWS IN BRIEF
- o Pharmacy building: Construction resumes
- o Newsmaker: Cantor joins V-chip advocates
- o UW budget: Action moves to GOP-controlled Assembly
- o Employee issues: Classified pay raises approved
- o Community: Retirement membership swells
- o Service: Surplus books, journals on way to Mexico
- o UW-Elsewhere: News from around the system

RESOURCES
- o On the Web: A virtual farmers' market

TIP
o Staff directory updates due

(issue on Web at http://www.news.wisc.edu/wire/i061699/)
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Top news

BARROWS TO OVERSEE STUDENT AFFAIRS
Paul W. Barrows, associate vice chancellor for academic services and campus diversity, will be the university's chief student affairs officer beginning Thursday, July 1. The new position expands Barrows' responsibilities and carries the working title of vice chancellor for student affairs. Barrows will continue to supervise the Registrar's Office, the Office of Student Financial Services, Undergraduate Admissions and student diversity, and he will also oversee the Dean of Students Office and University Health Service.
(Full story: http://www.news.wisc.edu/wire/i061699/barrows.html)

HISTORIC BASCOM ELMS GETTING SPECIAL TREATMENT
A towering stand of American elm trees on Bascom Hill that has survived the ravages of development and Dutch Elm Disease are being rewarded with some preventive medicine. Where there were once more than 1,000 elms on the UW-Madison campus, a new management plan focuses on keeping the remaining 68 survivors in the green for at least another century. This week, environmental managers will begin a fungicide treatment that's directly injected at the root of trees. "It looks like the tree is getting an intravenous transfusion," says Daniel Einstein, environmental management coordinator.
(Full story: http://www.news.wisc.edu/wire/i061699/elms.html)

UW'S 'FUTURE CAR' FIRST AGAIN IN NATIONAL COMPETITION
College of Engineering undergraduates logged another national victory this summer in the Future Car Challenge. Team Paradigm was the top performer in gas mileage, acceleration, workmanship, appearance and dynamic handling, among others.
The car achieved a fuel rating of 62.7 miles per gallon, which is a 142 percent improvement over the commercial version of the car-an aluminum body Mercury Sable. The team tied for first place in last year's competition, too.
(Full story: http://www.news.wisc.edu/wire/i061699/futurecar.html)

Research

UW SCIENTISTS FIND A GENE THAT CONTROLS ORGAN SHAPE

Growing complete organs in the laboratory, a longstanding dream of biomedical science, is one key step closer to reality as a team of Wisconsin scientists report the discovery of a genetic mechanism that gives organs their shape. Writing in the Thursday, June 10, edition of the scientific journal Nature, a team of scientists from the Howard Hughes Medical Institute at the describe a protein that regulates organ shape in the nematode Caenorhabditis elegans. With the new discovery of an organ-shaping protein, and the gene that makes the protein, a key step in the process of how nature organizes an ambiguous mass of cells into a complex organ has been identified.
(Full story: http://www.news.wisc.edu/wire/i061699/organshape.html)

STUDY SHOWS UNRELENTING GRIP OF NICOTINE WITHDRAWAL

A new study suggests nicotine withdrawal symptoms behave like characters in a bad horror flick: Just when you think you've killed them, they're back with a vengeance. Researchers with the Center for Tobacco Research and Intervention have found surprising variation in the length and intensity of symptoms across smokers attempting to quit. Their studies of hundreds of smokers in cessation programs have shown that many experience intense spikes of withdrawal symptoms months after their initial quit attempts.
(Full story: http://www.news.wisc.edu/wire/i061699/withdrawal.html)

Learning

COURSE EXAMINES HOW SPORTS SHOWS INFLUENCE CULTURE

A new course on sports, the broadcast media and their influence on culture debuted this week. Offered through the Department of Communication Arts, the course explores how sports broadcasts are constructed and the niche they occupy in culture, according to Doug Battema, the Ph.D. candidate who developed the course and will teach it. "We'll also look at how the sports industry has changed in response to media demands, and how sports broadcasts encourage us to think about issues of race, gender and class," he says. "I hope students in the class will come away with a greater consideration for the implications sports broadcasts have on our understanding of ourselves and others."

ENGINEERING DEBUTS ONLINE-ONLY GRADUATE STUDY

The Master's of Engineering in Professional Practice (MEPP) program debuted this week, catering to the working professional by offering an entire advance degree via the World Wide Web. Classmates will share an electronic classroom for the next two years and pursue a master's degree without interrupting their careers. Karen Al-Ashkar, the program's adviser, says the program gives people who are juggling professional and personal lives new access to higher education. "These students need to be able to access courses on their time, not ours," Al-Ashkar says. Employers strongly supported the concept, she says.

On Campus
(Events calendar: http://calendar.news.wisc.edu)

MOTORIZED DUCKS TO RETURN TO CAMPUS
Green-and-white Wisconsin Ducks -- former World War II amphibious transport vehicles -- were on campus last week doing a wet-and-dry run for campus tours planned in August during UW-Madison's Sesquicentennial Summer Celebration. On Sunday, August 22, from 10 a.m. to 6 p.m., seven Ducks will carry visitors along the university's shoreline. Tickets will be $6/adults and $4/children, with the proceeds going to the Sesquicentennial Undergraduate Scholarship Fund.
Photos: http://www.news.wisc.edu/wire/i061699/ducks.html

CHANCELLOR HONORS PARTNERSHIP PARTICIPANTS
More than 150 people will receive a special thanks on Wednesday, June 16, from Chancellor David Ward for their commitment to university and community partnerships. The third annual reception, held at Olin House, recognizes partnerships that promote community development, economic growth and greater access to educational resources. Programs honored include the Wisconsin Migrant Coalition; Families, Food and Fun Nights; the Women and Mental Health Study Site of Dane County; and the Waisman Center's Newborn Screening Program. Information: LaMarr Billups, special assistant to the chancellor for community relations, 263-5510.

Milestones

ASSOCIATE DEAN NAMED TO COORDINATE HUMANITIES
A specialist in Renaissance literature has been named associate dean for the humanities in the College of Letters and Science. Jane C. Tylus will begin her new duties Aug. 1, replacing Yvonne Ozzello, who has retired. As associate dean for the humanities, Tylus will be the point person in the college for more than 20 humanities departments and programs.
(Full story: http://www.news.wisc.edu/wire/i061699/tylus.html)

DIRECTOR CHOSEN FOR L&S CAREER ADVISING PROGRAM
A new director has been hired for Career Advising and Planning Services, marking the first step in a major expansion of the program. Ann Groves Lloyd, currently the senior director of campus outreach for the Wisconsin Alumni Association, will take the helm of CAPS beginning Thursday, July 1. Janet Vandevender, associate dean of the College of Letters and Sciences, described Groves Lloyd as a "real go-getter" whose experience with alumni will be a valuable asset.
(Full story: http://www.news.wisc.edu/wire/i061699/lloyd.html)

News in brief

PHARMACY BUILDING: CONSTRUCTION RESUMES

Occupational safety authorities continue to investigate the collapse of part of the fourth floor of the UW-Madison Rennebohm Pharmacy Building. OSHA crews are carefully dismantling the rubble in hopes of piecing together a detailed picture of what happened. Construction work resumed last Thursday in areas away from the damaged third and fourth floors of the building.

NEWSMAKER: CANTOR JOINS V-CHIP ADVOCATES

Joanne Cantor, professor of communication arts, plans to participate Wednesday, June 16, at a national news conference advocating the V-chip blocking device as a way for parents to control what their children watch on television. The V-chip allows parents to block particular channels or programs. "It can work as a sort of childproof cap for TV," says Cantor, and author of "Mommy I'm Scared," published last September (Harvest/Harcourt Brace). Cantor's research indicates that exposure to media violence can contribute to violent behavior, intense anxieties and recurring nightmares in young people.

UW BUDGET: ACTION MOVES TO GOP-CONTROLLED ASSEMBLY

The Assembly is expected to debate and approve a state budget beginning the week of June 28, while the Senate considers its own version of the $41 billion measure. Lawmakers are unlikely to agree to a spending plan by July 1, when the new fiscal year begins. If a new budget isn't approved, funding for all state programs will continue at current levels. Besides including overall spending plans for UW-Madison, the measure includes many items of departmental and individual interest. For a statement from Chancellor David Ward, go to: http://www.news.wisc.edu/wire/i061699/statement.html For an overview of recent action, go to: http://www.news.wisc.edu/chancellor/staterelations/

EMPLOYEE ISSUES: CLASSIFIED PAY RAISES APPROVED

The Joint Committee on Employment Relations (JCOER) has approved recommendations by the Department of Employment Relations (DER) to increase non-represented classified employee salaries by 2% in 1999-2000 and 2.5% in 2000-01. The committee reduced DER's recommendation for Performance Recognition funding from 1.0% to 0.5% annually of an agency's non-represented employee salary line. JCOER is expected to act on the unclassified employee pay plan, including faculty and academic staff, when it meets in July. In other action, the committee tabled the DER recommendation to change the state employee health insurance formula in FY 2001.

COMMUNITY: RETIREMENT MEMBERSHIP SWELLS

More than 600 current and retired university employees have become charter members of the UW-Madison Retirement so far, says Joe Corry, the group's acting executive director. The association, formed last year to enhance retirement services for current and future retirees, has elected Alma Baron as its first president. Corry says charter memberships are still being accepted. The application is part of the April issue of "The Sifter," the association's newsletter. Information: 262-0641.

SERVICE: SURPLUS BOOKS, JOURNALS ON WAY TO MEXICO

About 800 boxes of surplus books, journals and other scholarly materials are on their way to Mexico thanks to the continuing efforts of botany professor emeritus Hugh Iltis and others. During the past decade, Iltis has organized the collection of more than 50 tons of books and journals for the University of Guadalajara, Mexico. The university is building two new libraries, including one near the Sierra de Manantlan, a scientific reserve known for its diversity of plant life. Iltis helped establish the reserve. Many donated materials came from retiring professors and departments running out of storage space.

UW-ELSEWHERE: NEWS FROM AROUND THE SYSTEM

* UW System: San Orr has been re-elected as president of the UW Board of Regents; Jay Smith was re-elected vice president.

* Eau Claire: A new summer course will address a growing concern among educators in Wisconsin: keeping up with the recently adopted Wisconsin Model Standards for public school curriculum.

* Oshkosh: Astronomy professor Michael Briley is teaming with astronomers from the European Space Agency and McDonald Observatory in Texas to test his improved method for determining the distances to star clusters in the Milky Way and other galaxies.

Resources

ON THE WEB: A VIRTUAL FARMERS' MARKET

You'll find all you need to know about that seasonal ritual, the Dane County Farmers' Market, at a new web site developed by the College of Agricultural and Life Sciences to teach people about buying food from local sources. You can take a tour, take a quiz, find your favorite vendor, seek vegetarian recipes or look for produce that's in season.
Visit: http://www.madfarmmkt.org/

Tip

STAFF DIRECTORY UPDATES DUE

If you haven't already sent your staff directory updates, you've fallen behind schedule. Updates and corrections to the front section of the 1999-2000 staff directory will be handled electronically and department administrator/secretaries have received instructions for making changes via e-mail. To change individual detailed office/e-mail/home address information, you should submit a Person Information Form to Employee Compensation and Benefits. More information: Barbara Ziemer, 100 Bascom Hall, 263-2467; barb.ziemer@mail.admin.wisc.edu.

The Wisconsin Week Wire: Vol. III (No. 11)

NEWS
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NOTE TO PHOTO EDITORS: High-resolution images to accompany this story are available for downloading at: http://www.news.wisc.edu/newsphotos/animaltree.html

COMMON GENES FORM NEW FAMILY TREE FOR ANIMALS

MADISON -- Looking deep within the genes of three very different kinds of animals, scientists have found enough molecular evidence to finally fell the animal kingdom's old family tree.

Writing this week in the British journal Nature, scientists from the University of Wisconsin-Madison, the University of Paris, Cambridge University and St. Petersburg University in Russia report the discovery of a common genetic theme that provides powerful new evidence to firmly place nearly all animals -- from mollusks to humans -- on a simplified, three-limbed tree of life.

For more than a hundred years, scientist have depended on morphology, the form and structure of animals, to determine their place on the family tree. But over the past few years, a new tree has been proposed based on comparisons of themes found in animal genes.

"In the last four or five years, this tree has been totally reorganized and if you're interested in evolutionary relationships, that's really important," said Sean B. Carroll, a professor of molecular biology at the Howard Hughes Medical Institute at the UW-Madison and a co-author of the report in Nature.

The new genetic evidence suggests that in the animal kingdom there are three primary lines of descent that first diverged from a common ancestor at least 540 million years ago, and that gave rise to most animals (with the exception of jellyfish and sponges) living today, said Jennifer K. Grenier, a Howard Hughes Medical Institute Fellow, UW-Madison graduate student and a lead author of the report.

The new study was based on exploration of so-called Hox genes in three distinct kinds of animals: an unsegmented marine worm related to insects, an unusual marine animal called a lamp shell, and a segmented worm related to earthworms and leeches. Hox genes comprise part of a toolbox that is central to animal development. They help organize cells into the different body parts and determine such things as number and placement of legs, wings and other appendages.

By looking for, and finding, essentially the same critical organizing genes in seemingly unrelated animals, the groups from Wisconsin, Paris and Cambridge could, in essence, look far back in time and infer what critical body-organizing genes were present in a common ancestor.

"The point is we're trying to find out the early history of animal evolution," said Carroll, and what we've found is that "the genetic toolbox was pretty sophisticated in the earliest animals. That toolbox has been called on and expressed in many different ways."

It's possible, Carroll explained, to infer the past existence of some genes by looking at fossils, which may reflect those genes in the anatomy of the fossil animal. It is also possible to determine what critical genes were at work hundreds of millions of years ago by analyzing the genes of the living descendants of animals found in the fossil record.

"When you actually look at the genes, the three-branched tree is supported," Carroll said.

All of the animals involved in the new study, although from widely divergent parts of the animal kingdom, have similar Hox genes, although with slight but significant variations, said Grenier. The upshot, she said, is that an ancient common ancestor conferred these genes on animals that subsequently evolved in dramatically different directions.

"Before these (modern) animals existed, these genes were around. There was a common ancestor 600 million years ago that had all these genes," Grenier said.

The new, three-limbed tree simplifies the previous animal kingdom family tree by substituting one branch in place of many offshoots first suggested through anatomical comparison.

"Similar (anatomical) traits don't necessarily reflect a closer

relationship," Grenier explained. "We think there are fewer problems using molecular data" to map kinship among animals.

One intriguing upshot of the new study and others is that scientists, through genetic analysis, may learn something about the genes of an animal for which no fossil exists. Beyond 600 million years ago, the fossil record is skimpy at best, and scientists have no clue as to what the common ancestor of all animals actually looked like.

"There's no fossil. Five-hundred and forty million years ago is just about the end of the animal fossil record," said Grenier. "We don't know what (the common ancestor) looked like, but we think we know what its genes were."

# # #

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Res - Genetics

1•8•4•8 NEWS
UNIVERSITY OF WISCONSIN–MADISON

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EMBARGOED FOR RELEASE, 2 P.M. EDT WEDNESDAY, JUNE 9, 1999

CONTACT: Judith E. Kimble (608) 262-6188, jekimble@facstaff.wisc.edu;
Robert H. Blelloch (608) 262-7980, blelloch@students.wisc.edu

PHOTO EDITORS: A high-resolution image of the nematode Caenorhabditis elegans is available for downloading at: http://www.news.wisc.edu/newsphotos/celegans.html

UW SCIENTISTS FIND A GENE THAT CONTROLS ORGAN SHAPE

MADISON - Growing complete organs in the laboratory, a longstanding dream of biomedical science, is one key step closer to reality as a team of Wisconsin scientists report the discovery of a genetic mechanism that gives organs their shape.

Writing in the Thursday, June 10, edition of the scientific journal Nature, a team of scientists from the Howard Hughes Medical Institute (HHMI) at the University of Wisconsin-Madison describe a protein that regulates organ shape in the nematode Caenorhabditis elegans.

The finding is important for two reasons, said Judith E. Kimble, an HHMI investigator, UW-Madison professor of biochemistry and co-author of the Nature report. "One reason is that very little is known about how organs are shaped and this is one of the first molecules that can be manipulated to change organ shape at will," she said. "The second is that one of the mammalian counterparts of this organ-controlling protein may be involved in the spread of cancer cells."

The grail of growing human organs for transplant in a laboratory dish is still a distant prospect. But with the new discovery of an organ-shaping protein, and the gene that makes the protein, a key step in the process of how nature organizes an ambiguous mass of cells into a complex organ has been identified.

Working in the microscopic worm C. elegans, a workhorse of modern biology, Kimble and Robert H. Blelloch, a doctoral and medical student in Kimble's lab, found that a protein, dubbed GON-1, is responsible for shaping the gonad, an intricate reproductive organ.

In early development, gonads form from a grouping of four specialized cells that grow into an organ. They accomplish the task with the help of a specialized "leader cell" whose job is to set up the polarity and shape of the organ, Kimble said.

The leader cell is located at the tip of an arm of accumulating cells that migrate into the U-shaped gonad organ. In the Wisconsin study, the making of the GON-1 protein was found to be a key function of the leader cells that directed the growth of the organ.

Although the new research was conducted in one organ in a microscopic worm, Kimble said there is a good possibility that the same organ-orchestrating mechanism is common to other organs in most other animals. And with the advent of human stem cell technology in the past year, the chance that scientists might one day be able to coax cells in a dish to grow into entire organs is now enhanced.

Moreover, the discovery of the organ-shaping protein, Kimble added, yields an important clue to how cancer may spread because similar proteins may be involved in shepherding cancerous cells from a tumor to other parts of the body. When cancer spreads or metastasizes in the body, prospects for recovery are grim.

Kimble said knowing how the protein works may enable the development of inhibitors that could slow or stop the spread of cancerous cells in cancer patients.

# # #

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Res-
Genetics

THE WISCONSIN WEEK WIRE - May 12, 1999
for UW-Madison faculty and staff
(issue on Web at http://www.news.wisc.edu/wire/i051299/)
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Selected stories from this issue of Wisconsin Week ...

FRONT PAGE
- o UW-Madison, System negotiating software deals
- o 'Million-pound hammer' squashes stuff in the name of science
- o Program seeks to untangle knots of teaching dilemmas
- o 4,000 to graduate May 14-16

PROFILE: Joe Oliva
- o Instrumentation specialist moonlights aloft as photographer

Q&A: Mark Browne
- o Expert comments on implications of optional retirement plan

FEATURES
- o 150 Years: Sesquicentennial summer celebration planned

RESEARCH
- o Plants use genes to recruit friendly microorganisms
- o Professor explores science, politics of dams
- o New supercomputer will advance engine research
- o Hubble image selected by four with UW ties
- o Neuroscience integrates research, outreach
- o NISE charts three years of steady progress
- o Research digest

AWARDS
- o Four elected to AAAS honorary society
- o Two medical faculty receive unrestricted grants
- o Six get Lilly teaching fellowships
- o Student personnel workers honored for service
- o Awards wrap-up

CAMPUS NEWS
- o Press debuts spring titles
- o Search panel appointed for Dean of Students
- o Senate resets tenure clock
- o Faculty salaries still lag
- o Douthitt named interim dean of human ecology
- o International Studies refines procedures for emergencies
- o New terrace T-shirts available
- o Capitol capsule: Lyall urges effort to help pass budget
- o Newsmakers

ON CAMPUS
o Silver Buckle Press recalls era of wooden typography
o Events calendar: http://calendar.news.wisc.edu

(issue on Web at http://www.news.wisc.edu/wire/i051299/)
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Front Page

UW-MADISON, SYSTEM NEGOTIATING SOFTWARE DEALS
There's been a lot of buzz on campus about the UW System's negotiation with Microsoft Corp. over a new software buying agreement, buzz set off by the market domination of Bill Gates' behemoth. But what often isn't noted is this: UW-Madison is negotiating with other vendors regarding similar agreements for what is called a "site license."
(Full story in Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i051299/software.html

'MILLION-POUND HAMMER' SQUASHES STUFF IN THE NAME OF SCIENCE
Of all the devices that pulverize, crush, vibrate, flatten and stretch in the name of materials testing, one university machine separates the tools from the toys.
(Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i051299/hammer.html

PROGRAM SEEKS TO UNTANGLE KNOTS OF TEACHING DILEMMAS
UW-Madison faculty and teaching staff mulling course reforms this summer might want to eavesdrop on a vibrant online discussion that features proceedings from two years of campus workshops exploring universal dilemmas in teaching.
(Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i051299/knotty.html

4,000 TO GRADUATE MAY 14-16
A weekend of beginnings commences Friday, May 14, for 4,000 students eligible to graduate this spring. Five ceremonies will be held at the Kohl Center.
(Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i051299/commencement.html

Profile: Joe Oliva

INSTRUMENTATION SPECIALIST
MOONLIGHTS ALOFT AS PHOTOGRAPHER
Biomolecular chemistry staffer Joe Oliva trades on his photography skills to fly high with military jet jockeys.
(Wisconsin Week, page 4)
http://www.news.wisc.edu/wire/i051299/oliva.html

Q&A: Mark Browne

EXPERT COMMENTS ON
IMPLICATIONS OF OPTIONAL RETIREMENT PLAN

At its meeting May 6-7 at UW-Parkside, the UW System Board of Regents approved language for legislation to create an optional retirement plan for new faculty and academic staff. To help further the understanding of retirement issues and the optional retirement system proposal, Wisconsin Week asked UW-Madison business associate professor Mark Browne to analyze the proposal and current debate.
(Wisconsin Week, page 7)
http://www.news.wisc.edu/wire/i051299/retire.html

Features

150 YEARS: SESQUICENTENNIAL SUMMER CELEBRATION PLANNED

As you plan your summertime activities, don't forget the university's Sesquicentennial Summer Celebration and Open House on Saturday and Sunday, Aug. 21-22. Varied entertaining and educational activities are being planned.
(Wisconsin Week, page 5)
http://www.news.wisc.edu/wire/i051299/cele.html

Research

PLANTS USE GENES TO RECRUIT FRIENDLY MICROORGANISMS

In the battle against the legions of lethal soil pathogens that beset crops, plants, apparently, have the ability to summon the microbial cavalry.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i051299/cavalry.html

PROFESSOR EXPLORES SCIENCE, POLITICS OF DAMS

Emily Stanley, an assistant professor of zoology and scientist with the Center for Limnology, plans to use a dam removal project on Wisconsin's Baraboo River as a unique opportunity to gather important ecological data before and after the breach.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i051299/dam.html

NEW SUPERCOMPUTER WILL ADVANCE ENGINE RESEARCH

A unique partnership helped the university's Engine Research Center buy a new supercomputer that will invigorate its engine simulation work.
(Wisconsin Week, page 13)
http://www.news.wisc.edu/wire/i051299/sgi.html

HUBBLE IMAGE SELECTED BY FOUR WITH UW TIES

Four scientists with university ties helped select a polar ring galaxy that has become the newest image to be released by the Hubble Heritage Project.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i051299/hubble.html

NEUROSCIENCE INTEGRATES RESEARCH, OUTREACH
The Neuroscience Training Program, celebrating its 25th anniversary this year, has built a solid national reputation on its integrated academic approach and strong emphasis on undergraduate education and community outreach.
(Wisconsin Week, page 8)
http://www.news.wisc.edu/wire/i051299/neuro.html

NISE CHARTS THREE YEARS OF STEADY PROGRESS
As it flies toward its fourth birthday this fall, the National Institute for Science Education at UW-Madison has leaped over some tall pedagogical buildings, with more in sight.
(Wisconsin Week, page 8)
http://www.news.wisc.edu/wire/i051299/nise.html

RESEARCH DIGEST
Environmental study takes a leap into orbit; solar energy poises itself for a comeback; the Water Chemistry Program tracks mercury levels in watersheds; and civil engineers move to divert industrial waste away from landfills.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i051299/rd.html

Awards

FOUR ELECTED TO AAAS HONORARY SOCIETY
Four faculty have been elected to the American Academy of Arts and Sciences, an honorary society devoted to scholarly work that addresses social problems and needs.
(Wisconsin Week, page 14)
http://www.news.wisc.edu/wire/i051299/aaas.html

TWO MEDICAL FACULTY RECEIVE SHAW GRANTS
Two School of Medicine professors have been chosen to receive $200,000 Shaw Scientist Awards by the Milwaukee Foundation. Each will receive unrestricted grants of $40,000 per year over five years to further their research.
(Wisconsin Week, page 14)
http://www.news.wisc.edu/wire/i051299/shaw.html

SIX GET LILLY TEACHING FELLOWSHIPS
New or revised courses in speech, religious studies and physical science will be options for university students in the coming academic year as part of Lilly Award projects.
(Wisconsin Week, page 15)
http://www.news.wisc.edu/wire/i051299/lilly.html

STUDENT PERSONNEL WORKERS HONORED FOR SERVICE
Service "beyond the call of duty" to students has earned five staffers and a special team awards from the university's Student Personnel Association.
(Wisconsin Week, page 14)
http://www.news.wisc.edu/wire/i051299/spa.html

AWARDS WRAP-UP
o Returning Adult Student Awards
o Herfurth-Kubly Awards
o Arthur Ashe Award
o Holstrom Scholarships
o Letters and Science advisors
o Library awards
o Education awards
o Athletics award
Access stories about all these awards from the following web page: http://www.news.wisc.edu/wire/i051299/hf.html

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Campus News

PRESS DEBUTS SPRING TITLES
New titles from the University of Wisconsin Press this spring include a first-of-its-kind series of gay memoirs, works in Latino Studies and several offerings penned by UW-Madison faculty.
(Wisconsin Week, page 10)
http://www.news.wisc.edu/wire/i051299/press.html

SEARCH PANEL APPOINTED FOR DEAN OF STUDENTS
Chancellor David Ward has appointed a search and screen committee to select a new dean of students.
(Wisconsin Week, page 13)
http://www.news.wisc.edu/wire/i051299/dossearch.html

SENATE RESETS TENURE CLOCK
Campus departments will have more flexibility to determine how long the tenure clock ticks under a proposal approved by the Faculty Senate.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i051299/tenure.html

FACULTY SALARIES STILL LAG
In the past year, salaries for full and associate professors rose slightly compared to UW-Madison's peer institutions, while the pay level for assistant professors maintained its same position among the 11 peer universities, according to the Faculty Senate's Commission on Faculty Compensation and Economic Benefits.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i051299/salary.html

DOUTHITT NAMED INTERIM DEAN OF HUMAN ECOLOGY
Robin Douthitt, professor of consumer science, has been named interim dean of the School of Human Ecology.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i051299/douthitt.html

INTERNATIONAL STUDIES REFINES PROCEDURES FOR EMERGENCIES
The Office of International Studies and Programs has issued new guidelines for managing emergencies involving students in study-abroad programs, if and when they occur.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i051299/intl.html

NEW TERRACE T-SHIRTS AVAILABLE
Two new Wisconsin Union T-shirts are now on sale. One is a Picasso-esque design depicting summer fun at the Memorial Union Terrace. The other, a turtle with the Terrace chair-back for a shell, is the first Wisconsin Union T-shirt designed for kids.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i051299/tshirt.html

CAPITOL CAPSULE: LYALL URGES EFFORT TO HELP PASS BUDGET
UW System President Katharine Lyall told a Roundtable audience May 4 that faculty and staff should call or write their legislators and urge them to support the proposed UW System budget for 1999-2001.
(Wisconsin Week, page 15)
http://www.news.wisc.edu/wire/i051299/capsule.html

NEWSMAKERS
Chancellor David Ward espouses the liberal arts master's degree; Michael Sussman discusses the health and nutritional benefits that are the result of new biotechnology research; Linda Gordon argues that focusing on differences has divided feminism and other social and academic movements; and Donald Waller follows Aldo Leopold in advocating the reduction of Wisconsin's deer population for the benefit of the environment.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/nm.html

On Campus
(Events calendar: http://calendar.news.wisc.edu)

SILVER BUCKLE PRESS RECALLS ERA OF WOODEN TYPOGRAPHY
Silver Buckle Press, the working museum of printing history, caps its silver anniversary year with wood in the form of a new book. "Specimen Book of Wood Type" thoroughly catalogs the museum's more than 80 wood-type holdings.
(Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i051299/sbp.html

Res - Genetics

April 23, 1999

TO: Editors, news directors
FROM: UW-Madison Office of News and Public Affairs

UNIVERSITY DAYBOOK FOR APRIL 24-MAY 1

This daybook, a weekly service of the Office of News and Public Affairs, provides a quick summary of some of the events and activities that may be worth covering in the coming week at the University of Wisconsin-Madison. Contact numbers are listed for most items. If you need more help, call the Office of News and Public Affairs, (608) 262-3571.

EXTRA!

ENVIRONMENTAL BEAT: Aside from an annual cow chip toss, the world hasn't stumbled on many alternative uses for cow manure. But UW-Madison researchers have a couple of new ones: water filters and particle board. They have teamed with a Chicago consultant to make steam pressure-treated hardboard from manure fibers. They are also working with the Forest Products Laboratory to creating biofilters to clean up water pollution. A system using the manure fibers will filter storm water at Mount Horeb's Stewart Lake. CONTACTS: Richard Koegel, a USDA researcher and professor of biological systems engineering, (608) 264-5149; rgkoegel@facstaff.wisc.edu. Researcher Jim Han, Forest Products Laboratory, (608) 231-9423.

SCIENCE BEAT: Transferring desirable genes into crops is a high-tech game of chance, with success rates running about one in 1,000. But the odds get a whole lot better, it seems, when you remove gravity from the mix. A recent industry-sponsored research project aboard the NASA space shuttle suggests that microgravity might enhance genetic engineering of plants. The project, coordinated by UW-Madison's Wisconsin Center for Space Automation and Robotics (WCSAR) , tested a unique technology that uses bacteria as a means for gene transfer. Reseachers hoped to double the rate of transfer seen on earth. Instead, they reaped a 10-fold increase. CONTACT: Ray Bula, (608) 798-3772.
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Reg-
genes

FOR IMMEDIATE RELEASE 4/14/99
CONTACT: Ray Bula, (608) 798-3772; Stephen Goldman, University of Toledo, (419) 530-1540

STUDY: MICROGRAVITY MAY ENHANCE GENE TRANSFER IN PLANTS

MADISON - Transferring desirable genes into crops is a high-tech game of chance, with success rates running about one in 1,000. But the odds get a whole lot better, it seems, when you remove gravity from the mix.

An industry-sponsored research project aboard the Oct. 29 NASA Space Shuttle suggests that microgravity might enhance genetic engineering of plants. The project, coordinated by UW-Madison's Wisconsin Center for Space Automation and Robotics (WCSAR) , tested a unique technology that uses bacteria as a means for gene transfer.

"The level of genetic transfer from infection was way beyond our expectations," says Ray Bula, the retired director of WCSAR. "We thought if we could double the rate of transfer seen on earth, it would have been promising."

The increase in genetic transfer was more than 10-fold compared to a control experiment conducted on Earth, Bula says.

Collaborators in the mission include the Indiana Crop Improvement Association (ICIA), the Cross Plains, Wis. biotechnology firm Rapigen LLC and the University of Toledo. Researchers from Toledo developed the gene transfer process and the ICIA is interested in applying the results to new soybean crops.

Bula says the team is excited about the results, but cautioned that the experiment needs to be refined and repeated to ensure that the seedlings survive.

Toledo's process begins by slightly damaging the meristem region of plant seedlings. Next, a bacteria that carries the gene is placed in a solution around the plant. The bacteria provide the desired gene that is incorporated into the damaged cells. All subsequent plant parts derived from these meristem cells will carry the desired trait.

Normally, the bacteria simply die off without harming the plant. But the rate of infection was so high in microgravity that it blocked the vascular system of the plants. On future missions, Bula says the problem can be corrected in part by using less bacteria than is needed on earth.

Why are genes behaving differently in space? Bula says cell materials do

not settle out in microgravity, which allows more freedom of movement. With a minimum of physical factors to limit the mobility of bacteria, Bula says, they hit their target more easily.

Gene transfer techniques are increasingly important to the agriculture industry, as it looks for faster and more selective alternatives to complement traditional plant breeding. Bula says that this growing season, genetically engineered varieties are expected to make up 70 percent of all soybeans planted nationally.

"We will be growing crops in the future for more than just food, clothing or energy," says Bula. "Medical vaccines can be incorporated into plants to provide natural protection from disease. Genes that can make plants resistant to insects will greatly reduce chemical pesticide use."

The gene in this experiment was a marker gene, which is fluorescent and can be easily tracked. In future experiments, Bula says plans are to transfer a gene that has been shown to relieve certain human autoimmune diseases.

All the interest in conducting gene transfer in space is far from an academic exercise. Fully 30 percent of the International Space Station, now being assembled in orbit, is dedicated to private commercial use. Companies involved in plant genetic engineering are potential users of this new facility.

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-- Brian Mattmiller, (608) 262-9772

Res - genetics

THE WISCONSIN WEEK WIRE - April 14, 1999
for UW-Madison faculty and staff
(issue on Web at http://www.news.wisc.edu/wire/i041499/)

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Selected stories from this issue of Wisconsin Week ...

FRONT PAGE
- o Microgravity may multiply success of gene transfers
- o Grant to fund overhaul of lakeshore path
- o Web tools used to enhance Victorian literature course

PROFILE: Dale Bauer
- o Professor ignites students' learning with unorthodox techniques

FEATURES
- o 150 Years: International convocation to draw prominent, diverse group of global alums

ISSUES
- o Campus to deliver diversity plan to regents
- o Reaccrediting site team visit under way this week
- o Retirees criticize optional retirement system

RESEARCH
- o Plants: Good for you, bad for tumors
- o Experts seeks answers to emotional questions
- o Fertilizer run-off threatens long-term balance of lakes
- o Research digest

AWARDS
- o Arts Institute honors outstanding campus artists
- o Four UW-Madison faculty receive Hilldale Awards

CAMPUS NEWS
- o Gore: U.S. must close pay gap between men and women
- o McCubbin to step aside as human ecology dean
- o ISIS moving forward
- o Arboretum tree removal clears way for new gardens
- o Herbicide use planned in campus natural areas
- o Newsmakers

ON CAMPUS
- o Multicultural Student Center celebrates 10 years
- o Film fest shapes up
- o EXPO '99: A bridge to the new millennium

o Conference examines grad study issues
o Colloquium explores health of aging women
o Events calendar: http://calendar.news.wisc.edu

(issue on Web at http://www.news.wisc.edu/wire/i041499/)
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Front Page

MICROGRAVITY MAY MULTIPLY SUCCESS OF GENE TRANSFERS
Transferring desirable genes into crops is a high-tech game of chance, with success rates running about one in 1,000. But the odds get a whole lot better, it seems, when you remove gravity from the mix.
(Full story in Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i041499/micro.html

GRANT TO FUND OVERHAUL OF LAKESHORE PATH
The university plans to spend nearly $500,000 - most of it coming from a federal grant - to spruce up one of the campus's favorite transportation routes, the Howard M. Temin Lakeshore Path.
(Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i041499/path.html

WEB TOOLS USED TO ENHANCE VICTORIAN LITERATURE COURSE
Students enrolled in a course called "The Woman Question in Victorian Literature and Culture" continue their learning outside the classroom in a virtual Victorian study created using WebCT–a new instructional technology tool now available to faculty.
(Wisconsin Week, page 1)
http://www.news.wisc.edu/wire/i041499/webct.html

Profile: Dale Bauer

PROFESSOR IGNITES STUDENTS' LEARNING
WITH UNORTHODOX TECHNIQUES
Dale Bauer, professor of English and women's studies, keeps her students tuned in to her Major American Novelists course with innovative approaches like Jeopardy Day and Groundhog Day.
(Wisconsin Week, page 4)
http://www.news.wisc.edu/wire/i041499/bauer.html

Features

150 YEARS: INTERNATIONAL CONVOCATION TO DRAW PROMINENT, DIVERSE GROUP OF GLOBAL ALUMS
Alumni from 30 nations, including the manager of the famous Bullet Train in Japan, will return to their alma mater May 3-7 to attend the International Alumni Convocation.
(Wisconsin Week, page 5)
http://www.news.wisc.edu/wire/i041499/intlconv.html

Issues

CAMPUS TO DELIVER DIVERSITY PLAN TO REGENTS
University officials this week will deliver to the Board of Regents a proposed strategy to attract more minorities over the next decade. Plan 2008 seeks to increase the number of students, faculty and staff of color through expanded pre-college programs, stronger recruitment and retention measures, curriculum changes and other initiatives.
(Wisconsin Week, page 8)
http://www.news.wisc.edu/wire/i041499/plan2008.html

REACCREDITING SITE TEAM VISIT UNDER WAY THIS WEEK
A team of faculty and university administrators will be touring the campus April 11-14 as part of UW-Madison's 10-year reaccreditation.
(Wisconsin Week, page 8)
http://www.news.wisc.edu/wire/i041499/rp.html

RETIREES CRITICIZE OPTIONAL RETIREMENT SYSTEM
State retirement groups last week criticized a proposal to let new UW faculty and staff invest in individually directed retirement accounts, saying it would weaken the current pension system.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i041499/retire.html

Research

PLANTS: GOOD FOR YOU, BAD FOR TUMORS
Campus researchers report that small concentrations of two compounds from plants we eat suppress the growth of three kinds of human cancer cells in the laboratory.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i041499/plants.html

EXPERTS SEEKS ANSWERS TO EMOTIONAL QUESTIONS
About 300 scientists and students will gather in Madison, April 23-24, for the fifth annual Wisconsin Symposium on Emotion, an international forum on the latest basic and clinical research dealing with emotion.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i041499/emotion.html

FERTILIZER RUN-OFF THREATENS LONG-TERM BALANCE OF LAKES
A new university study of what happens to all the agricultural run-off pouring into Lake Mendota suggests it could literally take centuries for the lake to regain its natural chemical balance.
(Wisconsin Week, page 7)
http://www.news.wisc.edu/wire/i041499/lake.html

RESEARCH DIGEST
Drywall: Good fertilizer? Study of herbal flu remedy underway and the Geology Museum holds open an house.
(Wisconsin Week, page 6)
http://www.news.wisc.edu/wire/i041499/rd.html

Awards

ARTS INSTITUTE HONORS OUTSTANDING CAMPUS ARTISTS
Artists drawn from the ranks of UW-Madison faculty, along with one graduate student, will be honored with awards coordinated by the UW-Madison Arts Institute.
(Wisconsin Week, page 14)
http://www.news.wisc.edu/wire/i041499/artawards.html

FOUR UW-MADISON FACULTY RECEIVE HILLDALE AWARDS
Four UW-Madison faculty members have been chosen to receive this year's Hilldale Awards for major achievements in teaching, research and service.
(Wisconsin Week, page 14)
http://www.news.wisc.edu/wire/i041499/hilldale.html

Campus News

GORE: U.S. MUST CLOSE PAY GAP BETWEEN MEN AND WOMEN
Vice President Al Gore was on campus Saturday, April 10, for a visit to a biotechnology lab and a panel discussion on women in scientific and technology fields.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i041499/gore.html

MCCUBBIN TO STEP ASIDE AS HUMAN ECOLOGY DEAN
Hamilton I. McCubbin, who has served as dean of the School of Human Ecology for nearly 15 years, will step down as dean July 1.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i041499/mccubbin.html

ISIS MOVING FORWARD
The largest part of the conversion to UW-Madison's new student record system is complete, and campus officials overseeing the project say the transition has gone fairly smoothly.
(Wisconsin Week, page 8)
http://www.news.wisc.edu/wire/i041499/isis.html

ARBORETUM TREE REMOVAL CLEARS WAY FOR NEW GARDENS
When you visit the Arboretum this spring, expect to see some dramatic changes in the land surrounding the visitor center - including the removal of dozens of black locust trees.
(Wisconsin Week, page 13)
http://www.news.wisc.edu/wire/i041499/arb.html

HERBICIDE USE PLANNED IN CAMPUS NATURAL AREAS
Efforts to restore and maintain native vegetation in the Campus Natural Areas will again involve the application of chemical herbicides.
(Wisconsin Week, page 2)
http://www.news.wisc.edu/wire/i041499/herbicides.html

NEWSMAKERS
Professor of Engineering Physics Gerald Kulcinski weighs in on the prospects of on-the-cheap fusion energy; astronomer John Gallagher describes merger theory; a Robert Wood Johnson Project web site garners attention for promoting non-alcoholic events; and Sharon Dunwoody explains why having two student daily newspapers is good news for the journalism school's students.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/nm.html

On Campus
(Events calendar: http://calendar.news.wisc.edu)

MULTICULTURAL STUDENT CENTER CELEBRATES 10 YEARS
The Multicultural Student Center's 10th anniversary celebration April 19-23 will showcase the opportunities it provides to students and members of the community.
(Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i041499/msc.html

FILM FEST SHAPES UP
Independent filmmakers and restored prints from the Motion Picture Academy archives will highlight a festival of cinema April 29-May 1 at the university.
(Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i041499/film.html

EXPO '99: A BRIDGE TO THE NEW MILLENNIUM
From rampaging robots to high-tech racing machines, EXPO '99 on the College of Engineering campus this weekend will showcase the creativity and innovation of students and industry.
(Wisconsin Week, page 10)
http://www.news.wisc.edu/wire/i041499/expo.html

CONFERENCE EXAMINES GRAD STUDY ISSUES
The Modern Language Association of America conference, April 15-18 on campus, will examine key issues expected to shape graduate studies in English, comparative literature, and foreign languages and literature.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i041499/mla.html

COLLOQUIUM EXPLORES HEALTH OF AGING WOMEN
Health issues for aging women will be explored in a colloquium April 22-23 sponsored by the Institute on Aging.
(Wisconsin Week, page 3)
http://www.news.wisc.edu/wire/i041499/aging.html

The Wisconsin Week Wire: Vol. III (No. 7)

RESEARCH DIGEST

ETHYLENE STUDIES ADVANCE

Digging deep into the protein molecules that govern ripening and aging in plants, scientists have found an ion of copper — and a genetic link to some of the oldest life forms on the planet.

The discovery reveals another key component of the ethylene receptor, a protein sensor that helps plants detect the slightest whiffs of ethylene, a gaseous hormone that prompts fruit to ripen and flowers to form.

Writing in the Friday, Feb. 12, edition of the journal Science, a team directed by UW-Madison botany associate professor Anthony B. Bleecker reports that a copper ion is a key mediator in the process by which plants sense minuscule concentrations of ethylene. The discovery confirms a long-standing hypothesis that protein receptors somehow get the help of a transition metal like copper to sniff out important but barely detectable environmental and developmental cues.

Bleecker three years ago led a team that discovered the gene that governs the receptor for ripening and aging in plants. That discovery underpins the promise of one day being able to precisely control the process of aging and ripening, to make fruits ripen on schedule and cut flowers last many more days in their vases.

The new discovery also has an important evolutionary twist. Combing plant genome databases, Bleecker's team discovered a similar gene exists in a strain of blue-green algae, primitive photosynthetic bacteria that were on Earth as long as 3.5 billion years ago. That, says Bleecker, suggests "a very ancient origin for this protein function," one that predates the evolution of land plants altogether. The new mystery, he says, is precisely what role this gene plays in blue-green alga, which neither makes nor responds to ethylene.

KNEE-DEEP IN GOOSE DOO-DOO

As Canada goose numbers have soared in recent years, so have complaints about urban goose problems — primarily goose droppings, overgrazing and trampling of vegetation, and aggressive behavior toward humans.

Scott Craven, extension wildlife ecologist at the College of Agricultural and Life Sciences, has co-authored a guide, "Managing Canada Geese in Urban Environments," which describes legal effective ways of persuading problem geese to go elsewhere.

"Urban Canada goose populations have increased dramatically in both numbers and distribution over the past 10 to 15 years," Craven says. "Small numbers of geese are attractive and highly desirable, but it's easy to quickly experience too much of a good thing."

The $10 guide is available from Cornell University Media and Technology Services Resource Center, 7 Cornell Business and Technology Park, Ithaca, NY 14850. Order #1471B243.

SHIPWRECKS EASY TO EXPLORE

The cold, fresh waters off Wisconsin's Lake Superior coast have preserved hundreds of shipwrecks from the last century and a half, transforming their depths into maritime history museums.

Armchair adventurers and divers alike can now easily explore seven of those wrecks thanks to a Web site and a set of dive guides produced by the Sea Grant Institute and the State Historical Society of Wisconsin.

"Ice-Water Mansions: Shipwrecks of the Apostle Islands," can be found at: www.seagrant.wisc.edu/shipwrecks. The site features historical images of the ships, photos of the wrecks from archaeological investigations, and accounts of the vessels' histories and final voyages.

Research data up for grabs?

Federal proposal would require disclosure of raw data upon request

Terry Devitt

A looming change to a federal administrative provision could put one of academic science's most precious assets — raw research data — up for grabs.

Slipped into the 1999 omnibus appropriations bill late last year, the directive would make research findings subject to Freedom of Information Act requests. The measure would revise federal rules that govern the administration of federal grants to universities, hospitals and other non-profit organizations.

Depending on how the new requirement is interpreted by the White House Office of Management and Budget (OMB), the agency charged with implementing and enforcing the rules that govern federally sponsored research, the pending change to the provision could open a Pandora's box of problems for universities and academic researchers who depend on the federal government to support their research.

"Premature disclosure of research data could, for example, inhibit university-industry relations, jeopardize the confidentiality of clinical research, threaten intellectual property rights and, in the extreme, influence the very nature of scientific inquiry, skewing it away from high-risk investigations," says R. Timothy Mulcahy, a cancer biologist and an associate dean in the Graduate School.

Faculty or staff who wish to comment on the proposed change to OMB Circular A-110 can address their comments to: F. James Charney, Policy Analyst, Office of Management and Budget, Room 6065, New Executive Office Building, Washington, D.C. 20503. Comments can also be sent by e-mail to: fcharney@omb.eop.gov. All comments must be submitted by April 5, 1999.

The revision to OMB Circular A-110, the uniform administrative code that spells out all the requirements attendant to federally sponsored research, was sponsored by Alabama Sen. Richard Shelby, a Republican. Shelby and others argue that access to publicly financed research data is often used to mold a vast array of federal regulations governing things ranging from air pollution to drug safety, and that it is in the broad public interest to make such data available on request.

But universities, Mulcahy says, have traditionally acknowledged the importance of accountability and have encouraged the timely publication of research data.

There are concerns that the revised rule could add new layers of cost and bureaucracy. More importantly, it could inadvertently threaten academic freedom, jeopardize the publication of graduate student research and provide a new weapon to anyone who wants to impede research whose methods or outcomes they disagree with.

"People are very worried about its implications," says Rhonda Norsetter, special assistant to the chancellor for federal relations. "The hope is that it may be delayed pending further discussion and clarification if there's a big response."

Data relating to published research funded in whole or in part by federal funds would be subject to disclosure, posing a potentially messy situation for those who would be responsible for sorting through masses of information derived from research with multiple sponsors.

At question is what is meant by terms like "data," "published" and "used in rule making."

"The data question is at the heart of the problem," says Mulcahy. "The can of worms analogy is not far off the mark."

Already, a host of universities, scientific agencies and societies, and lawmakers are lining up to express their concern with the proposed changes to the regulation. Such comment is routinely solicited for proposed administrative revisions and can influence the final form of the rule.

"Unfortunately, this ruling is a blunt instrument which in the best of circumstances could have serious negative consequences," Mulcahy says. ■

Satellite laser to take pulse of ice sheet

Terry Devitt

By shining a laser from space onto the Antarctic and Greenland, scientists may soon peel away some of the mystery surrounding the fate of the massive ice sheets that, through natural fluctuation or human-induced climate change, could drastically alter the levels of the world's oceans.

If all goes according to plan, in 2001 a small satellite with a powerful ability to precisely measure changes in the height of the vast sheets of polar ice will sweep into near-polar orbit on a three- to five-year mission to monitor change at the Earth's poles and elsewhere.

ICESAT, as the satellite is named, will be equipped with a sensitive laser altimeter. The device, aboard one of a constellation of satellites that will make up NASA's Earth Observing System, will help scientists measure, at unprecedented scales, change in the mass balances of the ice sheets that together contain 77 percent of the Earth's fresh water and 99 percent of its glacier ice.

The altimeter, known as GLAS for Geoscience Laser Altimeter System, will allow scientists like Charles Bentley to finally get a precise look at the dynamics of the West Antarctic Ice Sheet, one of the least understood and most critical variables in the global climate change equation.

Bentley, a UW-Madison glaciologist and a 40-year veteran of Antarctic ice studies, is one of the world's preeminent authorities on the ice sheet and a member of the GLAS science team. He has been making trips to the Antarctic since 1957 to study the West Antarctic Ice Sheet and the rapidly moving ice streams that carry ice from the interior of Antarctica to the edge of the continent.

"My focus would be on using the laser altimeter to see what's happening on the West Antarctic Ice Sheet, to look for evidence of rapid shrinking," Bentley says. "We're more interested in how it changes with time than how high it is."

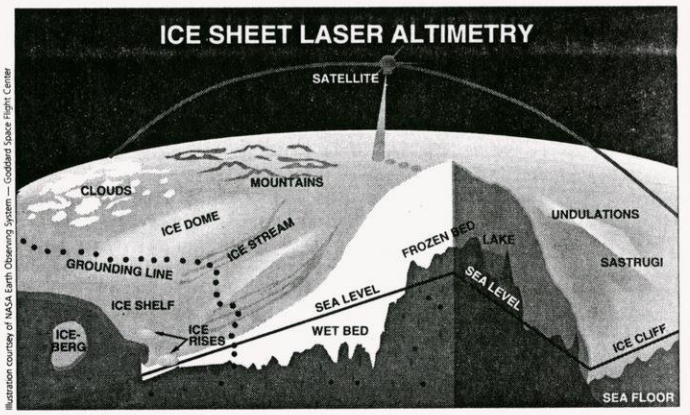


Illustration courtesy of NASA Earth Observing System — Goddard Space Flight Center

From its orbit 420 miles above the Earth, ICESAT will emit pulses of infrared laser light at a rate of 40 times per second, each pulse illuminating a "footprint" 70 meters in diameter. The laser light will be reflected back into space and collected by a telescope aboard the satellite. The distance from the satellite to a reflecting surface — be it a cloud, an ice sheet or a swelling volcano — will be determined by measuring time taken for the laser pulse to make the round trip.

The satellite and its laser altimeter represent a potentially powerful new way to precisely measure change over the desert of ice.

Interest in the West Antarctic Ice Sheet, which contains 3 million cubic kilometers of ice, is keen. It is a dynamic — some say unstable — system that each year dumps huge amounts of ice into the ocean, sometimes spawning icebergs the size of Rhode Island or larger.

It is also at the center of scientific controversy over its long-term stability. At the margins of the ice sheet, marine ice shelves that protrude over the ocean may be susceptible to a warming sea. Some scientists think that if the ice shelves were thinned enough, an important brake on the ice streams that shuttle ice from the interior of Antarctica would be removed, leading to an accelerated discharge of ice into the ocean and an attendant rise in sea level.

The laser system aboard the $200 million ICESAT, says Bentley, will help scientists keep tabs on the ice sheet and changes in its mass balance, the difference between ice shed into the ocean and the accumulation on the ice sheet of ice and snow that falls as precipitation.

Noticing change, however, may take longer than the projected mission of ICESAT, Bentley says. He explains that while the satellite can measure new accumulations of precipitated ice and snow, annual fluctuations in the amount of new ice and snow could mask any small but telling changes in the ice sheet's mass balance. A relatively short mission such as the one ICESAT will conduct, he says, may not be long enough to pin down trends in annual precipitation in the Antarctic. ■

Community

Transportation Services sets aside parking for arts events

To better balance competing demands for parking between sports fans and arts patrons, Transportation Services has designated several areas for theater and arts parking on campus.

With the opening of the Kohl Center a year ago, Transportation Services began receiving complaints that it was very difficult to find parking for theater and arts events taking place at the same time as Kohl Center events.

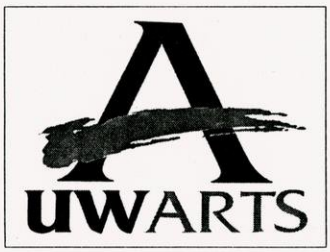
"We continue striving to ensure that parking accommodations are available for every group on campus, not just athletics," says Director of Transportation Services Lori Kay. "We have a strong commitment to meeting the needs of campus arts customers. Arts events are an important part of the university, and they should be able to co-exist with the Kohl Center."

Kay says the underground parking ramp at Grainger Hall (Lot 7) has been designated as the primary theater and arts parking area on nights when multiple events are taking place in the lower campus area. There are 300 parking stalls available there at a cost of $2. Parkers may be asked to show their theater tickets in order to gain admission to the lot.

In addition, a total of nearly 300 stalls are available for theater and arts parking on multiple-event nights in Lot 47 at University Square and Lot 6, the parking ramp at the Helen C. White College Library on N. Park Street.

Lot 20, just west of the Medical Sciences Center on University Avenue, has been designated as a parking area for those attending events at Lathrop Hall.

Theater and arts logos (shown below) have been placed at the entrances to the lots designated for theater and arts patrons. In addition, parking information will be provided to people when they purchase performance tickets at campus box offices.



"We would encourage theater and arts patrons to ask where the designated parking area for their event is when they purchase their tickets," says Patti Lux-Weber, special events parking coordinator for the campus.

"And due to the number of events the campus is hosting, both academic and athletic, they should plan to arrive early so they can locate parking and get to their event in a timely manner," Lux-Weber recommends.

Kay assures those who may still be concerned that "parking is more available than many people might think. Just follow the signs." ■

Participants sought for syndromes study

The Waisman Center is seeking help from families of adolescents with Down syndrome or Fragile X syndrome for a new research project on communication difficulties.

The project, led by UW-Madison educational psychologist Leonard Abbeduto, will look into the factors that cause communication problems in adolescents who have Down or Fragile X syndrome. It will also look at how those communication problems affect families.

Eligible for the program are people between the ages of 11 and 22 who have Down or Fragile X syndromes and their parents. Adolescents will be asked to complete several games and tasks, while parents will complete questionnaires about their adolescents' development. To find out more, contact Abbeduto at 263-1737, or e-mail: abbeduto@waisman.wisc.edu. ■

Campus bus routes change Monday, Feb. 8; ride free Feb. 7-13

Campus transportation officials and Madison Metro are gearing up for changes to the weekday campus bus routes that begin next month.

Madison Metro's L (UW Campus) Line will be revamped into the Red, Blue and Green campus bus routes starting Monday, Feb. 8. The Red route will provide 20-minute circulator service between Memorial Union, Union South and the Southeast dorms via Bascom Hill, Dayton Street and Lake Street from 7 a.m. to 6:30 p.m.

The Blue route will provide direct service between Eagle Heights and Memorial Union via Union South at 10-minute intervals. The Green route will provide direct service between the Clinical Science Center and Memorial Union via Union South at 20-minute intervals. The 50-cent fare will not change for any of the new routes.

To promote and celebrate the campus bus route restructuring, Transportation Services is sponsoring Free Campus Bus Week Feb. 7-13. UW-Madison students, faculty and staff can ride the buses for free that week by showing their university ID cards to bus drivers.

New bus schedules will be available Monday, Feb. 1, and can be picked up on campus buses; at Transportation Services, 124 WARF Office Building, 610 Walnut St, and at the Visitor Information Place in the Memorial Union. Weekend and evening campus bus routes will not change and will be referred to on new bus schedules as the Combined Route.

Fliers advertising the route changes will be posted on buses and at various campus locations, and Madison Metro ads announcing the route restructuring will be published in the UW-Madison student newspapers during the weeks of Feb. 1 and Feb. 8.

Information about the changes can be accessed by visiting: wiscinfo.doit.wisc.edu/trans/, or Madison Metro's web site at: www.ci.madison.wi.us/metro/. ■

UW names Thomas Towell interim licensing director

A retired Madison advertising executive has been named interim director of trademark licensing at the university. Thomas Towell replaces Pamela Holt, who resigned Jan. 15 for personal reasons and moved back to Arizona. Towell started his new position Monday, Jan. 18.

Towell, who ran Towell Promotional Services for 40 years and has extensive experience in trademark licensing, had been volunteering as a marketing adviser with the Department of Intercollegiate Athletics three days a week. His work included assisting Holt on some marketing projects. When Holt resigned, Vice Chancellor for Legal and Executive Affairs Melany Newby asked Towell to fill the job until a replacement is hired later this year.

UW-Madison ranks 10th in sales in the Collegiate Licensing Company, the organization that oversees trademark licensing for more than 170 universities. Royalties from licensing totaled almost $1.2 million in 1997-98, continuing a trend of more than $1 million in annual trademark income since 1993-94, when the Badgers won the Rose Bowl.

The royalty income is divided between financial aid for students, called Bucky Badger Grants, and the athletic department. The university has licensing agreements with 445 companies to market Bucky Badger, the motion "W" and the UW-Madison name on apparel and other merchandise. ■

Speech code debate to continue

The Faculty Senate will resume its discussion of a proposed speech code at its meeting Monday, Feb. 1, which begins at 3:30 p.m. in 272 Bascom Hall.

To foster communication at the meeting, the University Committee has developed the following format for the Committee of the Whole discussion.

Law Professor Carin Clauss will begin by presenting an overview of state and federal discrimination statutes. Clauss is an expert on discrimination law and a member of the majority group of the Ad Hoc Committee to Review Prohibited Harassment Legislation. Her presentation is being coordinated with the committee's minority group.

After Clauss' presentation, senators and others at the meeting will have two minutes each to speak. After every third speaker, three-member panels of the majority and minority groups will be able to respond to questions and comments, each for two minutes.

The University Committee recommends that no motions or amendments be made at the meeting, as the formal debate and vote on the measure is scheduled for the Faculty Senate's meeting Monday, March 1.

Copies of Clauss' overheads will be available at the meeting, and senators can obtain copies of state and federal discrimination statutes by calling the Office of the Secretary of the Faculty at 262-3956. ■

Butterflies help reveal the source of life's little novelties

How the elephant got its trunk, the deer its antlers and the rattlesnake its rattles may seem like disparate questions of developmental biology, but the origins of these novelties, according to the genes of butterflies, may have much in common.

Writing in the Jan. 22 issue of the journal *Science*, scientists from the Howard Hughes Medical Institute at UW-Madison describe a genetic trick that helps explain the staggering diversity of patterning and color exhibited on butterfly wings. The same trick, the scientists suggest, is widely used among animals and may be one of the underlying mechanisms that helps explain how new morphological characteristics — from teeth and tortoise shells to fur and feathers — arise through the course of evolution.

"The origin of new morphological characters is a long-standing problem in evolutionary biology," write molecular biologists David N. Keys, David L. Lewis and Sean B. Carroll in a paper that may help explain how unique bits of body architecture are added long after an animal's basic body has evolved.

The new insight into how animals acquire "novelties" was derived from comparisons of the wing-making genes of fruit flies and two very different species of butterflies, one from North America and one from East Africa. By tracing the genetic circuits that govern the development of wing shape and coloration, the Wisconsin scientists discovered that butterflies, instead of inventing new genes for color, simply reuse a part of the wing-building genetic circuit to turn on enzymes that produce the pigments responsible for wing decoration.

"One of the amazing things about butterflies is that these genetic programs result in a tremendous variety of color patterns, not structures," Lewis says.

"Few would have guessed," says Keys, "that those beautiful color patterns evolved from the same genetic processes which all insects use to shape their wings."

Co-authors of the paper include Jane E. Selegue and Bret J. Pearson, also of UW-Madison, along with researchers at Stanford University Medical Center and the University of Utah. ■

MILESTONES

Appointed

John Peterson, formerly an assistant dean in the Law School, is the new director of production services in the Division of Information and Technology.

Honored

Charles Bentley, professor emeritus of geology and geophysics, was formally made an honorary member of the American Polar Society and received the Richard Goldwaite medal for Antarctic achievement from the Byrd Polar Center of Ohio State University.

The International Congress on Schizophrenia Research gave the Young Investigator Award to **Diane Gooding**, assistant professor of psychology.

Christopher Kleinhenz, professor of French and Italian, has been elected to a three-year term as president of the American Association of Teachers of Italian.

William Ney, outreach coordinator in the Center for Latin American and Iberian Studies, received one of Wisconsin's 1999 MLK Heritage Awards for his service to the Latin American community of Dane County.

Steve Ohly, a member of the Department of Family Medicine, was one of 10 individuals nationwide to receive the Community Health Leadership Award from the Robert Wood Johnson Foundation. He received a $95,000 program grant and a $5,000 personal award.

Noting his contributions to the understanding and prevention of work-related musculoskeletal disorders, the American Institute for Medical and Biological Engineering has elected as a fellow **Robert Radwin**, professor and chair of the Biomedical Engineering Program.

The **marketing department of the Wisconsin Union** won four awards at the recent Association of College Unions International Region 8 meeting. **Keri Robbins**, marketing adviser, won the Gary E. Bartlett New Professional Award for her volunteer and leadership experience in the region and with students, staff and community organizations. The Union also won in three categories of graphics competition: first place for 3-D promotions with the 1998 design for the Terrace T-shirt; honorable mention for single-color design of the Morgridge Center for Public Service logo; and honorable mention for brochure or events calendar for the summer music/film calendar.

Education Professor **Thomas A. Romberg** recently was elected to the National Academy of Education. Membership is limited to 125 people whose accomplishments in education are judged to be outstanding.

Douglas Rosenberg, assistant dance professor, has received the Wisconsin Arts Board Fellowship in Performance and the Project on Death in America Fellowship in the Arts and Humanities.

To report faculty and staff news

Faculty and staff members are encouraged to report honors, awards and other professional achievements for publication. We must receive your announcement **AT LEAST 10 DAYS BEFORE PUBLICATION.**

Campus mail: **19 Bascom Hall**
E-mail: **wisweek@macc.wisc.edu**

FOR IMMEDIATE RELEASE 2/24/99
CONTACT: Philip Sobocinski, (608) 263-2840

UW RESEARCH FUELS GROWTH IN SPIN-OFF, STARTUP COMPANIES

MADISON - Research at the University of Wisconsin-Madison has fueled a swift rise in new technology-based business ventures in Wisconsin over the past five years, according to a new study of spin-off and startup companies.

The study, focusing on a 40-year period, was conducted by the University-Industry Relations office (UIR) at UW-Madison. It identifies 172 Wisconsin companies that have some fundamental connection with the university. Of that total, 62 began in the last five years.

The total number is a dramatic increase from the first study conducted in 1993, said Philip Z. Sobocinski, associate director of UIR and author of both studies. This time around, he was able to identify three times as many companies with close university ties.

"This study shows the effect UW-Madison has on Wisconsin's present and future economy through new business creation," said Sobocinski. "We have more researchers than ever before giving thought and effort to the applications of their work."

The findings reinforce a priority in Gov. Tommy Thompson's 1999-2001 budget recommendations. Thompson proposed creating a not-for-profit venture capital company and a new state position to facilitate more technology transfer between UW-Madison and the private sector.

"These new businesses are helping put research innovations to work right here in Wisconsin," Thompson said. "This study shows we're making great progress, but we can do even more to encourage technology transfer."

Sobocinski said the business-university connection is defined in two ways. A spin-off company develops products or services that stem directly from research on campus, and often are using a license from a UW-Madison patent. The second are startup companies, which are technology-based business ventures started by faculty, staff, students or alumni.

Virginia Hinshaw, dean of the UW-Madison Graduate School, noted that the companies are rooted in some of the university's most innovative research, in areas such as new materials development, biotechnology, biopharmaceuticals, medical imaging, power electronics and software development.

"This partnership between research at UW-Madison and Wisconsin business is an exciting growth area that benefits both partners," said Hinshaw. "It is also becoming a source for higher-wage, highly skilled jobs that will keep our graduates in Wisconsin."

Over the last five years, the study showed that an average of 12.4 new companies were started each year. That's nearly a 50 percent increase in the growth rate found in the previous five years, from 1989-1993.

Why the recent surge? Sobocinski attributes it to a number of factors. There has been an increase in technological innovations at UW-Madison that have strong commercial potential. There is also more availability of

federal "seed" capital through programs such as the Small Business Innovation Research (SBIR) program.

The three arms of UW-Madison technology transfer -- UIR, the Wisconsin Alumni Research Foundation and University Research Park -- have more joint ventures today to encourage and assist new business creation, he added.

The information from Sobocinski's study will be included in an upcoming publication called "UW-Madison Technology Transfer and Entrepreneurship: Creating High-Tech Business Growth in Wisconsin." The book will take stock of the ways UW-Madison makes its mark on the marketplace.

Other key findings from the study:

* More than 92 percent of the firms identified created over the past several decades are still in business.

* The vast majority of these high-tech firms stay in Wisconsin. Less than 2 percent of non-acquired firms chose to relocate outside of the state.

* These are truly small-business ventures, with the majority of them (66 percent) having fewer than 10 employees. Only 8 percent employ more than 100 people. Most (71 percent) have estimated revenues of less than $1 million annually.

* From fiscal 1983-1997, Wisconsin firms received $58 million in SBIR and Small Business Technology Transfer (STTR) grants from the federal government. Of that total, 67 percent, or $38 million, went to UW-Madison spin-offs and startups.

* The companies are distributed in 13 Wisconsin counties, but the vast majority located in Dane County.

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-- Brian Mattmiller, (608) 262-9772

Res - Genetics

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CONTACT: Philip Sobocinski, (608) 263-2840

EXAMPLES OF RECENT HIGH-TECH FIRMS WITH UW-MADISON TIES

MADISON -- From promising new treatments in gene therapy to nanometer-scale instruments, many laboratory advances from University of Wisconsin-Madison are the foundation of recent business ventures.

Here are a few examples of startup or spin-off companies developed in the past five years:

The Mirus Corporation. This company was founded in 1995 by a research team led by Jon Wolff, a pediatrics professor, and the PanVera Corporation. In his research, Wolff developed chemical reagents that are essential ingredients in gene therapy work. They are compounds that help genes penetrate cells. They also manufacture chemicals that help scientists track the transferred genes.

* Mirus Corp. is making these compounds available to other university-based laboratories and companies that do gene therapy work. It is also on the trail of a "universal" gene transfer reagent that could work on all applications.

* Piezomax Technologies, Inc. Founded in 1997, this company is developing the research of materials science Professor Max Lagally and researcher James MacKay in nano-scale devices. A nanometer is one billionth of a meter.

The company is developing new precision-motion devices that use piezoelectric materials, which expand and shrink when voltage is applied. Precise motion at the nanometer scale is becoming important for applications such as lithography, optical communications and microscopy.

* Bioassay, Inc. This 1997 company, founded by zoology Professor Stanley Dodson and researcher Christine Merritt, is developing a simple test that can determine whether new and existing chemicals may cause endocrine disruptions.

The technology has an interesting connection to UW-Madison history. In the late 1800s, zoology professor and lake studies pioneer Edward Birge surveyed plankton in Lake Mendota, including a species called Daphnia. Referencing Birge's data, Dodson and others recently discovered a significant decline in the percentage of male Daphnia, from 50 percent to about 2 percent. The surveys indicate the species may be sensitive to the increased amount of agricultural chemicals in the lake.

The test uses Daphnia as a test organism, akin to a "canary in a coal mine," to look at the effects of various chemicals on the next generation.

* ProCertus BioPharm, Inc. This company is based on the research of William Fahl, an oncology professor and researcher with UW-Madison's McArdle Laboratory for Cancer Research.

* ProCertus is developing products that can help alleviate some of the painful side effects of chemotherapy, such as hair loss, bone marrow suppression and weakened immune systems. It is also developing probiotic strains of bacteria that can protect newborn livestock from some lethal infections.

# # #

-- Brian Mattmiller (608) 262-9772

Res
Genetics

THE WISCONSIN WEEK WIRE - January 27, 1999
for UW-Madison faculty and staff
(issue on Web at http://www.news.wisc.edu/wire/i012799/)

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Selected stories from this issue of Wisconsin Week ...

(issue on Web at http://www.news.wisc.edu/wire/i012799/)

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Front Page

QUALITY CHILD CARE CAN CARRY SOCIAL BENEFITS FOR KIDS

If the quality is there, children in all varieties of child care show greater confidence with peers and more compliance with adults, according to one of the most expansive studies ever of child care in America.

(Full story in Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i012799/childcare.html

CAMPUS OFFICIALS RELEASE 10-YEAR DIVERSITY PLAN

Motivating the entire university community to help improve campus diversity is the thrust of UW-Madison's plan to increase the number of minority students, staff and faculty by 2008.

(Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i012799/plan2008.html

MOVIES' CULTURAL ROLE TO BE EXAMINED

Scholars from around the world will investigate film's mission as cultural amusement through a three-day symposium at UW-Madison Feb. 4-6.

(Wisconsin Week, page 9)
http://www.news.wisc.edu/wire/i012799/film.html

Research

FUTURE OF WEST TIED TO SAVING, NOT EXTRACTING, THE LAND
The road to economic stability for the American West today, argues a UW-Madison rural sociologist, is one that takes an ironic twist to the frontier axiom that "all wealth comes from the land."
(Wisconsin Week, page 16)
http://www.news.wisc.edu/wire/i012799/west.html

BUTTERFLIES SHED LIGHT ON BIOLOGICAL NOVELTIES
How the elephant got its trunk, the deer its antlers and the rattlesnake its rattles may seem like disparate questions of developmental biology, but the origins of these novelties, according to the genes of butterflies, may have much in common.
(Wisconsin Week, page 11)
http://www.news.wisc.edu/wire/i012799/butterfly.html

RESEARCH DESCRIBES HUMAN ORIGINS DEBATE BEFORE DARWIN
When Charles Darwin's Origin of Species was first published in 1859, the intellectual and spiritual controversy that colors nearly any discussion of where humans come from was already a two-decade-old phenomenon in the United States.
(Wisconsin Week, page 16)
http://www.news.wisc.edu/wire/i012799/origin.html

Campus News

THOMSON RECEIVES GOLDEN PLATE AWARD
Scientist James Thomson has earned an American Academy of Achievement 1999 Golden Plate Award for his pioneering work in embryonic stem cell derivation and culture.
(Wisconsin Week, page 10)
http://www.news.wisc.edu/wire/i012799/gplate.html

TRANSPORTATION SERVICES SETS ASIDE PARKING FOR ARTS EVENTS
To better balance competing demands for parking between sports fans and arts patrons, Transportation Services has designated several areas for theater and arts parking on campus.
(Wisconsin Week, page 11)
http://www.news.wisc.edu/wire/i012799/artpark.html

CAMPUS BUS ROUTES CHANGE FEB. 8; RIDE FREE FEB. 7-13
Campus transportation officials and Madison Metro are gearing up for changes to the weekday campus bus routes that begin next month.
(Wisconsin Week, page 11)
http://www.news.wisc.edu/wire/i012799/bus.html

SPEECH CODE DEBATE TO CONTINUE
The Faculty Senate will resume its discussion of a proposed speech code at its meeting Monday, Feb. 1, which begins at 3:30 p.m. in 272 Bascom Hall.
(Wisconsin Week, page 11)
http://www.news.wisc.edu/wire/i012799/scode.html

ACADEMIC STAFF ASSEMBLY TO VOTE ON MANDATORY REVIEWS
A proposal to institute performance reviews for the largest group of UW-Madison employees appears poised for passage next month in the Academic Staff Assembly.
(Wisconsin Week, page 16)
http://www.news.wisc.edu/wire/i012799/review.html

INPUT SOUGHT ON ACADEMIC STAFF WORKPLACE ISSUES
If you are one of UW-Madison's 5,300 academic staff and are concerned about training, pay levels, workload and other employment issues, your ideas are being sought.
(Wisconsin Week, page 10)
http://www.news.wisc.edu/wire/i012799/workplace.html

WHO KNEW? (Answers to your questions)
Please send your questions by e-mail to wisweek@macc.wisc.edu
o I really like Bucky Badger and I'd like to find him on campus.
Where should I look?
o How come I couldn't go skating at the Shell last Thursday night?
(Wisconsin Week, page 16)
http://www.news.wisc.edu/wire/i012799/answers.html

On Campus
(Events calendar: http://calendar.news.wisc.edu)

NEW EXHIBITION CELEBRATES UW ART FACULTY'S DIVERSITY
A stroll through the 1999 art faculty exhibition, opening at the Elvehjem Museum of Art Saturday, Jan. 30, will reveal virtually the entire scope of late 20th century American art forms.
(Wisconsin Week, page 12)
http://www.news.wisc.edu/wire/i012799/artex.html

Res - Genetics

Science Report

Agricultural and Consumer Press Service
440 Henry Mall
Madison WI 53706 (608) 262-1461

College of Agricultural and Life Sciences
Research Division
University of Wisconsin-Madison

Rec. October 29, 1998

For Immediate Release

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MADISON SCIENTISTS SHARE IN NSF GRANT TO IDENTIFY THE ROLE OF KEY PLANT GENES

Will establish a national facility for "gene knockouts"

Two University of Wisconsin-Madison molecular biologists will receive $1.8 million over three years to help develop a system to rapidly identify the function of genes specific to plants.

Michael Sussman and Richard Amasino, along with colleagues at Michigan State University, Stanford University and Yale University, will share in a three-year, $8.7 million National Science Foundation grant coordinated by Pamela R. Green of Michigan State University. Scientists at the four universities will work together to provide plant biologists across the United States with a set of powerful tools to reveal the function and relationships of the 20,000 or more genes in plants.

The grant is one of 20 awarded in October in the first year of NSF's plant genome initiative, which targets genomic studies of food crops, such as corn and soybeans, and other commercially important plants. However, the UW-Madison scientists and their colleagues will be developing techniques using *Arabidopsis*, a small plant in the mustard family.

"The impact of our work will extend far beyond *Arabidopsis*," says Sussman, an expert on plant membrane proteins. "We expect that most of the genes we identify in *Arabidopsis* will be important in crops and other plants of commercial value."

-more-

Arabidopsis has become the favorite model plant of scientists and was the first plant selected to be sequenced. Several years ago NSF began an effort to sequence all of the plant's genes, according to Sussman, who directs the UW Biotechnology Center and is a member of the Department of Horticulture in the College of Agricultural and Life Sciences. About 30 percent of the *Arabidopsis* genes have been sequenced and the task will be completed in two or three years. Researchers from the four universities will be building their work on that foundation.

By next fall, the UW-Madison biologists will develop a facility to serve researchers around the country by creating *Arabidopsis* plants with selective mutations or "gene knockouts."

"You can't tell what a gene is doing unless you disable or knock out that specific gene before evaluating how the resulting plant responds under a range of conditions," Sussman says. He and colleagues described a technique for creating knockouts two years ago in research published in Proceedings of the National Academy of Sciences. In a Science magazine article last May, Sussman's laboratory used the technique to evaluate a gene that controls potassium movement into plant cells.

Scientists at other universities will be developing DNA microarrays, also called "DNA chips," for *Arabidopsis*. With a new DNA chip for *Arabidopsis*, researchers could determine which of the plant's genes are switched on and producing proteins and which are inactive. About the size of a microscope slide, DNA chips allow scientists to study gene expression patterns in different parts of a plant under a variety of environmental conditions. The technique can also be used to screen mutants for gene knockouts.

The combination of the gene-knockout and DNA-chip techniques will enormously accelerate research on plant genes and what they do.

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nsf grant/plant genes 10/98
Writer: George Gallepp (608) 262-3636

Golf course development study finds surprises

Jeff Iseminger

No. 2 on a new list of communities ripe for golf course development is no shocker — Miami — but No. 1 may be: Sherman, Texas, a city of 32,000 50 miles north of Dallas.

A typical 18-hole course in Florida can handle about 75,000 rounds a year, while a course in Wisconsin can handle only half as many.

Sherman's not the only surprise uncovered by UW-Madison researcher Stephen Malpezzi, who's crunched enough numbers to cite 12 cities as showing the greatest potential for golf course development.

Malpezzi, a real estate professor in the School of Business, developed a statistical model explaining the demand for golf based on economic and demographic variables. Among the most powerful varables:

- The percent of a metropolitan population over age 65 was the biggest factor: It had an impact on demand nearly twice that of any other variable.
- Climate affects demand — and in a surprising way. People who live in or go to warmer places demand more golf, of course. But more interesting is this: For a given number of rounds, colder climates need more courses. A typical 18-hole course in Florida, let's say, can handle about 75,000 rounds a year, while a course in Wisconsin can handle only half as many.

"Several variables that could have been expected to affect the demand for golf didn't," says Malpezzi. "In particular, income had no statistically significant effect, and neither did racial composition of the metropolitan area, after controlling for other demand determinants."

Malpezzi used his model to produce the top-12 list of cities that don't have the number of golf holes per capita that the model says should be required, given the cities' demographic makeup, climate and size.

"These areas may be worth careful investigation for future golf development," he says. Malpezzi cautions that his results should be used as a screening tool, not a precise indicator of future demand.

"Apart from the potential fortunes to be made by developing golf in Williamsport, Pa., and Chico, Calif.," says Malpezzi, "demographic shifts over the next 40 years paint a very positive picture for golf."

Right now about 2 million people are turning 62 every year. Because of aging baby boomers, that number will turn up sharply, climbing to 3.5 million by the year 2020. That should add up to a lot of tee times — if golfers have enough tees to go around. ■

Here are the top 12 areas ripe for golf development, according to a study by UW-Madison's Stephen Malpezzi:

1. Sherman, Texas
2. Miami
3. Medford, Ore.
4. Fort Lauderdale, Fla.
5. Williamsport, Pa.
6. Baltimore
7. Scranton, Pa.
8. Tampa, Fla.
9. Atlantic City, N.J.
10. Hagerstown, Md.
11. Lancaster, Pa.
12. Chico, Calif.

When Malpezzi multiplied the golf-hole deficit per capita times the total population, the list looks different:

1. Baltimore
2. Miami
3. Tampa, Fla.
4. Philadelphia
5. Fort Lauderdale, Fla.
6. St. Louis
7. Newark, N.J.
8. Providence, R.I.
9. Milwaukee
10. New Orleans
11. San Antonio, Texas
12. Scranton, Pa.

Perfume in space

UW-Madison, industry project may give space travel a whole new fragrance

Brian Mattmiller

To some, a whiff of rare perfume might evoke images of a wild, exotic place. But a UW-Madison and industry research project will be in truly exotic territory when it tries to cultivate fragrances in space.

A plant growth experiment aboard the Oct. 29 NASA space shuttle mission will attempt to determine whether microgravity can alter the fragrant and flavorful "essential oils" of plants. The work is a joint project of the Wisconsin Center for Space Automation and Robotics (WCSAR) and the New York City-based company International Flavors and Fragrances (IFF).

The flowering plant will grow in WCSAR's device called Astroculture, a chamber that can precisely control growing conditions in space. When the project returns, the scientists hope to see whether the plant's brief growth spurt in space might produce an otherworldly aroma that's useful in consumer products.

"Companies like IFF are always looking for new natural sources of flavors and fragrances that consumers haven't experienced before," says Norman Draeger, a WCSAR associate scientist. "They find plants from exotic places on earth, such as Africa or South America, and identify pleasant tastes and smells."

"This latest exotic place where they haven't looked before happens to be space."

Draeger says they have reason to suspect that microgravity will be a player in this process. Plant oils are a complex mix of many different chemicals that form inside a plant, and a slight change in the chemical mix may produce big changes in the oil's flavor and fragrance.

One important difference between earth and space growing conditions, Draeger says, is in a physics principle called "buoyancy-driven convection." This is one of several effects that govern the transfer of mass inside cells from one place to another.

On earth, gravity makes the components of a cell buoyant — they float around in cellular fluid the way an ice cube floats in a glass of water. But in space, where weight is no longer a factor, the same ice cube would just hang in the middle of the water. If lightly tapped, Draeger says, the cube could move in any direction.

That same "absence of buoyancy," Draeger says, could make a difference in how these oils are formed inside plants. Molecules coming together in chemical reactions may be able to move more differently inside the space-bound cells of plants, potentially creating new compounds with different properties.

During the flight, the shuttle crew, using a propietary technology developed by IFF, will chemically sample a flower of the plant. A fiber needle will be placed near the bloom of the flower to collect the fragrant molecules.

Upon its return, IFF scientists Subha Patel and Braja Mookjerjee will analyze the samples using the tools of gas chromatography and mass spectrometry.

Anyone who's checked the fine print on ingredients knows that flavoring and fragrances are big business. IFF is the world's leading creator and manufacturer of flavoring and fragrances, and its creations are in scores of consumer products, including perfumes, soaps and detergents, air fresheners and a variety of foods.

IFF devotes almost $100 million annually to research and development of new products, which the company says is the largest effort of its kind "devoted to the two senses of taste and smell."

This marks the sixth space shuttle flight for WCSAR's Astroculture technology. The growth chambers are governed by a myriad of environmental controls, with light-emitting diodes that provide red and blue light, watering systems and a tiny camera that allows scientists to monitor progress from earth. ■

Gene transfer to be tested

Scientists are finding that plants can serve as "vessels" for desirable new traits, such as disease resistance and life-enhancing drugs, but the process is fraught with inefficiency.

A UW-Madison and industry project aboard the Oct. 29 NASA Space Shuttle will look at whether microgravity can provide a more efficient environment for gene transfer.

Raymond Bula, who retired this summer as director of the Wisconsin Center for Space Automation and Robotics (WCSAR), designed the project with three industry partners and the University of Toledo. About 1,000 soybean seedlings wrapped in water-soaked paper rolls will go on the flight.

In a technique patented by University of Toledo researchers, the plants will have their meristem region damaged just before launch. The meristem region directs the plant's diverse growth of roots, stems and leaf cells.

This damaged area provides an entry point for the new genetic information, Bula says, which can then be incorporated into the plant. The gene being introduced in this experiment has immune-strengthening properties. The process would allow use of soybean material as a source of medicine to relieve arthritis symptoms, Bula says.

When the seedlings return, researchers will monitor how many of the plants have this desirable new trait.

Says Bula: "If we can improve the gene transfer process to even one in 100 being successful, I think there would be tremendous industry interest."

Research reduces need for pesticides in cranberry growing

George Gallepp

For the fourth straight year, Wisconsin will lead the nation with a cranberry harvest forecast at 2.4 million barrels of the tart, native fruit. From Tomah to Manitowish Waters, the colorful harvest means income and jobs. Cranberries are the state's most valuable fruit crop, with the 1997 crop valued at $162 million.

Wisconsin is using the latest research and technology to produce the crop while minimizing harm to the environment. Most cranberries are grown near wetlands where pesticides can threaten fish and wildlife. Yet unless growers control pests, they can reduce yields by up to 80 percent.

Concern about chemical use prompted more than a decade of research by UW-Madison scientists. "We've found new ways and new tools to control pests," says Dan Mahr, an extension entomologist in the College of Agricultural and Life Sciences.

Mahr and co-workers in the Departments of Horticulture and Plant Pathology have produced a computer program that gives growers rapid access to all the latest information on managing the crop. The Wisconsin research incorporated in the program helps growers manage pests with far fewer chemicals than they once used.

"I can foresee a day when cranberry growers control virtually all insect pests with 10 percent to 25 percent of the insecticide used historically," says Mahr.

With the program — called Cranberry Crop Manager or CCM for short — growers enter and track records on weather, pest monitoring and pest control applications. When they encounter pests, growers can check an encyclopedia of information about cranberry pests. CCM tells growers when to look for problems and presents alternative control measures for the crop's most serious pests.

The program marks a dramatic step forward. For decades, growers applied pesticides at set calendar intervals and little else was known about how to use the chemicals. ■

Res-
Genetics

FOR IMMEDIATE RELEASE 10/9/98
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SPACE MIGHT ENHANCE GENE TRANSFER IN PLANTS

MADISON - Scientists are finding that plants can serve as "vessels" for desirable new traits, such as disease resistance and life-enhancing drugs, but the process is fraught with inefficiency.

A University of Wisconsin-Madison and industry project aboard the Oct. 29 NASA Space Shuttle will look at whether microgravity can provide a more efficient environment for gene transfer. (The project is one of two UW-Madison projects scheduled to be on board. See related story.)

Raymond Bula, who retired this summer as director of the Wisconsin Center for Space Automation and Robotics (WCSAR), designed the project with three industry partners and the University of Toledo. About 1,000 soybean seedlings wrapped in water- soaked paper rolls will go on the flight.

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Res-
genetics

FOR IMMEDIATE RELEASE 9/3/98
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GENE THERAPY SHOWING PROMISE IN FIGHTING MELANOMA

MADISON - In treating dogs for a highly aggressive form of melanoma, a University of Wisconsin-Madison research team is having success with a new cancer vaccine that could benefit human cancer-fighting efforts.

Professor Gregory MacEwen and research scientist Gary Hogge, of the UW-Madison School of Veterinary Medicine, have developed a method of gene therapy that helps the animal's immune system recognize and attack cancer cells. In the September issue of the journal Human Gene Therapy, the researchers reported the vaccine helped some animals live longer and shrunk the tumor in about 20 percent of animals treated.

"This is important work with melanoma, because there currently are no other treatment alternatives," said MacEwen. "Melanoma is resistant to chemotherapy drugs, and surgery doesn't always help because melanoma's spread is so aggressive. We're trying to establish this as a standard of care."

The study details the treatment of 16 dogs that had advanced stages of melanoma that could not be successfully treated through surgery or drugs. The cases were referred to the UW-Madison school by veterinarians from around the country.

To develop the vaccine, the researchers began by surgically removing as much of the tumor as possible. They extracted and purified individual cells from the tumor and injected DNA into those cells that accelerated production of chemicals called cytokines. Cytokine molecules stimulate production of certain white blood cells in the body. The altered cells are then injected back into patients in the form of a vaccine.

The vaccine is administered with a "gene gun," a unique tool that helps scientists insert genetic material into cells. With air pressure, the gun can shoot millions of microscopic gold beads coated with DNA into cells, which are then injected back into the patient. In cells that are penetrated by the beads, the new genetic material becomes integrated into the cell and the cytokine is produced.

With this therapy, the animal's immune response is improved by the increase in cytokine production. The cytokines "train" the immune system to recognize and kill tumor cells, Hogge said.

Cancer vaccines and gene therapy, which have become widely studied in the past decade, could provide a new approach to fighting cancer with fewer side effects than chemotherapy or radiation therapy. This study is unique, Hogge said, because the gene therapy can produce a broad range of immune responses against surviving tumor cells in the patient.

"This is a way to trick the immune system and get the body to fight the tumor," Hogge said.

MacEwen said this study closely parallels work in human gene therapy to treat cancer, and provides additional information that benefits those projects. "We try to target a lot of the research we do so it will benefit the development and design of human clinical trials," he said.

Dogs provide a good model for understanding cancer in humans, MacEwen said, because of their large size and biological similarity. The causes and behaviors of cancers in humans and dogs are also very similar.

Melanoma is a common type of oral cancer in dogs. While oral melanoma is rare in humans, there are roughly 35,000 cases of melanoma skin cancer reported in America each year, and it remains one of the deadliest forms of cancer because of its ability to spread rapidly, MacEwen said.

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- Brian Mattmiller, (608) 262-9772

While leg catheterization is safe and reliable, the downside is that patients must lie flat in bed after the catheter is removed to give the artery time to heal and reduce the risk of bleeding. This usually takes six hours, longer if doctors immediately open the blocked arteries with such procedures as option for about 90 percent of patients who need catheterizations. The remaining 10 percent do not have adequate blood flow to the wrist but remain candidates for leg or arm catheterizations. UW Hospital and Clinics is one of the few institutions in the area that offers all three options. ■

Does mountain living slow evolution?

Terry Devitt

A study of hummingbirds living high in the Andes Mountains suggests that life at the top slows the pace of evolution.

Findings from the study, which compares the DNA of 26 hummingbird species, is some of the first evidence to link an animal's physical environment to the rate at which genes evolve.

"This adds elevation to the mix of factors that one might consider as contributors to rates of molecular evolution," says Robert Bleiweiss, professor of zoology and the author of the recent study published by the National Academy of Sciences.

In all animals, change is governed at the molecular level as genes change or mutate. Over long periods of time and many generations, these genetic changes accumulate and can manifest themselves in altered body plans or behaviors. But what initially sparks those changes at the genetic level is largely unknown.

The evidence that life at higher elevations slows the "molecular clock," says Bleiweiss, was a surprise. Bleiweiss compared the DNA of hummingbirds living at a variety of elevations, from sea level to the equatorial snow line at more than 5,000 meters. Using a technique that combines the DNA of different species, Bleiweiss was able to compare and chart "genetic distances" between the amino acid base pairs that make up hummingbirds' genetic material. Those distances, says Bleiweiss, have a direct correlation to the altitude at which a species lives, suggesting that the higher you go, the slower the molecular clock ticks.

The study also confirmed that mass is "the overriding factor" for such change: "The larger you are or the higher you live, the slower the clock ticks. All of this makes a more interesting soup than DNA simply evolving in its own black box."

The finding that elevation may influence the rate of genetic change in an animal hints, too, that the rigors of life at high altitudes may play a role in slowing the molecular clock. Colder temperatures in general, and the fact that some high-living hummingbirds enter a state of torpor when things get too cold, may exert an influence on physiology that, over time, is expressed genetically.

Moreover, available oxygen also decreases with altitude and — given the extraordinary physiology of hummingbirds — metabolic factors such as these could have an important influence on genetic mutation rates.

Whatever the cause, the new findings provide evidence that the pace at which evolution marches may be dependent, to one degree or another, on environment. And those influences, Bleiweiss argues, may prove to be widespread and not limited to mountain peaks. ■

				Shorewood; summer school-age program ages 6 through 12
University Houses Nursery School, Inc.	35-A University Houses	238-3955	2.5 through 6 years	Part day/extended day parent co-op; 3-week summer enrichment sessions
University Preschool Laboratory Programs	Site 1 1440 Linden	263-4579	2 through 6 years	Full/part days; flexible schedules; summer school program for ages 2 through 8
	Site 2 1127 University*	265-4782	2 through 6 years	Full/part days; flexible schedules; summer school program for ages 2 through 8
Waisman Early Childhood Programs	1500 Highland	263-5760	2 through 6 years	Full/part days; focused programming for children with special needs and those typically developing
West Campus Day Care/ Child Development Inc. (CDI)**	2280 & 2290 Observatory	255-6223	1.5 through 4 years	Full day

* Will move in fall to Bethany United Methodist Church, 3910 Mineral Point Road
**Will close May 31

Police and Security honors six

Liz Beyler

A former student who tried to put out a fire and alerted residents at Ogg Hall was among six citizens who received 1997 Director's Awards from the Department of Police and Security at its annual awards ceremony at the Kohl Center April 1.

Philip Bowen discovered the blaze near his sixth-floor room in Ogg's east tower. He pulled an alarm, called police to report the location and assure them it was not a false alarm, and knocked on doors to warn his neighbors.

Other recipients of the awards, given to persons who have assisted the police or performed other commendable acts such as life-saving, included:

- Howard Blanchar of the Athletic Department, who worked with police on a plan to take tickets out of the hands of scalpers and sell them back to the public.
- Kandis Elliot, a computer graphics artist in the botany department, who assisted police in updating an old photo of prison inmate Kenneth Hunter after he escaped from UW Hospital last July. Hunter was located in Milwaukee a few days later.
- Jerald Walker, who reported a suspicious person loitering near UW Hospital early on July 20. Walker, then a nursing assistant at the hospital, was aware that a prisoner accused of battering a Middleton police officer had escaped from the emergency room. The prisoner was apprehended shortly after Walker reported seeing him.
- Sean Devlin of Evans, Ga., who caught a man fleeing from officers outside Camp Randall Stadium last November. Devlin held the man until officers could take him into custody.
- Roger Bambrough, the recently retired custodian at police headquarters who, according to his nomination, "embodies values we all hold most dear: honesty, loyalty and hard work. He was proactive, took extreme pride in everything he did, and was always a credit to his profession."

Fifteen department employees received Excellent Service awards: police officers Joe Hornbeck, Peter Ystenes, Johnnie DiaMante, Jean VanDenBogart, Theo Darden, Steve Weinberger; lieutenants Dale Burke, Glen Miller and Steve Rogers; detectives David Williams, Mike Geier and Harlan Hettrick; security supervisor Mike Gruber; and program assistants Patricia McGuire and Julie Dahmen. ■

FOR IMMEDIATE RELEASE 12/4/97
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Res. - Genetics

UW BIOLOGIST HAS EYE ON THE PRIZE

MADISON - Georg Halder loves rocks and he's captivated by the Sahara desert, a sea of sand where the only rocks in sight fell from space.

But it's Halder's acumen as a biologist and his discovery of a master eye-building gene that will enable him to indulge his exotic scientific side interest: exploring the Sahara.

Halder, a post-doctoral fellow in the laboratory of University of Wisconsin-Madison molecular biologist Sean Carroll, was named this week (Dec. 4) as one of four young scientists in the world to receive the Pharmacia Biotech & Science Prize for 1997.

"I'm fascinated with the Sahara," said Halder displaying a few of the unusual rocks collected during a previous trip to North Africa. "I'd like to go back."

Now Halder, 30, will be able to pursue his passion for exploration with the help of a cash award of $5,000 that will accompany the prize.

He was recognized for an achievement that was as shocking as it was controversial: As a graduate student at the University of Basel in Switzerland, Halder showed that a single gene in fruit flies is responsible for activating the developmental program for the eye. With that knowledge, Halder was able to direct cells at virtually any place on the body of the fly to develop into eyes.

His discovery, published in 1995 in the journal Science, has important implications for modern molecular biology and fuels an ongoing scientific controversy over whether the genes responsible for such things as eye development and limb formation in virtually all animals - including humans - have been conserved and passed down through the ages from a common ancestor.

"It's no longer nature's secret that many proteins involved in basic mechanisms of development are highly conserved between organisms as different as humans and flies," Halder said. Nevertheless, he said finding that essentially the same gene governed eye development in flies and mammals was a big surprise.

Similar genes have now been found in other groups of animals as diverse as squid and flat worms.

Halder and other scientists now think that eyes themselves evolved once in a common ancestor of all the animals that have eyes, and that nature's large diversity of eyes evolved from that primitive eye.

The graphic evidence of Halder's discovery, working eyes growing on antennas, legs and wings were flashed around the world and caused a sensation well beyond the laboratory.

The Pharmacia Biotech & Science Prize, sponsored jointly by Swedish biotech giant Pharmacia and Science magazine, was established to provide support for scientists at the beginning of their careers.

Halder will be honored at a Dec. 9 ceremony in Uppsala, Sweden. The ceremony will coincide with Nobel Prize festivities in Stockholm.
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For questions or comments about UW-Madison's email news release system, please send an email to:
UW-news@facstaff.wisc.edu

Res. Genetics

Where fossils fear to tread

Scientists follow genes to an ancient ancestor

Terry Devitt

Some 600 or 700 million years ago, before animal life made a sudden evolutionary shift and diverged into nearly all the major animal divisions we know from fossils, primitive animals were inventing the genes that would make it all possible.

No one knows what it looked like. There is virtually no clear fossil evidence. But now scientists believe they have found a way — using genes preserved in and common to modern animals — to look past the fossil record to our most distant common ancestors.

Writing in August in the journal *Nature*, and following up on a series of recent papers, molecular biologist Sean Carroll of UW-Madison, Neil Shubin from the University of Pennsylvania, and Cliff Tabin of Harvard Medical School, sketch out a radical new way of looking back in time.

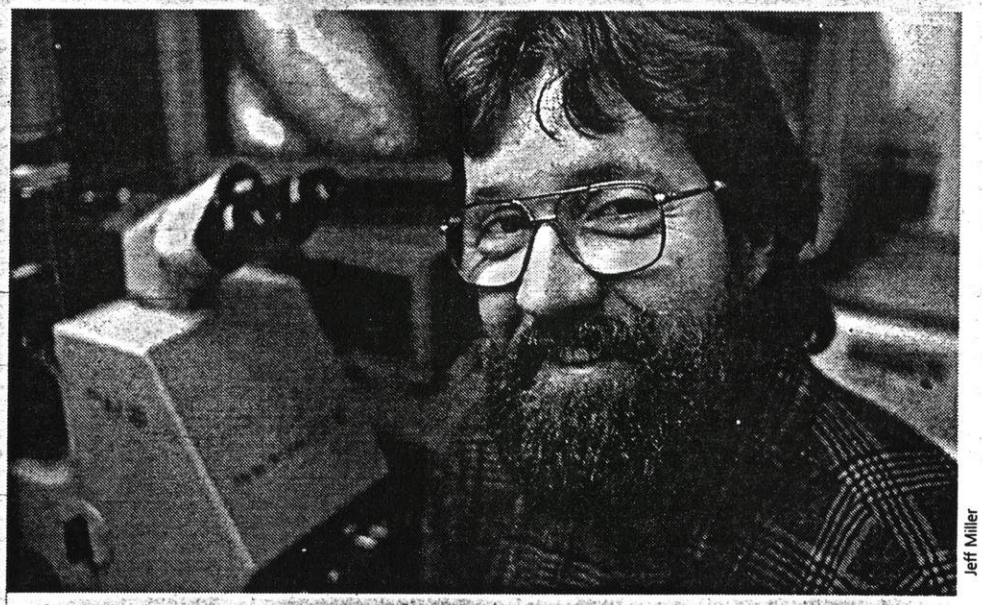
"The fossil record prior to the Cambrian is so scant nobody knows the origin of animal life," says Carroll. But now "we're drawing a picture of something no one has ever seen."

Carroll, a researcher for the Howard Hughes Medical Institute, is one of a growing number of scientists now using the techniques of modern molecular biology to look into the murky waters of distant evolutionary biology. They are looking so far back that there are virtually no fossils or other physical clues to what the Earth's earliest animals were like.

But Carroll and others are now finding powerful evidence that an ancient common ancestor — a worm-like animal from which most of world's animals subsequently derived — invented a set of body-building genetic machinery so successful and malleable that it has survived to this day.

"This is stunning," says Carroll. "Nobody thought that this animal was so sophisticated. We're talking about the common ancestor of all the most successful animals on Earth."

What is so striking, according to Carroll, is that the genes used to grow appendages — legs, arms, claws, fins and antennas — were operational at least 600 million years ago, and that the genetic machinery is very similar in all animals past and present. What makes animals different, what differentiates a crab from a mouse or a fruit fly from an eagle, is simply how those genes are expressed, he says.



Jeff Miller

Sean Carroll is using molecular biology to unlock the secrets of evolution in the pre-Cambrian world, a past so distant that tracing our ancesters through fossils would be impossible.

Until the advent of genetic techniques and recent work that has shown that animals, as embryos, share the same genetic machinery that governs body architecture, the only recourse for understanding how animals evolved different kinds of appendages was in the realm of comparative anatomy.

And appendages, says Carroll, have been used as classic examples of independent evolution. But now Carroll and his colleagues argue that the problem of developing limbs, be they claws or wings, was solved just once a very long time ago, and that the genetic mechanism is still at work.

"Everybody thought the wheel was invented again and again and again," Carroll says, "but there was a single solution and everything is a modification of that."

That argument is supported, says Carroll, by the discovery of the same appendage-making genes in six broad divisions of the animal kingdom, including vertebrates, insects and fish. The discovery, made in Carroll's lab, was reported last May in the Proceedings of the National Academy of Sciences.

"We found the same mechanism in all of these divisions of the animal kingdom. The architecture can vary tremendously, but the genetic instructions are the same and have been preserved for a very long period of time," he says.

The idea that a common set of genes is responsible for building appendages not only simplifies evolutionary history, but helps explain the great burst of evolutionary activity known as the Cambrian explosion. This "evolutionary big bang" took place in the world's oceans more than 500 million years ago when new animals appeared at breakneck speed.

"The reality is that animals with appendages took off and dominated the Earth," Carroll says. "It was like an arms race"—with animals that could swim faster, grab tighter and fight with greater effect dominating the ocean environment and conquering new ones like the land. During the Cambrian, animals got bigger and more diverse, but those changes did not require new genes.

The techniques being pioneered by Carroll and others are opening a new window to the past, says Carroll: "It's doing paleontology without fossils."

Business School alum mixes oil and water with fountain gift

Wisconsin Week 8/27/97

Research - Darlocs

1•8•4•8 NEWS

UNIVERSITY OF WISCONSIN–MADISON

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HOLD FOR 5 PM EST RELEASE WEDNESDAY, NOV. 20, 1996

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(Editor's note: Slides and electronic images are available to illustrate this news story. For a preview, link to http://www.wisc.edu/news/news_images/ For copies of slides, call (608) 262-8281.)

EVOLUTION ON THE FAST TRACK

SIMPLE GENETIC ALTERATION INSPIRES RAPID PATTERN CHANGE

MADISON — By altering as few as a half-dozen genes of a small African butterfly, scientists have shown that some animals can be sent down the road to becoming a new species in the blink of an eye.

New findings, reported today (Nov. 21) by an international team in the scientific journal *Nature*, paint the first comprehensive picture of how animal patterns, in response to selective pressure in the wild or in the laboratory, can evolve rapidly through simple genetic change.

The new discovery helps explain biological diversity at the genetic and molecular level, seasonal variation in animal appearance, and how geographically separated animals of a single species can sport vastly different patterns of spots, stripes and colors.

The research was conducted by a team that included Sean B. Carroll of the Howard Hughes Medical Institute at the University of Wisconsin-Madison, Paul M. Brakefield at the University of Leiden in the Netherlands and Vernon French of the University of Edinburgh in Scotland.

It has long been known that under the varying circumstances of nature, when different members of a single species are separated geographically for a period of time, they can exhibit dramatic differences in appearance. This is known to occur widely in the animal kingdom among insects, fish, birds and reptiles.

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"The question," said Carroll, "is how different are these animals? The answer may be as few as a handful of genes."

The set of experiments described in today's *Nature* capitalizes on the ability of a butterfly known to scientists as *Bicyclus* anynana to change the pattern of spots on its wings in response to seasonal changes in its African home.

During the rainy season, the butterfly exhibits characteristic wing eyespots that serve as decoys for prowling lizards and birds, luring them away from vital body parts. During the dry season, when there is little food and the butterflies are inactive against a dull brown backdrop, new generations emerge that lack the target-like eyespots.

"In the dry season, the presence of eyespots is a big disadvantage. They are like bulls-eyes. Predators pick them right off," said Carroll.

In butterflies — as in snakes, lizards, birds and mammals — color and pattern distinguish an animal and help conceal it from enemies and prey. But when the environment changes or populations migrate, the animal must change, too, or imperil its survival, said Carroll, a molecular biologist.

By selecting for butterflies with slight differences in eyespot size and interbreeding them over many generations, the scientists developed lines of butterflies with dramatically different eyespot patterns. Moreover, the team identified several individual genes that control the number, size or pattern of eyespots, and determined when during development those genes came into play.

"What these experiments illustrate is just how flexible these patterns are," said Carroll. "We can mimic evolution in the lab, virtually sending these animals down the road to becoming different species."

The fact that just a few genes have such a big and rapid influence in how an animal looks goes a long way toward explaining biological diversity, Carroll said. The changes emerged in just a few years in the laboratory, over the course of about 20 generations of the butterfly.

"If we can accomplish this with a just few genetic changes over a short period of time, and if you think of the millions of species of animals out there, we can get a glimpse of how evolution unfolds over fifty or a hundred million years."

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— Terry Devitt, (608) 262-8282, trdevitt@facstaff.wisc.edu

Research
-Genetics

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NEWS

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HOLD FOR 5:30 PM EDT RELEASE JULY 10, 1996

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BIOLOGISTS DISCOVER GENETIC MEANS TO GROW WING TISSUE

MADISON — Working with a common laboratory fruit fly, biologists have discovered a single gene responsible for growing wings — and the means to direct it to grow wing tissue from eye sockets, legs, antennae, and virtually any other body appendage.

The discovery, reported today (July 11) in the British journal *Nature*, promises key insight into how genes in animals, including humans, direct limb formation, said Sean B. Carroll of the Howard Hughes Medical Institute at the University of Wisconsin-Madison and a lead author of the study.

"It came to us as a surprise that a single gene appears to regulate the formation of wings," Carroll said. "We thought it would be a hodgepodge, that no single thing could have controlled this."

Finding out how genes, acting during embryonic stages of development, direct featureless cells to become arms, legs, eyes, wings and other body parts is a major quest of modern molecular biology. While the new finding has no immediate application, it promises a fundamental understanding of how genes mastermind the development of limbs, and may open new avenues to the prevention of the genetic miscommunication that leads to birth defects.

"We've clearly got our hands on one of the crucial genes," said Carroll. "It will

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enable us to get into the guts of the system" that controls limb formation.

Known as the "vestigial gene," the new gene is extremely potent and must be tightly controlled in order for it to correctly direct other genes to make wing cells in the right place at the right time.

"Because it makes wing tissue, you only want the gene to be turned on in certain places," Carroll said. "It is so powerful you have to control it to make sure you don't grow wings all over."

The paper published today in *Nature*, written by a team of UW-Madison biologists that also includes post-doctoral fellow Jaeseob Kim and graduate student Angela Sebring, details how the gene controls its function. It is that finding, said Carroll, that allowed the Wisconsin scientists to grow clumps of wing tissue virtually anywhere on the body of the developing fruit flies.

The control system, said Carroll, could be likened to a switchboard, able to direct genetic signals in time and space. Importantly, the system is almost the same in vertebrates, including humans: "It seems to be a built-in component of the vestigial gene. These same cues control where you put things in vertebrates.

"The genetic machinery is very old. The way cells talk to each other in insects and humans is essentially the same. Some general principles are being worked out here."

The genetic system that governs limb formation, according to Carroll, probably arose several hundred million years ago in a distant ancestor of both flies and humans. The system is apparently conserved today in both insects and vertebrates.

If general principles are worked out in detail, and hold true for vertebrates, it raises the possibility that one day at least some congenital defects can be prevented.

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— Terry Devitt, (608) 262-8282; trdevitt@facstaff.wisc.edu

R-Genetics

'Gene vaccine' may usher new era of virus protection

By Brian Mattmiller

A genetic answer to developing vaccines against potentially deadly viruses is showing great promise in a new UW-Madison study.

By using a single gene clipped from influenza DNA, and a "gene gun" that can inject the DNA into animal cells, the research has created a kind of genetic sleight of hand in test animals: They produce antibodies to attack a virus that isn't there.

As a result, the animals that were then challenged with the actual influenza virus showed a much greater ability to fight off the virus.

Teaming together on the project are an influenza study group in UW-Madison's School of Veterinary Medicine and Agracetus, a Madison biotechnology firm.

Virginia Hinshaw, a UW-Madison professor of veterinary medicine and leader of the school's influenza study, said this development could lead to a breakthrough in the fight against many dangerous viruses in humans — ones which currently have no vaccine.

Typical vaccines, like those used for the flu, use purified strains of the virus itself to induce virus-fighting antibodies in humans, she said. But the DNA-based approach uses only one key gene from the virus, which mimics the actual virus and triggers the same immune response.

That's an important distinction, said Hinshaw, who is also a UW-Madison associate vice chancellor for academic affairs. With viruses such as Hepatitis or HIV, a vaccine made from the actual virus would pose the risk of accidental infection.

The first results of a study with pigs were examined in September, Hinshaw said, and they bode well for further studies of the technique.

Pigs happen to be ideal subjects for this research, Hinshaw said, since they are very susceptible to influenza and can pass the virus to humans. She said they also are very similar anatomically to humans.

"How they respond is very close to how we would respond," she said. "Eventually the goal is for this process to serve as a model for vaccinations against other kinds of human viruses."

UW-Madison is in a unique position to conduct the study. Hinshaw is recognized internationally for her work with the influenza virus, and staff at Agracetus invented the DNA transfer technology (commonly called a "gene gun") that is making the work possible.

JEFF MILLER

Virginia Hinshaw, leader of a UW-Madison study of a 'gene vaccine,' says research findings could lead to a breakthrough in the fight against many dangerous viruses in humans. A study of the vaccines with pigs — which are anatomically very similar to humans — may well lead to clinical trials with humans.

Will Swain, senior scientist at Agracetus, said the gene gun works by shooting a microscopic gold bead coated with DNA into a cell. If the bead is placed in the nucleus of the cell, the genes from that DNA coating can be expressed in the cell. Each treatment shoots about 1 million coated gold beads, which covers about three square centimeters on the pig's skin.

Viruses infect a cell by getting inside them and assembling their own proteins. The research team is injecting the one virus gene which produces an attachment protein called hemagglutinin, which has the ability to "pick the locks" on a cell's surface and get inside. So antibodies to this protein will help block infection.

If the procedure works for influenza, Swain said the same approach can be tried for other viruses such as HIV or Hepatitis B.

"One of the beauties of this technology is it can be generally applied," Swain said. "Our work can switch from one virus to another quite easily."

In the study, Hinshaw said flu antibodies were evident after the initial vaccination. But after the animals were exposed to the virus the antibody counts "skyrocketed," she said. "We saw a very enthusiastic response, which is usually what you need to reduce infection."

Hinshaw noted that typically vaccines don't actually stop infection from a virus. They simply give the body a big head start in fighting them — usually enough to ward off becoming ill from the infection.

Hinshaw said DNA-based vaccines would also be very efficient. Rather than introducing a dead virus, the antibodies target the gene responsible for creating attachment proteins. "This directs your antibody response totally at what you want," she said.

And unlike conventional vaccines, which produce antibodies in the bloodstream, Hinshaw said a DNA-based vaccine can be targeted to a specific part of the body, such as the nose, or wherever the virus shows up.

Clinical trials may not be far away with humans, she said, but there have been some initial concerns about the potential long-term effects of fashioning vaccines from DNA.

Flu viruses mutate from year to year, just enough so that new antibodies have to be created to fight them. Hinshaw said some people have worried that flooding a person with antibodies would lead to more variants of the flu.

"But I don't think that would be a problem," she said. "The flu vaccines we currently use are 80 to 85 percent effective, and they haven't pushed up the level of change in viruses. We're not doing anything that nature isn't doing by itself."

Telescope in Arizona as near as desktop computer for UW astronomers and students

UW-Madison's new telescope may be on a mountain top 1,500 miles from Madison, but Wisconsin astronomers and their students need look only as far as their desktop computers to use the WIYN Observatory (*see story, page 1*).

Borrowing techniques that allow earth-bound astronomers to operate telescopes in space, Wisconsin astronomers have constructed an innovative remote-control system for the observatory that will enable its routine operation from Madison classrooms, offices and a dedicated control room in UW-Madison's Sterling Hall.

The state-of-the-art system uses computers, the Internet, telephone links, video cameras, and elaborate, custom-designed software to literally bring the telescope and its potential to the doorstep of UW-Madison's astronomy department.

Although the WIYN Observatory's new telescope is on a mountain top 1,500 miles from Madison, Wisconsin astronomers operate it using a specially designed remote control system in Sterling Hall.

In theory, UW astronomers say, the telescope could be operated anywhere there is a computer connected to the Internet.

"There are only a handful of places in the world where you can operate a telescope like this remotely," said Jeffrey W. Percival, the UW-Madison astronomer who developed the intricate software codes that power the WIYN Observatory's control system.

The remote observing powers of WIYN, according to UW-Madison Astronomy Professor Blair D. Savage, greatly expand access to the telescope for Wisconsin students, faculty and staff.

"This will allow graduate and undergraduate students to become important players in astronomical research programs on a large telescope," Savage said. "It will enable them to get direct experience on a world-class instrument."

The control system for the WIYN telescope is the major Wisconsin contribution to the WIYN consortium.

The control system, according to Percival, acts like the brain and central nervous system of the observatory. It directs the telescope's movements as it tracks objects across the sky, and provides astronomers with instant feedback on the state of the telescope, its environment and the battery of interconnected systems that govern its operation.

A unique aspect of the control system is Wisconsin-developed software that will enable high-quality astronomical images to be sent across the country in seconds rather than minutes or hours, Percival said.

The new software compresses the binary information that makes up an astronomical image and sends it streaking across the Internet as a small packet of information. Reprocessed by the computer that receives it, a clear image of a star, galaxy or planet can appear on a computer screen in Madison only moments after it was captured by the telescope 1,500 miles away.

Said Percival: "The pictures are truer than with any other method. I believe it has the potential to change the way astronomers do business."

— Terry Devitt

Faculty & Staff News ...

(Continued from page 10)

This annual award is made to composers of contemporary music who have had a record of significant performances of their music during the year.

Dacher Keltner, assistant professor, psychology, is author of a paper on intergroup perception and conflict that was named best empirical paper at the seventh annual International Conference on Conflict Management.

Mariana Hewson, associate scientist, department of medicine, received an award for outstanding workshop presentation at the Society for General Internal Medicine's Annual Meeting in April.

Honors

Ray Evert, professor, botany, and **Karen Till**, project assistant, geography, have been elected to the board of directors of the Alexander von Humboldt Association. This new association of former Alexander von Humboldt Scholars was established at the UW-Madison on Sept. 4, and plans to intensify scholarly exchanges among all U.S. Humboldtians and to improve the quality of information on the various researcher support instruments of the Alexander von Humboldt Foundation.

Morton Ann Gernsbacher, Bartlett Professor of Psychology, has been elected president of the International Society for Text and Discourse. She also recently organized an international conference on language processing; it was held in Lake Geneva, Wis., and supported with funds from the Wisconsin Alumni Research Foundation.

Publications

Joseph Koykkar, music director for the dance program, has had his orchestral composition "Composite" released on MMC Recordings. The CD is titled *Robert Black Conducts*.

The University of Wisconsin Press published *The University of Wisconsin, A History: Politics, Depression, and War, 1925-45* this month. Written by **E. David Cronon**, emeritus professor of history and former dean of the College of Letters and Sciences, and **John W. Jenkins**, university historian, this is the third in a continuing series of volumes on the history of the University of Wisconsin.

Morton Ann Gernsbacher, Bartlett Professor of Psychology, is editor of the *Handbook of Psycholinguistics*, published by Academic Press.

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NEWS

UNIVERSITY OF WISCONSIN–MADISON

R-Butterflies
R-Genetics

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FOR RELEASE 6 P.M. EST ON THURSDAY, 30 JUNE 1994

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(Note to Editors/News Directors: Sean Carroll can be reached through June 30 through the Research Conference Office at the University of California, Santa Cruz, (408) 459-5059 or (408) 459-2611. From June 30 through July 7 he can be reached at (916) 544-0128. Photographs, color and black and white, of the molecular structures that give rise to butterfly wings and of butterfly wings can be obtained from Terry Devitt at (608) 262-8282. Animated video of the development of butterfly wings from the initial molecular events to wing and pattern formation is also available.)

SCIENTISTS FIND GENES THAT GOVERN BUTTERFLY WING PATTERNS

MADISON — The genes that determine one of the most spectacular and diverse adaptations in nature — the patterns of butterfly wings — have been discovered by scientists at the Howard Hughes Medical Institute (HHMI) at the University of Wisconsin-Madison.

The find was reported in the July 1 issue of the journal Science, by a team led by Sean B. Carroll of HHMI and the UW-Madison Laboratory of Molecular Biology.

The discovery is important, according to Carroll, not only because it helps explain how the world's 17,000 species of butterflies created a vast gallery of colorful wing mosaics, but also because it suggests how genes evolve and take on new roles over time.

It appears, said Carroll, that the genetic machinery that governs the elaborate and colorful patterns found on butterfly wings is the very same set of genes that dictates wing architecture in butterflies and in flies, species that diverged from a common four-winged ancestor some 200 million years ago.

"We've identified a set of genes coming from flies that are generally used to build

-more-

wings," said Carroll. "This is the first evidence that butterflies probably do make wings in the same ways, involving the same key genes. But butterflies have figured out a way to superimpose color and patterns on top of this general wing plan."

The broader significance of the Wisconsin study is that it provides some of the first evidence for how genetic machinery common to many animals is conserved and used in different ways to promote diversity.

"The general lesson here is how do you invent," said Carroll. "All animal species are different. How do they get different? One way to be different is to tinker with the regulation of existing genes."

This new understanding of how genes regulate patterns on butterfly wings is grounded in extensive studies of the early embryonic development of the fruit fly, *Drosophila melanogaster*. Intensely studied in many different laboratories, this lowly fruit fly has yielded more detailed knowledge of the early molecular events of development than any other species of plant or animal.

"In flies, there are genes responsible for sculpting out a space and building a wing on it. There is a logic, a basic fundamental plan for wing formation. Butterflies have the same program, but they are doing something new with it."

The butterfly, said Carroll, appears to reuse the genetic programs that govern wing architecture to create patterns within patterns, which, coupled with the pressures of environment and reproduction, culminate in a vast array of colors, eyespots and stripes that butterflies use to attract mates or avoid being eaten.

Butterfly wings are formed from two flat sheets of cells that develop when the butterfly is a caterpillar.

The two, single-cell deep sheets of cells are pressed together, but form both the top

and bottom surfaces of the wings. Color and pattern determination occur independently on both surfaces, Carroll said, a developmental uncoupling that enables patterns to evolve independently in response to the pressures of natural selection.

For example, many butterflies have colorful patterns on the top surface of a wing that may be used to help attract a mate. The bottom surface, however, may be dull and plain, features that help the butterfly blend into the background to avoid birds and other predators.

"The roots of the pattern and the roots of the diversity of the pattern differ," said Carroll, whose study was based on genetic material gleaned from the buckeye, a common butterfly of North America. "The final product is entirely a result of the environmental context in which a butterfly lives."

Underpinning the discovery of how butterflies came to be so diverse are general ideas that can be extended well beyond the realm of one order of insects, Carroll said.

"Biologists are looking for general truths about mechanisms and are finding a tremendous conservation of basic genetic mechanisms among animals. The wing is teaching us something about diversity: how to invent, how to combine genes to make new patterns, how to use old tools in new ways."

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— Terry Devitt, (608) 262-8282

Research - Genetics

The Madison Commitment ...

(Continued from page 1)

Under The Madison Plan, the university made a major, though not uniform, gain in minority representation among faculty, students and staff. We made modest improvements in the retention rates for students of color and took a series of steps designed to enhance the tolerance of the campus environment.

Written in the winter of 1987, The Madison Plan was a response to a crisis. Tensions were high following a string of incidents that were insulting to people of all colors. The situation was exacerbated by extremely low levels of diversity among students, faculty and staff. The Madison Plan was a top-down response based on a series of committee recommendations formulated in a short period of time. It involved a major one-time reallocation of funds at a moment when funds and positions were expanding and were presumed to continue to expand.

Though The Madison Plan developed quickly, many of its recommendations clarified our existing obligations under federal, state and regent policies. The Madison Plan also codified one of the six directions of the Future Directions Committee's report, which preceded The Madison Plan proposals. It also, in many respects, built upon campus policies dating way back to the late 1950s and the era of civil rights advocacy.

As The Madison Plan marked its fifth and final anniversary, the university sought to renew its commitment to many of the same issues. Two faculty committees were asked to evaluate our continuing efforts to increase the racial and ethnic diversity of our campus:

The first was the Committee on Academic Affairs of Minority and Disadvantaged Students, known as the Werner Committee. This committee reviewed the university's goals and principles in the area of diversity to come up with a plan that expresses the reaffirmation of the university's commitment to diversity, particularly among the student body.

The second was the Committee on Minority Faculty and Academic Staff, also known as the Whitford Committee. This committee has spent the past year looking at efforts to recruit and retain minority faculty and academic staff, and developed a resolution that reaffirms the university's commitment to increasing the diversity of the faculty and academic staff.

The recommendations of these two committees form the core of what is described as The Madison Commitment.

This commitment involves a continuity of purpose, but includes shifts of emphasis, based on the review of our initial successes and failures as well as on the changing needs of our university.

I think The Madison Commitment reflects the changing demographic character of both our own and the world's population, and the responsibility of public universities to adapt to those changes.

It also reflects the need to have shared objectives and broad ownership of our commitment, rather than simply some short-term goals. The Madison Plan was conceived in an environment when new resources were available. Today, we are facing steady state resources — perhaps even declining state resources — and the downsizing of some parts of our university. Our mandate is to do more with less. For that to occur, our efforts to reach out to underrepresented groups will need to be integrated into the strategic plans of every school and college. I am counting on the leadership of our deans to make this happen. We will continue to have some specially funded incentives, but these will now focus on the recruitment of new faculty and staff, which will, I'm sure, be quite crucial in efforts to continue our earlier successes.

It (The Madison Commitment) also reflects a renewed effort to connect with our "supply system." Rather than passively waiting for students, faculty and staff of color to knock on our door, we must aggressively make connections. We have had some successes in this area and must continue to press on.

Our graduate and professional schools have made significant progress in attracting minority graduate students. Last fall, for example, the Graduate School recorded a 31 percent increase in minority student enrollment, and the quality of those students is at an all-time high and converging very rapidly with that of majority students.

This positive development can be at least partly attributed to the maturation of inter-institutional linkage programs with predominantly minority institutions, and to the attraction of undergraduates of color to our summer research programs. Both of these programs depend very definitely on the initiatives of individual faculty who make the key contacts with faculty and students at other institutions, and we continue to rely on those dedicated individuals.

We also continue to have summer outreach programs to middle and high-school pupils, because if these youngsters choose UW-Madison or any institution of higher learning as a result of their exposure here, our energies and resources are well-spent. Our Admissions Office is refining its blend of campus visits, personal contacts, high school visits and other strategies to encourage students of color, particularly those from Wisconsin, to choose our university.

In all of these efforts, we must take a longitudinal approach, building on our earlier foundations and leavening our efforts, modestly but strategically, with our limited resources. A recent allocation of private funds to enhance the Chancellor's Scholarship Fund for undergraduates is one example of this, which expands a program that has already had significant results.

I think we must also do something else, and that is to make a special effort to reconnect with our local minority community, not only to recruit the talented students of color in our own neighborhood, but also to rely on the community as a resource for those whom we recruit from elsewhere. This is an area in which, I am sorry to say, I have seen more leadership from the Greater Madison business community than from our own university community. We have taken our local community for granted, and we must make a greater commitment to them.

Finally, there is a continuing need to enhance the environment of tolerance and civility on the campus. We must explore how group consciousness and identities are linked to a broader sense of humanity.

As the authors of The Madison Plan recognized, improving the environment of tolerance begins with the students' introduction to the campus, at the Summer Orientation and Advising Program for freshmen and other new students. That orientation session sets the proper tone when it includes communication on race, tolerance and respect.

The inclusion of ethnic studies in our general education requirement is another important component of The Madison Plan, although it is also a regent-stipulated requirement. With these programmatic changes, we have stressed the discovery and recognition of diversity. We must continue that discovery process, exploring the complexities of our differences. But we must derive our understanding from also a comparative perspective and a sense of what we have in common.

I hope that you will review and endorse The Madison Commitment as an expression of our campus' strong continuing commitment to racial and ethnic diversity. I hope you will understand at this time I have not rushed to a sequel to The Madison Plan, but invited two faculty committees to spend a year taking ownership of what we want to do in the next five years. To the degree there are allegations that The Madison Plan did not have your ownership, this is the moment you can take ownership. This is the moment for you to express your diverse opinions about whether you wish to take ownership or not. I strongly encourage you to do so.

I certainly will pledge to support the programmatic expression of these policies and to share the responsibility for monitoring our progress.

Scientists find molecular switch for wing information

By Terry Devitt

Scientists, studying a common laboratory fruit fly, have discovered the molecular switch that governs the animal's ability to grow wings.

The find was reported March 24 in the British journal *Nature* by a team of scientists from the Howard Hughes Medical Institute (HHMI) and the Laboratory of Molecular Biology at the UW-Madison.

The discovery is important because it may help answer one of the most fundamental problems of modern biology: How do complex animals form from a simple egg, and what directs individual cells to organize into discrete appendages such as arms, legs, claws, fins and wings?

Recent discoveries have indicated that appendage development in insects, birds, mammals and fish — organisms widely separated in evolutionary time — is governed by similar genetic programs.

"The excitement of work in this area is that biologists are finding themes common to all animals, including humans," said HHMI investigator Sean B. Carroll, a UW-Madison professor of molecular biology and the lead author of the study. "Similar mechanisms guide limb formation in insects and the development of fish fins, bird wings and mammal legs."

According to the Wisconsin study, wing formation is initiated in the early embryo as cells multiply and are organized into compartments that, ultimately, will determine the fly's body pattern. At the boundary of two such compartments, chemical cross talk between cells triggers the action of a gene that sets wing development in motion.

In genetically mutated embryos, where the patterning gene required for the development of flight appendages is absent, the flies do not grow wings, the Wisconsin researchers found.

The development of wings is considered one of the most spectacular and successful adaptations in all of evolutionary history. Insects are the dominant group of animals on earth today, and nearly three-quarters of the one million documented species are winged.

"When you think about appendages — claws, fins, legs and wings — and the possibility of understanding their developmental basis, we are getting to the genetic heart of animal diversity," Carroll said. "The evolution of appendages, their number and type, is a dominant story in the evolution of animals.

"In the insect, we can dig deep and find key mechanisms and players and use this knowledge to look for generalities in the animal kingdom."

Arts project shares Native American oral traditions

By Judy Reed, Outreach Information

Lyrical tales of nature, humor and love handed down by their ancestors filled the stage for nearly an hour as Native American performers recently demonstrated the "Wisconsin Indian Story Theatre" for educators and friends at the Madison School District's McDaniels Auditorium in Madison. (*See photo, page 1.*)

The development of the presentation began over a year ago when Dave Peterson, professor, Department of Continuing Education in the Arts, decided to stage some of the oral legends and stories of Wisconsin Indian tribes.

"I had worked for over two years on a musical play about the contributions of African-Americans who settled in Wisconsin. Since it had been so well-received wherever we took it throughout the state, it seemed important that we find a similar forum for telling the stories of Native Americans who had lived in Wisconsin for so many centuries," he said.

Peterson began by contacting tribal leaders and getting ideas for stories and a style for presenting them. "American Indians have a wonderful oral tradition and we wanted to combine the telling with performing the stories. As we worked on the project, it evolved into a story-theatre technique," he said.

For example the performer in "Beansy and Peasy" tells the audience that a young girl sets off to visit her grandfather and then she does just that. She tells the listener when she meets River and the audience hears her talk to River and the river ask for her help to clean the sticks and stones so she can run more freely.

The cast of "Wisconsin Indian Story Theatre" are all Native Americans and all are volunteers, with no acting experience. Several are faculty or staff at UW-Madison, such as Hugh Danforth, an Oneida who recently retired from the Physics Department, and Barbara Elgutaa, a student services coordinator of Oneida, Menominee and Stockbridge-Munsee heritage. Danforth's daughter Michelle, a student at Edgewood College, and Elgutaa's daughter Ryan, a student at Falk Elementary School, also participate. UW-Madison students include: Jan Saiz, a member of the Northern Ponca, and her son Sean; Aaron Durfee, a Winnebago; and Randy Tallmadge, Winnebago and Dakota. Ron Anderson, a recent UW-Madison graduate and a Winnebago, and Liz Haller, of Winnebago and Menominee heritage, who works at the Rape Crisis Center in Madison, also perform.

Outfits worn by the theatre group were created by Linda Lou Metoxen, a Navajo, and the scene design was by Bert Benally, also Navajo. Fred Heide, director of the American Folklore Theatre in Door County, provided guitar accompaniment for the performance.

The production was directed by Jeffrey Herbst, who is part Sioux and is a UW-Madison graduate now based in New York City. His five-week residence on campus was supported by the UW-Madison Anonymous Fund. During his stay he also lectured in both the English and the Theatre and Drama departments.

The cast has also presented the Wisconsin Indian Story Theatre in Stevens Point and at the Wil-Mar Neighborhood Center, with representatives of tribes at each showing. At each event the audience was encouraged to make comments and give suggestions on how to improve the performance. Roberta Hill Whiteman of the Department of English led the discussion at the McDaniels Auditorium.

When the production is expanded and tribal leaders around the state have given their endorsement, the program will be made available to schools throughout the state during the 1994-95 school year.

The performance is produced by the UW-Madison Department of Continuing Education in the Arts, with funding from the Wisconsin Humanities Council, the National Endowment for the Humanities, The Anonymous Fund of UW-Madison, the Office of the Dean of the Division of University Outreach, and UW Continuing Education Extension.

For more information, call Peterson at 263-3369.

R-Genetics

Grants support Great Lakes Indian Law Center

By Bill Arnold

The Winnebago Nation of Wisconsin, the UW-Madison and the UW Law School have agreed to provide matching $30,000 grants to the Great Lakes Indian Law Center.

During a ceremony Feb. 15 at the Law School, JoAnn Jones, chair of the Wisconsin Winnebago Nation, participated in the check presentation and said the grants will be used to create a full-time director position for the center and one-year internships for four students.

The Winnebago Nation has agreed to provide partial funding in return for legal research and other related projects. The Law School will match that contribution and provide its students with educational opportunities in the field of American Indian law. UW-Madison will fund the center during 1995.

The cooperative relationship has helped instill good feelings toward UW-Madison, Jones said.

"I recall being attracted to UW-Madison because of its Indian law student population — it was one of the largest — and they were very active when I was an undergraduate here," Jones said. "I would like to thank the university and the Law School for being involved in our community. I think we'll see the cooperation and work between the Winnebago and UW-Madison grow and continue into the future." Jones added she learned firsthand the real impact that laws have on Indians while she was a student at UW-Madison.

Jones said the Winnebago Nation has hired many Law School graduates. She also noted the Indian Law Center helped the Winnebago restructure its constitution — a boilerplate document prepared by the Bureau of Indian Affairs more than 30 years ago that neither reflected the tribe's political philosophy and traditional values nor provided for a coherent and organized governmental structure. Interns from the center also have helped the tribe write new codes and ordinances.

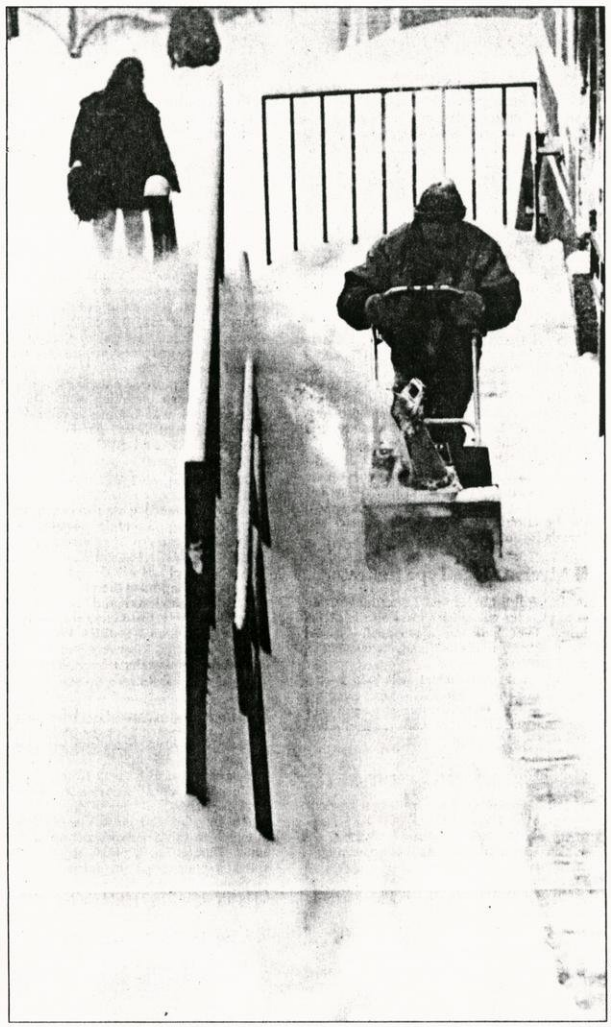
Gary Sandefur, an associate vice chancellor, said Chancellor David Ward welcomed the opportunity to match the Winnebago Nation's grant to the Indian Law Center. "Chancellor Ward was very honored and happy to match the grant, especially in light of the Winnebago Nation's contributions to the undergraduate scholarship fund and the Indian Law Center," he said.

Law School Dean Daniel Bernstine said the university's matching grant indicates "a commitment on behalf of the university as a whole in supporting the efforts of the Law School.

"A lot of our success is due to the fact that we've been able to recruit and retain Native American students at the Law School. It's a statement to the fact that we are an environment where all students can thrive, and I think that there is a great future for our graduates to continue in the tradition of people like JoAnn Jones. We look forward to having our Native American student population grow even further in years to come," Bernstine said.

Founded in 1991 and largely at the behest of law students who wanted to pursue summer internships on the state's Indian reservations, the center is a clinical program within the Law School and serves as a legal resource outlet for the state's Native American tribes.

The center was re-established primarily under the direction of Assistant Professor Richard Monette. Monette, a member of the Turtle Mountain Band of Chippewa from Belcourte, N.D., is on leave, working in Washington, D.C., as a policy adviser for the Bureau of Indian Affairs Assistant Secretary Ada Deer, a UW-Madison graduate and former lecturer here. The center is presently being directed by Carol Brown Biermeier, a Lac du Flambeau Chippewa and 1993 Law School graduate.



JEFF MILLER

Enough already!

Helping campus to dig out from yet-another snowfall last week, custodial worker Ron Moore blows snow from a handicapped entrance ramp at Bascom Hall. Grounds Department and custodial personnel have been toiling some very long hours, battling the elements to clear the snow and ice left by this winter's snowstorms. Since Feb. 13, the entire Grounds Department crew has been called in four times in the wee hours of the morning to plow streets and parking lots and sweep sidewalks while the rest of us are asleep. They head out around 1 a.m. and work through the night and on into their normal workday. And when there's just no place else to push or pile it, they haul the snow away. Using end loaders and dump trucks, they scoop up the snow and deposit it on the northwest end of the campus near the old baseball field. The hauling, which begins at 3 a.m., has taken place on three occasions in the last two weeks.

Study: an even temperament may lie in genes

By Terry Devitt

Confronted with a toy mechanical spider, an infant recoils in fear. Faced with the same intimidating toy, the infant's fraternal twin shows interest, not anxiety.

Why the different response? The answer may lie in our genes, according to H. Hill Goldsmith, a UW-Madison professor of psychology.

In a series of studies of fraternal and identical twins, Goldsmith and others are accumulating evidence that suggests temperament is at least partly written out in the same genetic instructions that give us blue eyes or brown, short stature or tall.

"Our genes seem to account for about half of the variability we see in temperament," says Goldsmith. "The other half seems to be due largely to environmental sources of variation that remain to be identified."

In particular, negative aspects of temperament like fear and distress seem to be influenced more by our genes than by the experiences we share with our siblings, Goldsmith says.

The idea that our temperaments — one's customary frame of mind or natural disposition — may be inherent is not new. But the data emerging from studies of more than 700 pairs of twins is providing some of the first hard evidence that aspects of our temperaments arise from a genetic template.

According to Goldsmith, who directs the Personality Development Research Group at UW-Madison, human temperament emerges in the first year of life and serves as an emotional regulator. In the first days of life, temperament seems not to emerge or is immeasurable, the Wisconsin psychologist says.

"We should not think so much as being born with a temperament encoded in our genes. It may take genetic influences a while to get organized. Generally, those influences show up later in infancy."

'We should not think so much as being born with a temperament encoded in our genes. It may take genetic influences a while to get organized. Generally, those influences show up later in infancy.'

Over a lifetime, stability of temperament is an important part of our identities, Goldsmith notes: "A stable temperament is what makes us unique and identifiable individuals, and makes us predictable to our friends."

In his studies, Goldsmith looked for the differences in the early-developing emotional components of personality between fraternal twins whose genetic makeup is about 50 percent similar, and identical twins whose genetic blueprints are 100 percent identical.

What he found was that the dark sides of our temperaments, at least during infancy, tend to be influenced by our genetic heritage to a much greater degree than the positive aspects of temperament. The positive side of temperament — the ability to smile and laugh and be soothed — have a stronger link to environment.

"One could infer from the data that there is a moderate genetic affect on fearfulness," Goldsmith says. "For fear, the identical twin correlation is definitely higher than for fraternal twins."

According to Goldsmith, as the twins are studied over time, the genetic influence becomes more apparent. In identical twins, for example, the temperament of one twin can be reliably forecast by an assessment of temperament in the other.

"In fraternal twins you can predict it to a lesser degree," says Goldsmith. "The greater predictability of the identical twins indicates that genes are responsible for much of the stability of temperament."

How the environment influences temperament is more difficult to measure, Goldsmith says. Such things as social learning, the warmth and love present in the home and a sense of self all contribute to the development of human temperament.

Proof positive of the genetic influence on temperament, Goldsmith says, must now await molecular genetic studies of temperament, a field just now being opened to behavioral scientists.

R-Genetic

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NEWS

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TWIN STUDIES SUGGEST AN EVEN TEMPERAMENT MAY LIE IN GENES

SAN FRANCISCO — Confronted with a toy mechanical spider, an infant recoils in fear. Faced with the same intimidating toy, the infant's fraternal twin shows interest, not anxiety.

Why the different response? The answer may lie in our genes, according to H. Hill Goldsmith, a University of Wisconsin-Madison professor of psychology.

In a series of studies of fraternal and identical twins, Goldsmith and others are accumulating evidence that suggests temperament is at least partly written out in the same genetic instructions that give us blue eyes or brown, short stature or tall.

"Our genes seem to account for about half of the variability we see in temperament," says Goldsmith. "The other half seems to be due largely to environmental sources of variation that remain to be identified."

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— Terry Devitt, (608) 262-8282

uw news

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R: Genetics

Release: Immediately 9/12/90

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UW-MADISON CHEMISTS DEVISE FAST PROTOTYPE GENETIC SEQUENCER

By Terry Devitt
University News Service

MADISON--Chemists at the University of Wisconsin-Madison have developed a device capable of decoding genetic information up to 25 times faster than techniques currently in use.

The development paves the way for a new generation of automated genetic sequencers, tools certain to play a leading role in the exploration of the human genome, according to Lloyd M. Smith, a UW-Madison professor of chemistry and the leader of the team that developed the new instrument.

In papers published in the scientific journals Analytical Chemistry and Nucleic Acids Research, the Wisconsin researchers describe a prototype device that promises scientists relief from the tedium of ordering the information encoded in DNA, the hereditary material for humans and most other living things.

"A new instrument based on this technology has the potential to sequence on the order of 500,000 bases a day," Smith said. "The hope is to minimize the drudgery of sequencing for Joe 'molecular biologist.'"

The development of new automated sequencers is essential for the success of the human genome initiative, biology's quest to map the location of all the estimated 100,000 genes on the 23 pairs of human chromosomes and to decipher

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the sequence of the chemical bases that compose them, Smith said.

The Genome Project, the largest project in the history of biology, will require hundreds of millions if not billions of dollars. Scientists will seek to pinpoint and dissect the genes that determine the differences and similarities of people and that predispose some to such maladies as cancer and heart disease.

The chemical bases of genes, known as nucleotides, make up the long chains of DNA that look like twisted rope ladders. The set of chromosomes in each human cell contains about three billion nucleotides, the genetic instructions that make us human, spelled out in a four-letter biological alphabet. It is the sequence of these nucleotides in the human genome that has become the Holy Grail of biology.

Such a mammoth effort will require machines to do much of the work, said Smith, who previously developed the world's first automated gene sequencer. These instruments, now available commercially, are capable of sequencing as many as 10,000 chemical bases a day.

The new device works by feeding genetic material into a hair-thin quartz capillary. An electric voltage is applied to the gel-filled capillary, which forces the genetic material to move through the gel.

Fragments of DNA molecules in the gel sort themselves by size and the sequences of nucleotides on the DNA fragments then are read by a laser beam directed through windows on the capillary.

The advantage of the new technique, said Smith, is that higher voltages can be applied, thereby speeding up the separation process by forcing the DNA molecules to move faster through the gel.

"Conventional sequencing is done in slabs, but is limited by the voltages you can apply because the slab gel has a tendency to heat up," said Smith. "There is less heating in the capillary because of the high surface to volume

ratio, and good heat dissipation through the capillary walls."

Smith believes that capillary sequencing technology can be quickly applied. However, still to be developed are technologies to efficiently feed genetic material into the system and to handle the resulting data.

"The real significance of this is that it's a step toward building a second generation sequencer," he said. "What we've done is akin to building an auto plant in a country without any roads. Now we have to develop the infrastructure to support it."

Working with Smith to develop the new sequencing technology were UW-Madison graduate students John A. Luckey and Howard Drossman, and electrical engineer Anthony J. Kostichka.

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Science Report

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For release: Dec. 15, 1986
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GENETIC DEFECT LINKED TO HEART DISEASE IN PIGS

by George Gallepp
UW Ag Press Service

Studies of pigs may lead to insights about coronary artery disease in humans, including the roles of diet and heredity.

University of Wisconsin-Madison researchers report in this week's Science magazine that they have identified a strain of pigs that has high levels of blood cholesterol from birth and develops heart disease as early as seven months, even when fed a low-fat, cholesterol-free diet.

The scientists, led by geneticist and animal scientist Jan Rapacz, found that three mutant genes code for three different lipoproteins that are associated with elevated blood cholesterol and heart disease. Two of the genes are low density lipoproteins, which are the principal molecules in the blood of pigs and humans that carry cholesterol to the parts of the body where it is needed.

"We believe that mutations in the genetically determined lipoproteins lead to high cholesterol and accelerated heart disease which is independent of dietary fat intake," says Rapacz.

Coronary heart disease, often resulting in heart attacks, is the leading cause of death in the United States. It is caused, in part, by cholesterol deposits in the walls of the coronary arteries, which carry blood to the heart. Heart attacks occur when the artery walls become so thickened that they block blood flow to the heart. This artery disease is called atherosclerosis.

Pigs are an excellent animal model for studying heart disease, according to Rapacz. He says pigs are similar to humans in the way they develop cholesterol-related heart disease.

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Mutations in lipoproteins--add one

Rapacz has studied lipoproteins in pigs for almost 20 years and has identified 15 mutations in the lipoprotein genes. In addition to the swine strain that was the topic of the Science magazine article, Rapacz and other collaborators have identified other strains of pigs with different sets of mutant genes. One of these strains has normal blood cholesterol levels and doesn't develop heart disease even when fed a diet high in cholesterol and fats.

Despite these two extreme strains, in which genes appear to control the presence or absence of heart disease, Rapacz says many other strains of pigs respond to excess fat and cholesterol in the diet. In these pigs, diet does influence the development of heart disease.

"Pigs may live to an age of about 12 years and many develop atherosclerosis between six and eight years of age," Rapacz says. "But pigs with the defective lipoproteins develop severe heart disease before they are two years old -- as early as seven months -- and die of heart problems by age four."

The researchers report that the lipoprotein defects are in the structure of the molecule. They do not understand how the change in structure causes heart disease in pigs.

Lipoproteins are large, unstable molecules that fragment easily and also clump together. These properties make them difficult to study with traditional biochemical techniques. Rapacz and his coworkers used immunological techniques to identify the different types of lipoprotein structures of swine.

The UW-Madison findings on mutant lipoprotein structures contrast with a well known disease in humans, called familial hypercholesterolemia (FH). FH is an inherited disease characterized by elevated blood cholesterol levels and early onset of heart disease. FH is not associated with lipoprotein structure, but to a problem with lipoprotein receptors, which help move lipoprotein-cholesterol complexes into cells.

Rapacz says scientists regard FH as the most common known inherited metabolic disease associated with premature atherosclerosis. "However, the disease is rare in comparison with the high incidence of heart disease in human populations," he says. "It is likely that other mutations may exist in people similar to those we have found in swine."

Rapacz also believes further research with pigs will lead to advancements in swine health and production. He considers the defective genes as risk factors for pigs, and says he can determine when a pig is born if it is at high risk for heart disease.

"This research shows that we can breed healthier, longer-lived animals, which will not develop heart disease. It is also possible that these LDL genes may control the fat content and composition in pigs, allowing swine breeders to produce leaner pork products for human consumption," Rapacz says.

In addition to Rapacz, coauthors of the Science article were Judith Hasler-Rapacz, Katherine M. Taylor, William J. Checovich and Allan D. Attie. Hasler-Rapacz is a member of the Departments of Genetics and Meat and Animal Sciences, Taylor is a member of the Department of Surgery, and Checovich and Attie are members of the Department of Biochemistry.

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Science Report

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Research Genetics

UW PLANT SCIENTISTS TRANSFER TRAITS FROM WILD POTATOES TO DOMESTIC ONES

Domestic potatoes are good, but they could pick up a few positive qualities from their wild relatives.

Wild potatoes often have desirable traits such as resistance to frost, drought and disease, but they can't readily share these with their domestic cousins. Both wild and domestic potatoes have a basic genetic language, but they express themselves in very different genetic dialects.

Plant scientists at the University of Wisconsin-Madison have found special pollen in wild potatoes that may help transfer their desirable traits to domestic potatoes. Georgia Yerk, a graduate student in plant breeding and genetics, and geneticist Stanley Peloquin are using intermediary potatoes to capture and preserve genetic traits found in wild potatoes.

"We are now in a position to tap the storehouse of genes present in wild species and to evaluate their contributions on a single plant level," Yerk says. She will present a paper on their work Dec. 1 at the American Society of Agronomy meeting in New Orleans, La.

Yerk is experimenting with wild potatoes from Argentina, Bolivia, Chile and Peru. Her work faces two serious obstacles, though. Wild potatoes don't grow tubers in Wisconsin because of differences in day length. And traits can't be directly transferred from wild potatoes to domestic species because wild potatoes have two sets of chromosomes, a characteristic known as diploidy, and domestic potatoes have four sets of chromosomes, a characteristic known as tetraploidy.

The two sets of chromosomes in wild potato seed come from the combination of pollen grains (which have one set of chromosomes) with ovules in the potato plant's flower (which also have one set of chromosomes). Sometimes, a mutation called parallel spindles occurs during the production of wild pollen grains.

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"The parallel spindles mutation makes it possible to directly cross wild diploid potatoes and domestic tetraploid potatoes," Yerk says. "The pollen formed by this mutation has two sets of chromosomes and when you combine it with an ovule from a tetraploid potato, you obtain a tetraploid potato from the cross."

Although this genetic cross is possible, desirable traits contained in a wild potato's pollen may be hidden amidst the many genetic combinations that can occur in tetraploid species.

Yerk and Peloquin want to use the wild pollen to transfer characteristics to domestic tetraploid species, but they also want to keep the wild potato traits more apparent in hybrid progeny. To accomplish this, they use a derivative of domestic potatoes to capture and preserve desirable traits from individual wild potatoes.

The domestic potato they use as a stepping stone is a haploid, a potato that carries the same categories of genetic information as its domestic parent but in two sets of chromosomes instead of four. Yerk and Peloquin pollinate these haploid parents with normal pollen from wild potatoes with the parallel spindles trait. The hybrid offspring have two sets of chromosomes like both parents, and carry genetic information from both wild and domestic parents. However, haploid hybrids express wild traits more strongly than a tetraploid hybrid because fewer sets of chromosomes are there to mask wild traits.

"It's the difference between flipping a coin and rolling dice," Yerk says. "You lose some genes from the wild species in the sexual cycle," she adds. "However, the process 'captures' the genes in something that will grow tubers that you can perpetuate if you find that plant has desirable characteristics."

The researchers use the haploid hybrids to perpetuate desirable characteristics of wild potatoes. They also screen the hybrid species for the special pollen that has two sets of chromosomes. This pollen is used to crossbreed the hybrid species with domestic tetraploid potatoes.

This year, Yerk planted more than 4,000 hybrids bred from haploid derivatives of domestic species and wild species that carried traits for pollen with two sets of chromosomes. The hybrids produced tubers and carried traits of the wild potatoes, including the parallel spindles mutation. Yerk is screening the hybrids for the latter trait and plans to crossbreed them with domestic tetraploid potatoes during the 1987 growing season.

"We're not trying to introduce any specific characteristics into domestic potatoes," Yerk says. "We're trying to get a feel for ways to use the wild species and the differences that exist among and within them."

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2824W

Science Report

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SCIENTISTS SURPRISED BY RAPID EVOLUTIONARY CHANGES IN INBRED MICE

by George Gallepp
UW Ag Press Service

Two University of Wisconsin-Madison scientists report in the June 7 issue of Science that inbred strains of laboratory mice have diverged genetically much more than scientists expected.

Biochemist Walter Fitch, of the Department of Physiological Chemistry, and geneticist William Atchley found that after 120 to 180 generations of inbreeding (brother-sister matings that produce genetically uniform strains), the genetic makeup of the 10 mouse strains they studied differed considerably.

The article is certain to stir debate among geneticists and evolutionary biologists. Fitch and Atchley say that current genetic theory can't explain their unexpected observations. For example, if one ascribed all the changes in the mice genes to mutations -- spontaneous changes in genes -- then their data suggest that mutation rates may be as much as 100 times greater than those other scientists have measured.

The results are also important to scientists who experiment with inbred strains of laboratory mice, says Atchley. Mice are widely used as subjects for testing the safety of new drugs, and chemicals that may be toxic or cause cancer or birth defects.

Over the years, scientists have developed more than 250 inbred strains of mice. Many strains have known pedigrees and are known to be good test subjects for certain

types of experiments. The genetic integrity of these strains is crucial to experimenters. Standardized inbred strains enable other scientists to repeat and verify experiments.

To illustrate the divergence between strains of laboratory mice, Atchley cites the example of strains CBA and C3H, two strains scientists established at the same time in 1920. From a common litter of mice, scientists took one male and female to begin strain CBA, and another male and female to begin strain C3H. In each subsequent generation, scientists mated a brother and sister to perpetuate the strains.

To develop mouse strains for experiments on tumors, the scientists who began the two lines mated sibling mice with a high incidence of mammary tumors in strain C3H and a low incidence of tumors in strain CBA. Not surprisingly then, the two strains differ in this characteristic.

But Atchley and Fitch's study indicates that the two strains differ in approximately 20 percent of the 97 genes they examined. This is a much greater difference than scientists would expect. For example, says Atchley, mice from strain C3H have low blood pressure, live an average of 280 days, and become blind after six weeks because of retinal degeneration. Mice from strain CBA have high blood pressure, live an average of 360 days and do not become blind.

Fitch and Atchley stumbled on the unexpected finding of great genetic divergence between strains while studying computer models that describe how animals are related.

Since Darwin, biologists have classified organisms based on how they are built and how they function. This approach has led biologists to classify bats and whales as mammals rather than birds and fish.

More recently, biochemists have discovered information about chemical differences among species to help sort out relationships among primates, for example. Comparisons of blood proteins tell scientists that humans and chimpanzees are more closely related than either is to gorillas.

Evolutionary scientists now have so much information about different species that they've developed computer programs to help them establish these family trees. After listening to scientists debate the merits of different computer models, Fitch and Atchley decided to test the computer programs against a known "family tree," that of mice.

Mice became popular as pets in the early 1800s. Atchley says the founder of genetics, Gregor Mendel, kept mice as pets. Atchley and Fitch have used their scientific findings to suggest that today's laboratory mice were derived from the European house mouse about 150 years ago.

The descendants of pet mice found their way into the laboratories of scientists, who began establishing inbred strains of mice in the early 1900s. Because the scientists often described how they started the strains, many strains have well documented pedigrees. After considerable digging, Fitch and Atchley settled on 10 well-studied mouse strains that originated between 1909 and 1930.

For these 10 strains, they had nearly complete information for 97 different genes that scientists had studied. Nearly all the genes coded proteins or determined immune responses of the mice. "With so much genetic information, all the computer programs successfully 'predicted' what we knew to be the true evolutionary history of the mice," says Atchley. "But as we looked at the data, the question became how did these strains become so different genetically?"

The genetic differences among the 10 mouse strains they studied ranged from 14 percent to 50 percent. The ancestral stocks from which these mice were chosen varied in only about 9 percent of their genes.

"Many people will try to use contamination from matings with other mice to explain these results," says Atchley. Although he and Fitch agree contamination may have contributed to the observed genetic divergence, they present convincing reasons in the article why contamination is not a major contributor to the genetic divergence.

Atchley doesn't believe any single mechanism can explain the differences. He believes that some of the divergence may result from mutations and some from contamination; and he suspects much came from the procedures used to set up the strains.

"Starting an inbred strain is a tricky business," says Atchley, "because inbred lines often run into serious problems during the first few generations." If the brother and sister initially selected for mating have any genetic weaknesses, repeated brother-sister matings of their offspring tends to accentuate the genetic problems. The strains develop what scientists call inbreeding depression and frequently die out. Once past this critical period, however, the strains can be bred indefinitely.

To avoid the problem of inbreeding depression, Atchley suspects that scientists either consciously or unconsciously selected vigorous specimens -- which are more likely to be genetically diverse -- for the initial crosses. "Such selection," he says, "would also contribute to the divergence we now see among the strains."

Fitch and Atchley feel that even a combination of all these explanations do not satisfactorily explain the large differences they have observed among inbred mouse strains. "If people are aware of the genetic divergence, they will look for other ways of explaining it," says Atchley. "There may be some sort of mechanism that scientists don't know about yet. We're simply putting out a problem we currently can't explain."

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research news

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SCIENTISTS SUCCESSFUL AT NEW PLANT GENE TRANSFER

by JACQUELINE KELLEY
University News Service

MADISON--In a first-of-its-kind gene transfer experiment, scientists in Madison may be on the way to engineering improved crop plants that could be more nutritious, faster growing, pest and disease resistant, and easier to grow on marginal land.

Genetic engineers from University of Wisconsin-Madison and Agrigenetics Corporation recently transferred a gene from a bean plant into a tobacco plant and followed the transformed tobacco plant through two generations. The experiment is encouraging to researchers who would like to pluck a useful gene -- disease resistance, for instance -- from one plant and make it work in another plant.

The crucial transformation began when a team of scientists led by Timothy C. Hall inoculated tobacco tissue with bacteria that cause crown gall, a tumor-like plant disease. Hall, an adjunct professor of biophysics and genetics at UW-Madison, explained that the infecting bacteria had been painstakingly engineered to contain a gene for a storage protein found in bean seeds. To date, infection by the carrier bacteria is the only way biologists can transfer genes to a plant.

Hall said that tests revealing the presence of bean protein in the infected tobacco tissue, proved that the "foreign" bean gene was accepted by

-more-

its new host. Along with the actual gene, the researchers also managed to transfer the genetic signals that led the tobacco plant to adopt the orphan gene.

However, other important questions remained: Would the bean protein show up in the proper spot in the tobacco plant -- namely, in the seed -- once a plant was regenerated from the infected tissue? And would the "foreign" gene behave as it would "at home," or would it cause problems in its new host?

"At first," Hall said, "we did find a little bean protein in young leaves. But as the plant matured, normal cell controls took over and the protein disappeared from there. It did, however, show up in the seeds where it belonged. It seems that the bean gene had become integrated in the tobacco's genetic material and behaved normally."

Long a favorite research subject, tobacco was chosen as a model plant for the experiment because it is easy to grow and manipulate.

"Despite the need for extensive refinement of the techniques involved, all the essential steps in the genetic engineering of crop plants are now demonstrated to be technically feasible," said Hall, who recently presented his findings at the prestigious Gordon Conference on plant molecular biology.

Hall added that there may be a more immediate use for the bean gene. Beans are a major source of human protein in much of the third world. However, they lack enough methionine to be a complete source of protein. Methionine is one of the essential amino acids that are the building blocks of proteins.

Hall said it now seems feasible to alter the genetic make-up of the bean gene so that it would include more methionine. Scientists could then put the reconstructed gene back into a bean plant -- or perhaps another kind of plant -- which would then provide a comprehensive protein source for humans.

Hall was the first scientist to decipher the complex make-up of the bean gene three years ago, a necessary step in its subsequent transfer to another plant.

###

--Jacqueline Kelley (608) 262-8282

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

Research Handwriting

Release: Immediately 8/7/84

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MORSE CODE COULD AID BLIND

MADISON--Morse code, that seemingly outdated alphabet of dots and dashes, could assume an important new role as a substitute for Braille and recorded books for the blind, if the efforts of a University of Wisconsin-Madison researcher are successful.

Anatole Beck, a professor of mathematics known for his exotic ideas, says that with the help of modern typesetting techniques and a small computer, books can be quickly and inexpensively translated into Morse code and put on data tape.

"We want to find a way of using modern technology to routinely produce books for the blind and visually impaired at very low cost," Beck said.

Producing Braille and Talking Books can be expensive and time-consuming, noted Beck, but the technology is available to produce Morse-coded books at a cost of less than one dollar per manuscript.

"It could be done cheaply because printing books involves putting manuscripts on magnetic tape and having them set in type from the magnetic tape," Beck said. "From that tape it would also be possible to produce a data tape on which the book's words would be translated into dots and dashes."

This tape, containing the familiar dots and dashes of Morse code, could then be used to produce an audio tape. The only catch, he added, is finding out how quickly people are able to comprehend Morse code when they hear it.

-more-

Add 1--Dots and dashes

"The Morse code technology has always been limited by the speed of sending, not the speed of listening," said Beck. "No one knows how fast Morse code can be transmitted and still be understood."

Working with UW-Madison's McBurney Resource Center, Beck is seeking volunteers to participate in an experiment designed to find that out.

"I'd like to get people to learn Morse code and then provide them with stories and books in code to find out how fast they can 'read' it," Beck said.

If Morse code can be understood as quickly as Braille, Beck said, coded books may become a viable substitute for Braille and recorded books. Although this would principally benefit the blind and visually impaired, Beck said sighted people also could benefit too.

"There is enormous potential for this," Beck said. "People who would like to read books but are busy doing other things could listen to the books and benefit from the technology."

Beck cited commuters, joggers and bicyclists as among potential users of the Morse-coded books.

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-- Terry Devitt (608) 262-8282

uw news

From the University of Wisconsin-Madison / News Service, Bascom Hall, 500 Lincoln Drive, Madison 53706 / Telephone: 608/262-3571

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UNICORNS -- A WISCONSIN IDEA

MADISON--Passers-by stared in disbelief at a "unicorn" nonchalantly grazing in a Maine pasture in the 1930s. The unicorn, after all, is considered to be a mythical beast.

Fifty years later, millions of Americans saw a photograph of Maine's unicorn in the Jan. 1 issue of Parade Magazine. It seems that University of Maine biologist W. Franklin Dove had transplanted the horn buds of a day-old Ayrshire bull calf from the sides of its head to the center of the forehead. The horn grew into a powerful weapon, and the unicorn-like animal became the leader of its herd.

The story began, however, in the classrooms and animal breeding facilities of University of Wisconsin-Madison -- where Dove learned embryology and transplanting techniques as a genetics doctoral student in the 1920s. The department, located within the College of Agricultural and Life Sciences and known as the experimental breeding department, consisted of two staff members -- R. A. Brink, still an active geneticist, and chairman L. J. Cole.

"Dove was Cole's student but since there were only two professors, we were both involved with all the students," said Brink, who was part of Dove's Ph.D. examination committee. "I remember Dove as a very good, hard-working and ingenious student. And he had other skills as well. He was a cabinet maker, and earned his way through graduate school."

-more-

Add 1--Unicorns

E. B. Hart, chairman of agricultural chemistry, gave Dove access to calves born in Hart's experimental herd.

Hard evidence of the success of Dove's later experiments in Maine now resides in the UW-Madison zoology museum.

"We have skulls of seven cows and one goat, all with one large center horn," said John E. Dallman, curator of paleontology at the museum. "Dove had read the old literature and found many references to unicorn-like animals produced by manipulation of the horns."

Dove's son, William F. Dove, a UW-Madison professor of oncology, donated the skulls to the zoology museum several years ago in honor of the spirit of unfettered research at Wisconsin.

"My father had many germinal teachers here," Dove said, "people like Charles Bardeen from anatomy, L. J. Cole, Michael Guyer from zoology, and R.A. Brink."

Dove said his father's doctoral thesis involved the transplantation of tissues and the genetics of cattle, interests that eventually resulted in his Maine experiments.

###

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UIR / RESEARCH NEWS

Research Genetics

UNIVERSITY OF WISCONSIN-MADISON

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August 2, 1977

PROBLEM PREGNANCIES OFTEN OVERLOOKED

by William J. Broad
UW Science Writer

Madison, Wis.--Most women with a high risk of having a deformed infant cross their fingers and hope for the best. But the health of some unborn infants need no longer be a guessing game.

According to a University of Wisconsin-Madison medical geneticist, about three per cent of the women who risk having a child with a prenatally detectable problem rely on a medical test known as amniocentesis.

With this procedure, cells from the fluid surrounding the fetus are removed by an obstetrician and then analyzed for abnormalities, indicating possible genetic problems with the child. More than 60 family-related diseases can thus be detected.

Although readily available, the test is ignored by 97 per cent of the high-risk women--often unintentionally but sometimes out of anxiety.

For example, according to Dr. Renata Laxova of the university's

-more-

Clinical Genetics Center, some women may be afraid to face the thought of an abortion.

Yet reassurance that the child is normal, she notes, is much more often the outcome of the test.

"Women over 35, for example, run a greater risk of having a child with Down's syndrome," she says. "But about 95 per cent of the tests on these women show, in fact, that their babies are perfectly normal--and that's comforting."

And detecting an abnormality doesn't immediately bring on cries for abortion. For some couples, she notes, the information helps prepare them and their families for the birth of a handicapped child.

Still, in Wisconsin last year around 100 of these tests were performed on women over 35. Laxova estimates that about 3000 pregnant women in Wisconsin were in this high risk group.

Laxova believes that some women fear the technique itself. Inserting a needle through the abdominal wall of a pregnant woman brings visions of fetal damage or spontaneous abortion.

However, the increasing use of ultrasound--a radar-like technique that allows a physician to pinpoint the position of the fetus and placenta--eliminates guesswork.

And recent surveys, Laxova says, show that women who have amniocentesis suffer no more spontaneous abortions than women whose pregnancies go unexamined.

But apprehension is only part of the problem. Some people don't realize they are part of a high-risk group.

If, for example, a family has a baby with genetic birth defects, relatives might also have the potential for the same problem--but not be aware of it.

The pattern is changing, however. Laxova notes that amniocentesis is being sought more and more often as a means of detecting certain conditions that can plague an unborn infant.

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UIR / RESEARCH NEWS

UNIVERSITY OF WISCONSIN-MADISON

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UIR SCIENCE WRITING PROGRAM
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Further Information: Eeva Patau (608/262-2920) May 31, 1977

"TURNED OFF" SEX CHROMOSOME MAY UPSET DEVELOPMENT

by William J. Broad
UW Science Writer

Madison, Wis.--A female's second sex chromosome--once thought to remain idle amid the swirl of cellular activity--is now suspected of having a minute segment that can cause abnormal physical development.

For over a quarter of a century biologists have assumed that one of the two X chromosomes in a female condenses into an inactive lump known as a Barr body. However, a finding by a University of Wisconsin-Madison medical geneticist has tempered the old belief.

According to Eeva Therman-Patau of the university's Center for Health Sciences, a small segment extends from the Barr body the way three or four inches of tape might extend from a coiled tape measure.

In normal female cells, where only one Barr body forms, the previously u suspected activity is thought to be a normal part of the cell's delicate mechanism.

add one-- sex chromosome

However, in genetic diseases where Barr bodies are either too numerous (Kleinfelter's syndrome) or missing altogether (Turner's syndrome), the tiny strand may be scrambling cellular commands.

"Previously we couldn't explain how an unusual number of Barr bodies caused strange development," says Patau. "Now we can."

The extra strand found in Kleinfelter's syndrome, for example, may cause an over-production of proteins which in turn wrench fine cellular mechanisms out of alignment. The result is a person who shows poor sexual development, cannot reproduce, and may suffer some degree of mental retardation.

"The facts have been accumulating for several years now," says Patau. "We have a reasonable explanation, but we're still interested to see whether outside evidence supports our findings."

Several years ago a similar scientific search resulted in Patau and her husband discovering a rare genetic disease. With the aid of a microscope the couple examined the chromosomes of a severely deformed child and discovered there was one too many.

The disorder is now known as Patau's syndrome or trisomy thirteen.

The recent finding was also made with a microscope, but the tiny strand suspected of the cellular mischief was too small to be seen directly. Instead, Patau found it while studying Barr body formation in a rare type of chromosome.

Although uncommon, two sex chromosomes will sometimes hook together--from one end or another--forming one long chromosome that condenses into a Barr body twice the normal size.

Patau noticed, however that on certain occasions the large Barr body divided into two pieces connected by a tiny, almost invisible strand.

While wondering why some remained whole and others broke apart,

add two-- sex chromosome

Patau discovered that a particular part of the chromosome was in the center whenever double Barr bodies formed.

Patau now reasons that this active uncoiled strand not only pushes the large Barr body apart but is also present--though invisible--on the single Barr body of a normal chromosome.

Additional evidence, Patau notes, comes from the surprising behavior of the X chromosome during division--a time when the active segment can be easily measured.

Patau's group noted the length in male cells--where there are no Barr bodies--and then in cells with more and more Barr bodies. Surprisingly, as the Barr bodies increased the length decreased.

Patau believes this shrinking--not found anywhere else--is the chromosome's way of trying to compensate for the hidden activity of the additional Barr bodies.

The idea of an active Barr body has made quite a stir in the research community, judging from the towering stack of reprint requests in Patau's office. To gain further insight into the activity of the segment, Patau is currently searching for additional rare chromosome groups.

The finding, Patau notes, represents more than just another piece of the cellular puzzle falling into place.

"We're finally getting a firm idea of how these genetic diseases arise," she says.

Patau's research is supported by the National Institutes of Health.

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research news

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LINK BETWEEN CELLULAR DNA AND RADIATION DAMAGE TO HUMANS UNCOVERED BY SCIENTIFIC TEAM

By JACK BURKE

MADISON--A team of scientists, including University of Wisconsin-Madison Prof. Seymour Abrahamson, has discovered a relationship between the amount of DNA in a cell and the genetic damage it sustains in high-energy radiation.

Thus it appears possible for the first time to predict accurately the effect of radiation on genetic mutation in man from experiments with other species. This was described as of major importance to persons exposed to even low levels of X or gamma irradiation, a situation becoming more frequent in modern society.

After exposure to harmful radiation, the direct effects, such as burns or the development of cancers, are relatively easy to assess in man and other forms of life. What is much more difficult to estimate is the risk of damage to future generations from genetic mutation.

The team's report, first printed in Nature, the British science journal, stated that:

"It was already known that the mean lethal dose of radiation for certain species, particularly plants, is proportional to the total amount of DNA (Deoxyribonucleic acid) in their cells. It appears that it is because the amount of DNA in cells varies from species to species that their response to radiation varies so much.

- more -

"We re-examined the data on the rate of induced mutation in those organisms where the quantity of DNA present is known, and where the mutation rate varies by over 1,000-fold."

The team found that when the mutation rates of bacteria, plants, insects, and mammals were adjusted to their respective amounts of DNA, and normalized to a common baseline, the rates varied by a factor of three.

Thus, by making the appropriate adjustment, these scientists were able to predict the effect a certain dose of radiation should produce in several species, including man; this from its effect on just one test species. So far these predictions have been tested on two different yeast species and have proven to be very accurate.

The rate of mutation varies with the amount of exposure and the stage in the life cycle of the cell when the irradiation takes place. But there is remarkable consistency in averaged mutation rates, in a great variety of organisms. This strongly indicates that direct relating of simple organisms to man is possible.

The report continued:

"The question remains as to the relationship between the amount of DNA in a cell and that in the gene where the radiation produces its effect. It would seem that either the gene is larger in the higher forms of life, such as in man, than in the lower forms, like bacteria, or that the effect of the radiation is somehow altered by the presence of DNA.

"This is contrary to the belief that all genes are about the same size in all organisms, but the former explanation agrees with some recent models, suggesting that the higher forms of life have more DNA per gene than is necessary for the production of cell parts and that this DNA performs an additional regulatory function, perhaps determining when and where the gene will function."

With Dr. Abrahamson, geneticist-zoologist, on the team were Profs. Michael A. Bender, Johns Hopkins University; Alan D. Conger, Temple University; and Sheldon Wolff, University of California-San Francisco.

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Contact Prof. Abrahamson at (608) 262-2506

research news

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By KEITH HAGLUND
UW Science Writer

MADISON, Wis.--Better estimates of radiation hazards will result from a significant discovery made recently by four American scientists.

It was an unexpected discovery. The four scientists realized while attending a scientific meeting that an important basic concept had simply been overlooked for years.

The concept is that there is a direct relationship between the total amount of DNA per cell in a species and the amount of mutation induced in sex cells, known as the specific gene mutation rate, by a given amount of X-rays.

The discovery was made jointly by Seymour Abrahamson of the University of Wisconsin-Madison, Michael A. Bender of Johns Hopkins University, Alan D. Conger of Temple University, and Sheldon Wolff of the University of California, San Francisco.

"It was an inspiration," says Abrahamson. "One afternoon we didn't have it, and the next morning we did. When we found the relationship held for two organisms we were flabbergasted. When we found it worked for four species we were ecstatic. I can hardly describe the feeling."

The relation will, they believe, provide better estimates of radiation dangers to humans and could have important implications in gene theory.

- more -

The four scientists drew together existing information about radiation-caused mutation in living things as disparate as bacteria, fungi, higher plants, and mammals.

In any of these organisms high energy ionizing radiation causes changes in the nucleotides, the code units in DNA in the chromosomes of cells. A group of nucleotides constitutes a gene. Genes serve as the blueprints for the proteins that catalyze chemical reactions and act as cell building blocks.

Genes are thus made slightly imperfect, mutated by the radiation, and will then code for imperfect chemical and building units.

These mutations show up in the offspring of irradiated plants or animals since they are passed along in the sex cells. For example, heavily x-rayed fruit-flies, Drosophila, would perhaps breed a generation of flies with odd-colored eyes.

Scientists have been measuring the induced frequency of mutations in different species for some time. But no one ever thought to examine the phenomenon in relation to the amount of DNA coding material, unique to each species.

Abrahamson and the others did so and found that when they plotted the mass of DNA per cell for each species against the amount of specific gene mutation induced by a single unit of x-rays a straight line graph was formed.

This meant that they should be able to predict the mutation rate of a given species using the graph and the known amount of DNA.

Human Applications

The most immediately useful implication of the relation is in determining the genetic effect of radiation on humans. Of course, offspring mutation tests can never be carried out on people. But since scientists know the average amount of DNA in a human cell, they can use the relationship to determine with greater confidence than ever before the effect of radiation on human genes.

"This will have great implications in nuclear industries," Abrahamson claims.

He says that, previously, scientists really did not know what radiation was doing to humans exposed to it.

"It could always be claimed that man was 15 times as sensitive as a mouse," says Abrahamson, "but now we believe man is no more than 20 per cent more sensitive than the mouse."

Another practical result of the finding may be the reduction of experimental time and cost needed to find the potential human hazard of mutagenic radiations and chemicals. Rabbits and mice are frequently used in laboratories because they, like man, are mammals. But they are expensive to keep and relatively slow to produce offspring.

If insects or even bacteria, which are cheap and reproduce in a matter of hours or days, can be used, mutagen effects can be rapidly demonstrated. There will still be a need for studies on mammals, but some expensive, large-scale studies may no longer be needed.

Gene Theory

A more theoretical implication of the newly discovered relation concerns the modern concept of what a gene is. The "one-gene-one-enzyme" hypothesis defines the gene as the portion of a chromosomal DNA strand that controls the formation of any specific protein. Further, many scientists have assumed that the genes that code for the same protein but in different organisms would be the same length.

But Abrahamson believes the DNA-level, gene-mutation-rate parallel implies that the higher the DNA per cell, the larger the size of each gene in any organism.

The four scientists' discovery shows that more DNA in a species coincides with a greater tendency for induced mutation in any of its genes so far studied. This higher tendency of a gene to be disrupted by a given amount of radiation seems to mean that there is more chance of it being hit by an energy burst. Abrahamson thinks this can be explained by larger genes--more nucleotides--in plants and animals that have larger DNA masses.

If genes are bigger, there would be many fewer genes in DNA-rich organisms than is now believed to be the case. Perhaps the additional DNA is used to regulate that part responsible for making the protein.

Surprise Discovery

All of this emerged from an effort to provide recommendations for further induced-mutation research. During a ten-day National Academy of Science panel meeting near Aspen, Colo., the search for a unifying trend in research interests suddenly confronted the scientists with the possible existence of a relationship governing all the work they were reviewing.

Abrahamson, Bender, Conger, and Wolff believe that credence has been given to their inspiration by findings made since Aspen. The X-ray mutation rates were predicted for two previously untested yeast species, according to their DNA contents. When actual X-ray experiments were done, the results agreed almost perfectly with the predictions.

Abrahamson says the theory will now be tested by laboratories around the world. Work must be done on various organisms, particularly those with unusual DNA contents, to learn if the relationship is general.

Perhaps even more important is the application of the theory to other kinds of mutagens. Abrahamson is starting work in his laboratory to see if mutation created by neutron radiation will fit the pattern with DNA levels.

The Wisconsin genetics professor says that he and colleagues have been receiving telephone and letter inquiries concerning further research from scientists throughout the country.

He says confidently: "We think we've made a unifying breakthrough. I believe it's important."

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uw news

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Research Genetics

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Editors; For further information contact Mary Nohl, 608-262-3571

EXOSEX SURVEY OF UW-MADISON UNDERGRADUATES REVEALS AWARENESS VERY LOW IN NEW GENETIC DEVELOPMENTS

MADISON--Test tube babies, embryo transplantation, cloning, and artificial insemination . . . science fiction or fact?

"Fact," says a University of Wisconsin-Madison geneticist who warns, "Most people regard recent bio-medical developments as fiction that exists only in books like Brave New World and 1984, but today, it's reality."

Prof. William H. Stone backs up his claim with information from a random sample telephone survey of 174 UW undergrads on the Madison campus this spring. The Wisconsin Survey Research Laboratory (UW-Extension) directed the study.

Survey results showed student awareness of new developments in reproductive biology "pathetically low," and attitudes toward new techniques of human reproduction "largely negative."

The survey was undertaken by students in Stone's Man, Science and Society seminar called Exosex, a course aimed at informing non-science majors about the genetic, social, and ethical aspects of biological manipulation and control.

Popularity of the seminar, which is limited to 18 undergraduates, is so intense that last year more than 100 students were turned away. Some of the overflow is absorbed by Stone's course in genetics and human affairs.

"Enthusiasm by respondents surveyed was amazing," says Stone. "They wouldn't let our student interviewers off the phone; they just wanted to know more about these things."

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The survey response rate was a high 79 per cent, with interviewers questioning only students of their own sex.

Topics considered in the survey included cloning, amniocentesis, sex control and possible links between chromosome makeup and crime.

/_Cloning, a technique of asexual reproduction already successful in experiments with lower animals, involves the transplantation of the nucleus of an adult donor cell to a fertilized egg whose nucleus has been destroyed. The egg then goes on to develop into an adult nearly identical to the adult from which the donor nucleus came.

Amniocentesis is a harmless method of extracting a small amount of fluid from the sac, (amnion), that surrounds the fetus in the mother's uterus. Performed usually around the 16th week of pregnancy, the technique is used to determine if the baby is normal.

Sex control is the ability to determine the sex of a child before conception, and is expected to be widely practiced in human populations within the next 30 years._/

Stone called the general level of student knowledge of these genetic developments "so low that it is shocking," adding, "These are processes that will be operational in their lifetimes and will have tremendous social, political, and economic consequences."

The geneticist went on to label the low level of student approval of artificial insemination "surprising." "After all, college students are among the most liberal and best educated groups in our society," Stone said.

Although almost half of the males surveyed were science majors, they were less liberal than were coeds toward the new reproductive techniques--even though the manipulations involved mainly the females.

Asked if they would control the sex of their children before conception if this were possible, more than two-thirds of both sexes questioned said they would still leave the child's sex to chance.

Over 80 per cent approved the use of amniocetesis if a history of genetic diseases existed in the family.

Seventy-five per cent knew that a human egg has been fertilized outside of the human body (the test tube baby, 1968), but only 7.5 per cent could define cloning. When informed of this technique, a meager 4.6 per cent of the students--and all of them males--considered cloning beneficial to society.

Only about 10 per cent knew that the abnormal XYY chromosome make-up has been associated with criminal behavior. Less than 35 per cent of the coeds said they would permit their fertilized egg to be transplanted to the uterus of another person if they couldn't have a baby otherwise.

"Some of the respondents were abhorred by this idea, says Stone, "but some of the women ignored the obviously great psychological problems involved, and said they would carry the child of a relative as a favor if the couple could not have children otherwise."

Once informed of the new techniques, students had a strong opinion about using them. Fewer than 10 per cent had no opinion in response to subjective survey questions.

"We need to be very anticipatory in this day and age," Stone adds, "because the time between the conceptual stage and implementation of these developments is so short. New techniques become epidemic and spread like disease with serious effects on the whole world."

"The students who conducted the survey will no doubt go on to educate a lot more people on the amazing discoveries in exosex," says Stone, "and there certainly is a need for it."

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research news

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Research Genetics

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UIR SCIENCE WRITING DIVISION
University-Industry Research Program
(608-263-2876)

For further information: Contact Prof. Crow--608-263-1993

By Helen Raizen
UW Science Writer

MADISON, Wis.--Mutations caused by chemicals may threaten human health more than those caused by radiation, according to James F. Crow, University of Wisconsin-Madison geneticist.

"We know a great deal about radiation and, consequently, public policy has severely restricted human exposure to it," Crow says. "In contrast,we don't know which chemicals in the environment may be mutagenic and test programs are just beginning."

The more drastic the effect of a mutation, the more quickly it will be eliminated from the population. Over several generations, mutant genes with mild effects, while not serious individually, may reach high enough levels in the population to constitute a serious human health hazard.

The effects of many radiation induced mutations are so gross that they result in death of the early embryo, causing little real harm. However, chemical mutations individually may be only mildly harmful and the effects may go unnoticed for several generations. But once established in the gene pool, such mutations will be difficult to eliminate.

Crow believes that even though we don't know the magnitude of such effects, we should minimize them as far as possible by eliminating human exposure to chemical mutagens wherever feasible. But this should not be done at the expense of more important human needs.

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"We can be foolishly careful not to increase the mutation rate or recklessly careless," Crow cautions. "It is critically important to develop a means of balancing the risk of mutation against the benefits afforded by the use of a particular chemical."

The attempt to identify chemical mutagens and their associated risks is an important activity of eugenics, the application of genetics to human welfare.

"We can all agree on what is bad," Crow says. "Nobody wants people to be severely diseased, deformed, or mentally retarded. By reducing the mutation rate, we can decrease human suffering. We can also do so by eugenic measures, such as genetic counselling. No couple, in my view,has the right knowingly to have a severely diseased or deformed child."

Today geneticists are devising tests to identify the individuals who are carriers of genetic diseases. Some of these diseases can even be identified during the early months of pregnancy and diseased embryos aborted. Tests will help eliminate many genetic diseases such as sickle cell anemia, or hemophilia, but they will not eliminate genetic carriers of these diseases.

As far as using eugenics to select for positive traits in the human population, Crow thinks this is a long way off. It would be wonderful, he feels, if we could improve the human population in intelligence, mental health, and longevity. But he is not sure that society is willing or wise enough to do this, at least at present.

"We are living in a continually improving environment and the result is that we are becoming genetically weaker," Crow states. "If something happens so that we lose this improved environment, we shall have a difficult time. The higher the mutation rate, the greater the problem. Fortunately, we are thinking in terms of several generations so that we have some time to deal with the problem."

# # #

research news

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UIR SCIENCE WRITING DIVISION
University-Industry Research Program
(608-263-2876)

By Jan Laan
UW Science Writer

Madison, Wis.--Low levels of ionizing radiation may not be as deleterious as once thought, says zoologist Seymour Abrahamson, University of Wisconsin-Madison.

Prof. Abrahamson and Dr. Helen Meyer (Ph.D.) have been working on the effects of low doses of x-radiation on the fruit fly, Drosophila, one of the most commonly used subjects for genetic experiments. Abrahamson summarized the work that has been in progress for the last few years.

Mutations, or changes in the genetic material due to natural high energy radiation, are constantly occurring. Abrahamson's work shows that at certain levels of x-radiation above natural background radiation there seems to be little genetic damage.

"Genetic risk estimates for radiation are now determined by assuming a linear relation between radiation dose and damage," Abrahamson said. "However, at very low doses our data indicate that few, if any, mutations are induced. Only at moderately low doses do we find an increase above control values.'

"Even here the mutation rate appears to be lower than expected, based on extrapolation from high doses," he said.

The guidelines for human population exposure are set from experiments in which mammals are given very high doses of radiation, usually far higher than an individual would receive in a lifetime. Effects for lower doses are then predicted from these results and known modifying factors.

-more-

add one--mutations and x-radiation

Very few genetic experiments are carried out with low dose radiation because of the expense and extremely long time required to obtain reliable data.

Abrahamson was checking a current hypothesis that more mutations would be caused by low doses of radiation than predicted by extrapolation from high dose results.

"By this hypothesis the really genetically mutable cells are killed off at the lower doses," Abrahamson said. "Our results directly contradict this hypothesis."

Investigations in which low levels of radiation were found to prolong life and decrease mortality in salmon sperm were cited by Abrahamson.

"A certain amount of stress--low level radiation, for example--may be beneficial if it induces repair mechanisms," Abrahamson stated. "If scientists can learn what the repair systems are and how they operate it might be possible to eliminate a substantial amount of genetically determined illness and misery."

Abrahamson was cautious, however, in judging the impact his results will have on currently established safety limits of radiation. His results do not necessarily imply that the limits should be revised upward, not at least until scientists understand more about the effects of low level radiation.

Recent estimates provided by the National Academy of Sciences are extremely cautious, Abrahamson believes, by more likely overestimating rather than underestimating the hazards from low level radiation.

Abrahamson also pointed out that radiation protection committees have functioned, nationally and internationally, since the early 1930's and could serve as a model for assessing other environmental hazards.

"The recommendations made by these committees have had a great impact in reducing unwarranted radiation exposure to the public and to workers exposed to radiation," Abrahamson said.

His work has been financed both by the Atomic Energy Commission and the National Institute of Health. Abrahamson was a member of a committee appointed by the National Academy of Sciences to study the problem of low level radiation effects.

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uw news

From The University of Wisconsin-Madison / University News and Publications Service, Bascom Hall, Madison 53706 / Telephone: (608) 262-3571

Research Ventures

Release: Immediately 12/13/71

University-Industry Science Writing Program
(263-2811, 263-2876)

By Thomas Burroughs
UW Science Writer

MADISON, Wis.--By watching young monkeys play, University of Wisconsin-Madison scientists have found genetic differences in social behavior between males and females.

"Although monkeys are not little people, they have enough physical and behavioral similarities to suggest that the findings apply to humans as well," says Stephen J. Suomi, researcher at the Wisconsin Regional Primate Research Center.

The major difference in behavior is in type of play, Suomi says. Since young monkeys spend most of their time playing, play is a catch-all term for general social behavior. Play is important, he adds, because it teaches patterns for later behavior.

Males play more aggressively and prefer rough-and-tumble games with much physical contact, he explains. Wrestling, rolling and sham-biting are common.

Females usually play with little physical contact, often chasing each other back and forth with frequent role reversals, he says.

"A human example of this type of difference can often be seen at grade school picnics where boys play football and girls sit under a tree and talk," notes Primate Laboratory Director Harry F. Harlow, who also participated in the study. "Certainly this behavior is culturally related to a large extent, but it does have some genetic basis."

Play differences in normal monkeys begin appearing at three to four months and are well pronounced by six or seven months, Suomi says. Many of these

-more-

genetic traits will carry over into adult behavior, though some will be modified by learning.

To learn if differences are actually genetic in origin, the scientists studied male monkeys raised in total isolation for the first six months of life. This isolation completely destroys the development of normal social behavior.

The male isolates were then paired with normal three-month female "therapist" monkeys, and within two weeks were responding to simple play, Suomi says. As the isolates matured, their play became more sophisticated and sex differences appeared.

"Even though the isolates had no exposure to other males and therefore no way to learn male behavior, their play was typically male," he explains. "Thus even when social development is retarded, when it finally appears the genetic differences are there."

This study is now being repeated with female as well as male monkeys, Suomi says. Preliminary results indicate that female social behavior is also genetically influenced, with the isolates developing in typically female fashion.

Work with monkeys at the Primate Center, funded by the National Institutes of Health and Mental Health, has pointed out several other genetic behavioral differences, Suomi notes. Both young and adult female monkeys tend to groom themselves more, are generally less aggressive and are better able to tolerate isolation.

"Though the monkeys clearly demonstrated that there are some genetic differences in social behavior, this in no way indicates that men and women should not be treated as equal," Suomi stresses. "Genetic differences in humans should not be ignored, but neither should they serve to condemn anyone because of their sex."

# # #

BROADCASTERS: Suomi is pronounced SOO'-mee

uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research News

Release: Immediately 8/17/71

UIR Science Writing Division (263-2875)

BY Thomas Burroughs
Science Writer

MADISON--Two University of Wisconsin-Madison scientists have discovered new information about a small plant virus which may make it a useful tool for studying the genetics of viruses that infect humans.

Leslie C. Lane, a post-doctoral fellow in biochemistry, and Prof. Paul J. Kaesberg, have found that bromegrass mosaic virus--common in the United States and one of the smallest known--has a surprisingly complex structure and life cycle.

"From previous observations, this virus was thought to consist of a single spherical shell or protein enclosing a core of RNA, the genetic material of the virus," Lane explains. "However, we found that the virus is actually made up of three particles with identical outer shells but enclosing three different varieties of RNA."

Each of the three particles, which are randomly spaced and move independently, must be present in a cell before the virus can multiply and produce an infection. This is the first time that the existence of multiple genetic components in an apparently homogeneous virus has been demonstrated.

Since there are several pieces of RNA, it is possible to isolate and study them individually to learn their genetic properties, Lane says. If the genetic functions of the RNA components can be determined, this will provide a model of RNA-type animal viruses, which cause may diseases and are even thought to be involved in cancer.

- more -

Genetic studies of this kind are exceedingly difficult with animal viruses because they usually have only a single large piece of RNA which performs all the functions and is hard to separate, Lane notes. The mosaic virus is not only easier to work with, but is also far easier to obtain.

The two scientists have already identified the function of one gene contained in the largest RNA component--that of development of the protein shell. The rest of the genetic material, however, remains to be analyzed.

They obtained their new information by using gel electrophoresis, a fairly new technique for separating RNA components that is able to show complexity that couldn't be seen with earlier methods.

Their study, funded by the National Institute of Allergy and Infectious Diseases and the Atomic Energy Commission, may have other medical implications as well as providing a genetic model.

"Other viruses previously thought to have one simple component may in reality consist of several particles, each containing genetic information which affects the cells they invade," Kaesberg says. "Thus the biochemical events they can trigger may be much more complex than previously thought."

Whether this is actually the case has not yet been determined, but he notes it is very likely to be true. This means that scientists studying the functions of viruses should not decide on their complexity just on the basis of a simple and homogeneous appearance.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research News

Release: Immediately 8/17/71 tb

UIR Science Writing Division (263-2875)

MADISON--Two University of Wisconsin-Madison scientists have discovered new information about a small plant virus which may make it a useful tool for studying the genetics of viruses that infect humans.

Leslie C. Lane, a post-doctoral fellow in biochemistry, and Prof. Paul J. Kaesberg, have found that bromegrass mosaic virus--common in the United States and one of the smallest known--has a structure and life cycle much more complex than previously thought.

"The virus is made up of three particles with identical outer protein shells but enclosing different varieties of RNA, the genetic material of the virus," Lane says. "Since there are several pieces of RNA, it is possible to isolate and study them independently to learn their genetic properties--a difficult task with larger animal viruses."

If the genetic functions of the RNA components can be determined, this will provide a model of RNA-type animal viruses, which cause many diseases and are even thought to be involved in cancer.

Their study was funded by the National Institute of Allergy and Infectious Diseases and the Atomic Energy Commission.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research Genetics

Release:

Immediately 11/18/70

UIR Science Writing Division (262-5984)

By THOMAS BURROUGHS

MADISON, Wis.--Organ transplants will become more and more common as new techniques are developed for replacing diseased organs, according to Dr. Fritz Bach, University of Wisconsin professor of medical genetics.

"A great majority of fatal diseases is caused by an organ that malfunctions," the transplant pioneer says, "and the outlook for future transplants in this regard is promising."

The number of people receiving transplants is increasing yearly, Bach notes. In 1958, only four kidneys were transplanted, while only 10 years later there were over 400 done. At the same time, the level of success has also increased.

"When an optimal sibling donor is used for a kidney transplant, there is now about a 90 per cent chance the organ will last two years," he says, "and if it lasts that long, it will probably last much longer."

Many doctors, however, hesitate to use live donors, even though the danger is minimal and the donor can consent only after having been warned of all danger. Since there is always a chance that something might go wrong, most doctors prefer to use cadaver organs, Bach explains.

Though transplanting a cadaver organ is not always as successful, better drugs and improved donor-recipient matching methods are boosting the success rate.

At present, approximately 50 per cent of the cadaver kidney transplants survive for two years," Bach notes. "This is only slightly less than the success rate of a transplant from a living, but not perfectly matched, donor."

- more -

While saving lives is the most important consideration, there is an economic advantage to transplants also. On the average, it costs eight to 15 thousand dollars per year to keep a patient in dialysis--treatment with an artificial kidney machine--versus a total cost of six to 15 thousand dollars for a kidney transplant.

"Another big factor is that the transplant patient can work five days a week, while the other patient must spend two days a week undergoing treatment," Bach adds.

Though there has been much progress, transplants have not escaped from all problems and controversy.

For one thing, the advent of heart transplants has started a move toward a new concept of death. In the past, the heart-beat has always been used to determine death, Bach points out. But in many cases, waiting until the heart stops before removing an organ for transplant increases the possibility of failure.

"The new concept based on cessation of brain activity is really just a switch from an emotional basis to a statistical basis," Bach says, "and some people recoil at this change."

To determine whether the brain has stopped, an electroencephalogram (EEG) is made. If the brain waves are flat, there is a 24 hour wait and another EEG is run. If the second one is also flat and several other criteria have also been met, it is assumed, from thousands of similar cases, that the person will never recover.

When a situation is so critical that the heart might stop before the two tests can be run, it is necessary to keep the person "alive" for the 24 hour period. To do this, a heart-lung machine takes over the necessary bodily functions, and it is here that the ethical questions arise.

If the second test shows no brain activity, but the heart is still beating, can the machine be turned off?

"This isn't a major problem if you define death in the new way," Bach contends. "But you must be sure everyone involved understands exactly what is being done and why."

According to Bach, many theologians have already accepted the new concept of death. Pope Pius XII, for example, has said that when a person has lapsed into such a deep coma that the brain stops, the soul may have already left the body and there is no obligation to use extraordinary means to keep the heart functioning.

Under the old definition of death, turning off a heart-lung machine could raise legal questions also. But there has never been a firm, legal precedent established by the courts, Bach says, and most lawyers now accept this new measure of death.

He foresees many developments in this field. The transplanting of organs from other animals will solve many of the current donor problems, he predicts, and the outlook for artificial organs is getting better.

"In the future," he says, "organ transplants are going to be one of the most exciting aspects of medical therapy."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research-Genetics

Release: Immediately 6/15/70 rt

MADISON, Wis.--How much does it cost to synthesize a gene, and who pays for it?

University of Wisconsin Pres. Fred Harvey Harrington made an effort to tie down such costs last weekend in a report to UW Regents on Dr. Har Gobind Khorana's recent announcement of the first complete laboratory synthesis of a gene.

Pres. Harrington called Dr. Khorana's accomplishment "the most significant event of the year for the University of Wisconsin," and said he could answer questions about its cost only in terms of the total support of Dr. Khorana's work since he came to Wisconsin a decade ago.

"In the 10 years Dr. Khorana has been with us he has directed projects totalling $2.7-million," Dr. Harrington reported. "In this total were $226-thousand of State appropriations. Thus for every dollar the State of Wisconsin put into the studies by him and his group over the period, Dr. Khorana's group attracted $10 from the outside. In addition to the State appropriation, the University invested a similar amount($230-thousand) from the Wisconsin Alumni Research Foundation--which included Dr. Khorana's full salary as Elvehjem Professor since 1964.

- more -

Add one--Khorana's funding

"The major support of the Khorana group's work came from federal agencies, just over $2-million. Of this, $1.5 million came from the National Institutes of Health, $.5 million from the National Science Foundation, and $1,000 from the Atomic Energy Commission for a fellowship for one of the members of Dr. Khorana's group.

"Private agencies which supported their work include the Life Insurance Medical Research Fund, the Upjohn Pharmaceutical Co., and the American Cancer Society. Together these totalled $159-thousand."

In addition to the $2.2 million provided by federal and private sources to support the Khorana projects, the president reported, these agencies also paid indirect costs to the University totalling $337-thousand, which went into the State treasury to offset State appropriations to the University.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research Genetics

Release: PLEASE OBSERVE OUR RELEASE DATE 6/1/70
Release 3:00 p.m. June 2 CDT

Slides, Newsclips & Pix on request

UIR Science Writing Program (262-5984)

By NANCY THORN AND JAMES A. LARSEN

MADISON, Wis.--The first total synthesis of a gene--the basic hereditary unit--has been accomplished by University of Wisconsin Nobelist H. Gobind Khorana and his colleagues at Wisconsin's Institute for Enzyme Research.

The achievement--long awaited by molecular biologists--will now make it possible for organic chemists to synthesize the basic genetic material from simple organic chemicals.

This is the first time that chemists have shown it is possible to synthesize a gene by putting the building blocks known as nucleotides into the sequence in which they occur in natural genes.

Scientists previously learned how to take small bits of genetic material out of living cells. They could make copies of natural genetic material in the test tube. Khorana is the first to show, however, that genes can be synthesized from atoms or the simple chemical building blocks, nucleotides. No natural gene is required as a model in the reaction mixture.

Khorana is the first to produce a gene completely by synthetic methods, using as his model the gene for alanine transfer RNA from yeast. The structure of the yeast alanine transfer RNA molecule was elucidated by Nobelist Robert Holley, now of the Salk Institute, some years ago. From the order of the nucleotides the structure of the gene coding for this molecule can be deduced.

- more -

The gene is a molecule of deoxyribonucleic acid (DNA), made up of two strands. Each strand is composed of four basic building blocks or nucleotides--these consist of four bases adenine, thymine, guanine, and cytosine. These bases, represented by the letters A, T, G, C, are linked to a sugar and a phosphoric acid molecule. The two strands of the gene are wound in a helix and are complementary in that the A's of one strand are always opposite the T's in the other. The same is true for the G's and C's.

These four coding units are arranged in various combinations to code genetic information used in producing molecules of transfer RNA, which are then employed in synthesizing the proteins of cells along with many other components.

Khorana started with the four nucleotides which can be synthesized easily from atoms. He joined the four basic building blocks into a number of shorter single-stranded segments with the nucleotides in proper sequence, then later joined these fragments into the complete double-stranded 77 nucleotide gene.

The single-stranded fragments were designed by Khorana so that they spontaneously line up in proper sequence to form the double-strands exactly as happens in natural DNA. The ends of the fragments are then joined by the enzyme DNA ligase, which is purified from living cells.

Khorana's group showed that the gene they had synthesized is exactly the same as the one they set out to make. They checked the sequence in each of the segments and demonstrated that they joined together in the correct manner.

One ultimate test would be to check the gene for biological activity in a living cell, by introducing the artificial gene into a cell lacking the gene, showing that by this introduction the cell was transformed into a normal cell. Other more immediate experiments for biological activity can also be carried on and these are now under way. These experiments include learning how to copy the artificial gene in a test tube using an enzyme called DNA polymerase discovered

several years ago by Nobelist Arthur Kornberg. The next job is to copy the gene into the transfer RNA.

After learning how to copy the artificial gene, Khorana wants to find out what turns a gene off and on in a living cell--or what its starting and terminating "signals" are. The ultimate challenge would be to introduce the artificial gene into a living cell.

The work on the yeast transfer RNA gene was started in 1965 and Khorana is now at work on the synthesis of a second gene, called tyrosine-supressor transfer RNA, found in a species of bacteria known as E. coli. Synthesis of the fragments of this gene is now nearly complete, but the work of joining the segments has only been begun. The work on this second gene is expected to be completed within a few months. Mutants lacking the gene are already known and will be available for testing the biological activity of the artificial gene when synthesis is complete.

Khorana began the synthesis of this second gene because it will be easier to test for biological activity in living cells; its function in the protein synthesizing system is well known.

Now that he has determined the rules for chemically synthesizing genes, theoretically any desired gene could be manufactured in the test tube. Thus, some scientists foresee the time when genetic diseases, such as diabetes and some mental illnesses, might be cured by providing the tissues of affected individuals with a supply of normal genes.

Other characteristics--not necessarily pathological ones--could even be altered in the same manner.

Scientists caution, however, that this is many years in the future and a problem can be foreseen in developing techniques for introducing the genes into the proper target areas. Methods now contemplated would involve using purified genetic material or viruses as carriers to introduce genes into affected cells.

Add three--Khorana

Khorana shared the 1968 Nobel Prize in medicine with Robert Holley and Marshall Nirenberg. It was awarded to Khorana for his work in elucidating the genetic code by synthesizing double stranded DNA polymers of various sequences and then determining which proteins were synthesized from information encoded in the various DNA sequences.

Khorana would also like to know how the transfer RNA molecules act the way they do in protein synthesis. To understand their function better, he plans to modify chemically specific parts of the molecule and to see what the effects are.

Khorana made his momentous announcement Tuesday to a small colloquium of biochemists and molecular biologists at the University of Wisconsin. He pointed out that he made the announcement in this way rather than at a large scientific meeting, in recognition of the support and encouragement provided him during the past decade by the University of Wisconsin.

An article describing the achievement will be submitted to a scientific journal shortly. The work will also be presented at an international symposium at Riga, Russia, under the auspices of the U.S.S.R. Academy of Sciences late in June.

A native of India, Khorana joined the Wisconsin faculty as a co-director of the University's Institute for Enzyme Research, in 1960. He received his early education under a tree in India, meeting informally with other students and a government teacher, and was the only member of his family to obtain a higher education. His first major scientific accomplishment was the synthesis of adenosine triphosphate and co-enzyme A.

He has been assisted through the years by a large and international group of young, hard-working chemists who come to the laboratory at Wisconsin specifically to work with such a distinguished individual.

Those who helped in the synthesis of the yeast gene were Vittorio Sgaramella, Italy; Hans van de Sande, Netherlands; Kjell Kleppe, Norway; Marv Caruthers, U.S.; Ashok Kumar and Naba Gupta, India; E. Ohtsuka, Japan; and Hans Weber and Henri Buchi, Switzerland.

The present group will accompany Khorana when he leaves Wisconsin to move to the Massachusetts Institute of Technology this fall.

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University of Wisconsin News Service, 10 Bascom Hall, Madison, Wis. 53706

Research - Genetics

KHORANA'S SYNTHESIS OF A GENE (about 1:30)
FILM (about 1:05) shows Dr. Khorana and research colleagues in laboratory scenes; script is not keyed to specific film scenes.

FILM 1:05

LS, ENZYME LAB :03

MS, LAB SIGN :02

MS, KHORANA OFFICE :05

CU, KHORANA :03

CU, HAND CUTAWAY :02

CU, KHORANA :03

MS, RESEARCHER (KATSUMARO MINAMOTO) IN LAB :07

CU, BOILING SOLUTION :02

MS, MINAMOTO :03

MS, RESEARCHER (KEN AGARWA) and EVAPORATOR :03

CU, AGARWA :02

AT THE UNIVERSITY OF WISCONSIN INSTITUTE FOR ENZYME RESEARCH, NOBEL PRIZE WINNER H. GOBIND KHORANA (Ko-RONN'-AH) ANNOUNCED THE FIRST TOTAL SYNTHESIS OF A GENE--THE BASIC HEREDITARY UNIT OF LIFE.

THE SYNTHESIS OF THIS GENE, FROM THE COMMON HOUSEHOLD YEAST, IS A BREAKTHROUGH IN DETERMINING THE RULES FOR CHEMICALLY BUILDING GENES FROM ATOMS OR SIMPLE MOLECULES.

THE ACHIEVEMENT, LONG AWAITED BY MOLECULAR BIOLOGISTS, PROVES THAT IT IS POSSIBLE FOR CHEMISTS TO PUT THESE SIMPLE MOLECULES, KNOWN AS NUCLEOTIDES, INTO THE SAME SEQUENCE IN WHICH THEY OCCUR IN NATURAL GENES. AND YET, NO NATURAL GENE NEED BE PRESENT IN THE TEST TUBE AS A MODEL.

IN 1968 ,DR. KHORANA OF THE WISCONSIN INSTITUTE FOR ENZYME RESEARCH, SHARED THE NOBEL PRIZE WITH TWO OTHER SCIENTISTS. KHORANA'S AWARD WAS THE RESULT OF HIS WORK IN CLARIFYING THE GENETIC CODE. THE CODE IS THE MECHANISM BY WHICH INFORMATION FOR ALL INHERITED TRAITS IS PASSED ON FROM ONE GENERATION OF LIVING ORGANISMS TO THE NEXT.

- more -

MS, RESEARCHER (VICTORIO SGARAMELLA) IN LAB :05

CU, HANDS :02

CU, LAB TABLE :03

MS, RESEARCHER (KJELL KLEPPE) AND NUCLEOTIDE ANALYZER :04

CU, KLEPPE :02

CU, ANALYZER DIAL :02

CU, KLEPPE :02

MS, RESEARCHERS (MARVIN CARUTHERS AND HANS VANDE SANDE) WITH SCINTILLATION COUNTER :05

CU, PRINTOUT :02

CU, LIGHTED READOUT :02

CU, PRINTOUT :03

NOW HE IS THE FIRST TO PRODUCE A GENE COMPLETELY BY SYNTHETIC METHODS. THE WORK ON THIS GENE (THE YEAST ALANINE TRANSFER RNA GENE) REQUIRED FIVE YEARS TO COMPLETE. HOWEVER, THE SYNTHESIS OF A SECOND GENE, THIS TIME FROM A BACTERIUM, IS EXPECTED TO TAKE ONLY A FEW MONTHS.

THEORETICALLY NOW, ANY DESIRED GENE CAN BE MANUFACTURED IN A TEST TUBE. MANY SCIENTISTS FORESEE THE TIME WHEN GENETIC DISEASE--SUCH AS DIABETES AND SOME FORMS OF MENTAL ILLNESS--MIGHT BE CURED BY PROVIDING THE TISSUES OF AFFECTED PERSONS WITH A SUPPLY OF NORMAL GENES.

DOCTOR KHORANA AND HIS FELLOW RESEARCHERS CAUTION, HOWEVER, THAT THIS APPLICATION OF THEIR WORK WILL NOT COME FOR A NUMBER OF YEARS. AMONG OTHER THINGS, EXPERIMENTAL TECHNIQUES FOR INTRODUCING NORMAL GENES INTO THE DISEASED TISSUES WILL HAVE TO BE DEVELOPED.

# # #

uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research-Genetics

Release: Friday, April 17 PM 4/10/70

UIR-Science Writing Division (262-5984)

By MaryJo Takach

ATLANTIC CITY, N.J.--Why is an eye an eye and a nose a nose?

University of Wisconsin scientists are using a new tool in an effort to find the answer to this puzzling genetic question.

David S. Wilkinson of the McArdle Memorial Laboratory for Cancer Research at Wisconsin told fellow scientists attending the annual meeting of the Federation of American Societies for Experimental Biologists that a substance known as 5-fluoroorotic acid (5-FOA) is incorporated into non-ribosomal RNA and that this factor may then be used in studies of differentiation.

Differentiation is the biological process by which embryonic or primordial cells specialize and become parts of specific organs--an eye, nose, liver, brain, and so on.

Wilkinson has employed radioactive 5-FOA to label messenger RNA, the substance which carries genetic information from DNA in cell nuclei to enzymes in the cell cytoplasm.

Messenger RNA, for example, tells the enzymes whether they are to be part of a muscle cell, blood cell, or other organ or tissue.

It is hoped 5-FOA will enable researchers to isolate messenger RNA from ribosomal RNA--the latter is involved in enzyme synthesis but as manufacturer rather than as a messenger carrying instructions.

- more -

Wilkinson has isolated RNA from rat liver three hours after injecting 5-FOA into the rat's digestive cavity and has demonstrated the presence of labeled non-ribosomal RNA in the extract.

He hopes in future research to establish the mechanisms by which differentiation occurs. The malfunction of these mechanisms may be the reason for undifferentiated cancer cell growth.

Five-fluoroorotic acid is chemically related to 5-fluorouracil (5-FU), a drug which has shown considerable success in the treatment of some forms of cancer.

Wilkinson, a U.S. Public Health Service supported trainee, was assisted in the research by Carleton Garrett, Prof. Henry C. Pitot, and Alois Cihak, a visiting professor from Czechoslovakia.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Release: Immediately 8/20/69 pw

UIR Science Writing Division (262-5984)

MADISON, Wis.--An international group of scientists, meeting at the University of Wisconsin, called Wednesday for public support to rid man's environment of mutagenic chemicals.

"A number of chemicals--some with widespread use--are known to induce genetic damage in some organisms," Dr. James F. Crow, UW geneticist, declared, opening a discussion during the annual conference of the Genetics Society of America.

"Some chemicals may constitute as important a risk as radiation, possibly a more serious one," he warned.

Unlike radiation, however, the problem of environmental mutagens is largely unstudied, and federal funding is needed to support such research.

Alexander Hollaender, geneticist from Oak Ridge (Tenn.) National Laboratories, revealed that 30,000 new chemicals are discovered each year. He stated:

"Perhaps only a dozen of these cause mutations, but it will take 10 to 20 years to investigate the new chemicals and those already on the market. Funding for such an extensive investigation will require public support...and Madison isn't such a bad place to start the campaign.

- more -

"Mutagens may be present in food, drugs, and water. Additives to food are very dangerous because in many cases children are exposed to them most."

Appealing to the taxpayers' sense of economy to help prevent genetic damage, one scientist noted that it costs $1 million to institutionalize a deformed child for the span of his life. This, he said, is in addition to the emotional price paid by society and the parents.

Evoking the old "ounce of prevention" proverb, other scientists contended it is much more effective to test a chemical before--not after--it is distributed. As geneticists, they stressed that it would take many months, even years, to detect genetic damage and many more years to trace the cause of damage, if mutagenic chemicals are released without thorough testing.

Hollaender predicted that the issue of chemical mutagens would soon come under study by congressional committees, and he told the scientists to prepare to stand up and be counted.

He is president of the Environmental Mutagen Society, which was established last January to encourage interest in and coordinate the study of chemical mutagens.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research - Genetics

Release: Immediately 6/13/69 lw

UIR Science Writing Division (262-5984)
Contact Linda Weimer

MADISON, Wis.--Two years of basic research in medical genetics are resulting in dramatic progress in the fight against a genetic disease.

University of Wisconsin researchers, led by Dr. Robert I. DeMars, professor of medical genetics, have now developed a technique to spot women who are carriers of the disease.

Should a woman become pregnant, physicians can use the technique to determine if the fetus is normal. The method is described in the June 13 issue of Science magazine.

The specific target--the Lesch-Nyhan syndrome--is a severe nervous system disorder which resembles cerebral palsy and is caused by a mutant gene carried on the X chromosome.

Like hemophilia, this disorder is not found in women. Though a woman may carry the gene causing the Lesch-Nyhan syndrome on one of her two X chromosomes, its effect will be blocked by the normal gene on her other X chromosome.

A male, however, has only one X chromosome together with a Y chromosome. Therefore, if he inherits a mutant gene from his mother, he is defenseless--he has no normal gene to counteract the mutant.

When looking at cells taken from such a person, Dr. DeMars and graduate student Jeannette S. Felix noticed that the characteristic mutant cells are much more difficult to grow in cell cultures than are normal cells.

- more -

They found this is because mutant cells require more adenine and 50-100 times more folic acid than do normal cells.

They then tested women who are known carriers of the disease and found that, though the women themselves are normal, they carry a certain percentage of mutant cells in their bodies.

By culturing cells taken from a woman who is a suspected carrier, scientists can positively determine whether she has the mutant gene.

"Diagnosis of the carrier is the first step toward prevention of the disease," says Dr. DeMars. "Women who are positively diagnosed can be advised of the risk they take in having children, for it is expected that one-half of any sons they have will be affected with the disease."

If a known carrier should nevertheless become pregnant, physicians can extract amniotic fluid surrounding the fetus and culture the fetal cells contained in the fluid to see if they are mutant. This has recently been done at the UW by Dr. DeMars' lab in collaboration with Dr. Gloria E. Sarto of the department of obstetrics and gynecology.

Thus, a baby can be diagnosed long before birth and, if he is affected, medical treatment can be started immediately in the womb to alleviate the disease.

The Wisconsin group hopes that since adenine and folic acid enable the mutant cells to grow in culture, applications of adenine and folic acid to human patients with the disease may result in similar successes.

This treatment is now being given to several Wisconsin patients.

"Some initial results appear favorable in newborns treated from birth," says Dr. Paul P.D. Benke, of UW Hospitals, "but it's really too early to say definitely if the treatment will be successful. We may not be able to do much, in this respect, for children who have already established symptoms of the disease."

Though the syndrome is comparatively uncommon, the applications of the Wisconsin research, sponsored by the National Institutes of Health, are very broad.

Mutant cells from an increasing number of genetic diseases can now be defined in terms of their biochemical needs in cell culture. This gives physicians an extremely handy tool for diagnosing carriers of a disease and affected offspring. In addition, it carries with it the promise of new forms of treatment.

"Further, the development of these tests," Dr. DeMars notes, "is a prime example of how basic research can have direct practical applications to human problems."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research - Genetics

Release: Immediately 4/26/68

UIR Science Writing Division (262-5984)

By JOHN WOLF

MADISON, Wis.--A meeting this weekend in Tennessee will probe the possibility that a number of chemicals may threaten the genetic well-being of future generations.

Several experts in mutation research, including University of Wisconsin geneticist James F. Crow, are taking part in this conference at Oak Ridge National Laboratory.

The purpose of the meeting is primarily to see what research is needed in this area and how it might be carried out.

Scientists have long known that radiation increases the mutation rate of genes. Consequently, humans are carefully protected from excess radiation in such forms as x-rays and rays from television picture tubes.

Prof. Crow notes that, like radiation, some chemicals also increase the mutation rate in experimental organisms such as bacteria and fruit flies. These mutations do not affect the organisms themselves, but instead they cause genetic abnormalities in their offspring.

Present studies do not confirm that chemicals which cause mutations in experimental organisms can also cause mutations in humans. Prof. Crow stresses that "better testing methods are needed to determine what compounds produce mutations in man."

- more -

Add one--Prof. Crow

Some of the chemicals that should be investigated, according to Prof. Crow, are pesticides, herbicides, food additives, cosmetics, drugs, industrial chemicals, air pollutants, and contraceptives.

Most of the suspected chemicals are man-made and not normally found in nature. This is largely because many synthetic chemicals are more highly active than most naturally occurring chemicals, according to Prof. Crow.

In considering the problems of chemical-caused mutations, Prof. Crow cautions, however, "We must guard against having such elaborate and expensive precautions that we hinder the development of beneficial chemicals.

"On the other hand, we must also guard against seriously damaging the genetic heritage of future generations by not being careful enough."

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research - Genetics

Release: THURSDAY NOON, APRIL 4 4/2/68

UIR Science Writing Division (262-5984)

By JOHN WOLF

MADISON, Wis.--(for use noon, Thurs., April 4)--A mother's womb seems to possess a "forgiving influence"--an ability to temporarily correct certain genetic defects in an unborn child--a University of Wisconsin pediatrician and geneticist emphasized Thursday.

Dr. John M. Opitz discussed the "forgiving influence" as part of a talk on genetic factors affecting the growth of unborn children.

Dr. Opitz told doctors attending a symposium on fetal medicine in Madison this week that a baby's prenatal growth is determined largely by conditions within the womb. In certain cases, these conditions compensate for inherited defects and allow a fetus to grow normally in the uterus. Sometime after birth, however, the genetic flaws become apparent.

As a result of this forgiving influence of the mother's womb, doctors often have a hard time recognizing some genetic disorders in a newborn child.

"Tom Thumb" dwarfs offer an excellent example of the womb's temporary forgiving influence, Dr. Opitz pointed out. Side-show dwarfs--like Tom Thumb himself--do not produce any hormones that promote growth. This hormone deficiency can be inherited even from normal-sized parents.

When Tom Thumb dwarfs are born to full-sized parents, they are always of normal length at birth. After several months, however, their growth rate begins to lag seriously.

- more -

Add one--Dwarfs

Tom Thumb dwarfs have married other Tom Thumb dwarfs, and their children are always dwarfs. Strangely, though, the children of a dwarf couple are also normal sized when born and must be delivered by caesarean section.

Doctors suppose that in mothers who can not produce their own growth hormones, the placenta produces the substance--called placental lactogen--that acts as the forgiving influence on their unborn children.

Dr. Opitz concluded that doctors who wish to study genetic size deficiencies may have to direct their efforts toward undersized babies--like those suffering from mongolism--who do not benefit from the forgiving influence of their mothers' wombs.

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uw news

From The University of Wisconsin News and Publications Service, Bascom Hall, Madison 53706 • Telephone: (608) 262-3571

Research - Human Genetics

Release: NOON THURSDAY, APRIL 4 4/2/68

UIR Science Writing Division (262-5984)

By NAOMI EPSTEIN

MADISON, Wis.--(for use after noon Thursday)--Mother and child will fare better before, during, and following birth -- if their doctors utilize new equipment and knowledge.

Equipment that traces the baby's heart rate, tests to determine whether a blood transfusion is needed, and other examinations of the developing baby -- or fetus -- are new tools in a field called fetal medicine.

Dr. Ben Peckham, head of the Department of Gynecology and Obstetrics at University of Wisconsin Hospitals, reviewed the history of fetal medicine today at a Madison conference.

"Man has speculated about the fetus and attempted to study it since antiquity," he said, "but he has never been able to gather such accurate, useful information as we can now."

Dr. Peckham said he foresees the involvement of a variety of people in this branch of science.

For example, the skills of engineers will be needed to design and monitor specialized equipment. Meanwhile, other scientists will study the genetic and biochemical aspects of fetal medicine.

- more -

Newborn areas of hospitals will be designed in different ways, too, Dr. Peckham predicted.

"There will be sections for intensive care in complicated cases," he said, "and regular facilities for normal cases."

Present levels of observation of mother and child will be maintained, he added, but new assessments of responsibilities will determine who does the observing.

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U. W. NEWS FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

Research - Genetics

1/18/63 jeb RELEASE: Immediately

By JANE BRODY

MADISON, Wis.--What are the keys to the evolutionary process?

A University of Wisconsin medical geneticist has discovered a striking example of what may be an important step in the evolution of new forms of life. This evolutionary mechanism is the duplication of part of a gene.

Dr. Oliver Smithies, collaborating with two University of Toronto biochemists, Drs. George E. Connell and Gordon H. Dixon, has traced the evolution of certain blood proteins to such a duplication.

The gene, as Dr. Smithies refers to it, contains a blueprint for the production of a particular polypeptide. Several different polypeptide chains may combine to make a single protein. If a gene is changed by partial duplication, it specifies a new kind of polypeptide and, therefore, a new kind of protein.

Although such duplications are probably not uncommon, they may or may not be functional. The partial gene duplication that Dr. Smithies and his co-workers demonstrated, however, is completely functional.

The scientists' discovery resulted from an analysis of three common types of the hemoglobin-binding protein, haptoglobin. One of these types, they found, was composed of a piece of each of the other two.

The simplest explanation for the genetic origin of this "double" type is that parts of the genes which code the two original haptoglobins joined up to form a new gene, Dr. Smithies concluded. The researchers note that there are many other proteins--such as the digestive enzymes, trypsin and chymotrypsin--which could have evolved by a similar mechanism.

-more-

Add one--genetics

Most new protein types which have been studied in the past arise from point mutations--single changes within tiny portions of the genes which specify their structures. Point mutants, as the new gene forms are called, usually make only a very slight difference in protein structure.

If point mutations were the only functional genetic changes which could occur, the human species would have taken a much longer time to evolve than it did, Dr. Smithies suggests.

The big jumps, such as the one just demonstrated, were probably important steps in making evolution possible in the time that was available, the geneticist believes.

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Research

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

5/12/61 gmb

RELEASE: Immediately

MADISON, Wis.--A grant of $641,233 over a seven-year period for support of a research center in medical genetics has been made to the University of Wisconsin by the National Institutes of Health, and the first installment of $53,233 for 1961-62 was accepted by the UW Board of Regents Friday.

One of the first such grants made by NIH, the funds will be a major contribution to the rapidly developing program in medical genetics at Wisconsin. The grant will provide funds for staff salaries, assistants, visiting investigators, new research projects, and laboratory supplies and equipment.

A new $1,790,025 Genetics Research Building also is planned for the departments of genetics and medical genetics.

Medical genetics had its beginning at UW in 1956 when Dr. Newton Morton was appointed assistant professor of anatomy. In addition to a research program in human genetics, Dr. Morton gave a series of lectures in the first-year course in anatomy.

The medical genetics department, a unit of the Medical School, was formally organized in 1957 and consisted of two members--Dr. Joshua Lederberg as chairman and Dr. Morton. When Dr. Lederberg resigned in 1958, Dr. James Crow joined the department as chairman.

During the 1959-60 academic year, the department added five new members: Dr. Robert DeMars, Dr. Oliver Smithies, Dr. Charles Cotterman, Dr. Klaus Patau, and Dr. C. S. Chung.

-more-

Last spring, the medical genetics department moved into new quarters in the just-completed Medical Sciences Building. Previously it had been scattered in a variety of temporary laboratories.

A grant from the Rockefeller Foundation enabled the department to acquire its present staff, growing from one to seven men in four years, and to build and furnish the new laboratories.

The staff is involved in six major areas of research. Under formal analysis of human inheritance, Dr. Morton has been engaged in developing and applying new techniques that add greatly to the precision of genetic analysis of family records. Certain methods of analysis have been successfully applied to muscular dystrophy, congenital deafness, and low grade mental deficiency.

In human cytogenetics, Dr. Patau, collaborating with Dr. David Smith of the pediatrics department, Dr. Stanley Inhorn of the preventive medicine department, and Dr. Eeva Therman of the pathology department, has discovered two new disease syndromes of congenital anomalies that are caused by extra chromosomes. This kind of work offers the possibility of being able to identify the position of genes on specific chromosomes, which has been done with experimental animals and plants but so far has been impossible in man.

Dr. DeMars is directing work in the genetics of individual body cells. He is studying human cells in tissue culture, emphasizing the study of cells from persons who are heterozygous for the recessive gene for galactosemia.

Dr. Smithies, in biochemical genetics, has discovered that there are several types of hemoglobin-binding proteins (haptoglobins) in different individuals, and he is analyzing their chemistry. These haptoglobins may aid in revealing how information in the gene is related to the corresponding protein molecule.

In immunogenetics, Dr. Cotterman is studying plant agglutinins--sensitizing antibodies which cause clumping together of red blood cells--and blood group mosaicism.

Dr. Crow is using the fruit fly (Drosophila) to study whether "recessive" mutants are really completely recessive, and also the distribution of mutants with harmful, but less than lethal effects.

The medical genetics department maintains close liaison with the department of genetics, which is in the College of Agriculture and has long been one of the strongest genetics departments in the country. Graduate students take courses in both departments and there are several cooperative research programs. There are also cooperative research projects involving the departments of pediatrics, medicine, and pathology.

At present, the department has one visiting professor--Dr. Seymour Abrahamson of Rutgers University, five post-doctoral fellows, and several graduate students.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

10/6/60 rt

RELEASE: in PM's of Thursday, Oct. 6

MADISON, Wis.--(Advance for PM's of Thursday, Oct. 6)--The University of Wisconsin today announced a grant of $189,800, completing the amount of money required to construct and equip a new building for genetics research.

The grant came from Campbell Soup Co. of Camden, N.J., and will be used to equip the new five-story building, estimated to cost $1,680,000.

Other sources of funds for the building were pledged from the National Institutes of Health and the Wisconsin Alumni Research Foundation.

The building is to be located between the State Laboratory of Hygiene and the Wisconsin High School, across the mall from the red brick structure, built in 1907, which currently houses the genetics department.

"The award was prompted, in part, by the high quality of work in the field of genetics performed at the University of Wisconsin" Campbell Soup Company said in its letter of transmittal.

The major portion of the Campbell Soup Company grant will be utilized by the University to provide laboratory furniture, fixed equipment, and the special scientific facilities required in a modern genetics research building.

"Modern genetics research has reached the point where we require many of the research facilities commonly employed by bacteriologists, biochemists, and physical chemists," according to Prof. M. R. Irwin, chairman of the genetics department who heads the committee in charge of planning the new structure.

-more-

"Laboratories in the new building will be furnished with equipment designed for modern genetics by specialists employing techniques derived from these related fields," he added.

Among the special laboratories to be furnished with the funds are embryo culture rooms, transfer rooms for tissue culture, constant temperature rooms, and rooms for the study of the molecular mechanism of mutation.

The new equipment will furnish laboratories to be used by both the University's department of genetics and the department of medical genetics. The former is part of the College of Agriculture and the latter is included within the UW Medical School. The latter department is relatively new, having been established in 1957, and is headed by Prof. James Crow.

At present, both departments are crowded into less than 18,000 square feet of floor space. The new laboratories will provide some 53,000 square feet for the two departments.

At the present time there are six faculty members of professorial rank on the staff of the department of medical genetics and 16 on the staff of the genetics department. Several of these individuals hold joint appointments with other university departments and federal agencies.

Prof. Irwin pointed out that the location of the new structure will be ideal for access to related departments in the UW Medical School, the College of Letters and Science, and the College of Agriculture.

"We are exceptionally gratified that the Campbell Soup Company has recognized the importance of our basic research program," Prof. Irwin added. "We cannot fully express our appreciation for the grant which has made it possible to furnish the projected building with all of the needed modern equipment."

He explained that the program of genetics research at Wisconsin is directed toward an improved understanding of basic genetic processes in plants and animals, without particular emphasis on direct or immediate practical applications.

While many immediate improvements often come from basic research, he added, continued future progress depends entirely on the fund of general knowledge built up through basic research.

He pointed out that the development of hybrid corn was based on a fundamental discovery for which there seemed no practical application at the time it was made.

Irwin added that Wisconsin's genetics center is one of the leading centers in the nation for the training of graduate students and for research in the field of genetics.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

Research
Genetics

4/7/60 db

RELEASE: Immediately

By DAN BOTKIN

MADISON, Wis.--University of Wisconsin scientists have discovered a strange trait inherited by fruit flies which provides a possible clue to why people keep getting some rare inherited diseases.

The discovery could explain the unequal boy-girl birth rate. Some one hundred and six male babies are born to every 100 females, though genetic theories predict equality.

The fruit fly trait violates the law of natural selection; the trait should almost disappear, the law predicts.

The law of natural selection states that inherited traits which are most advantageous to a species will survive while harmful ones should almost disappear.

The fruit fly trait is harmful--it can kill offspring whose parents both transmit it. For this reason, the theory predicts, the trait should almost disappear.

Dr. Laurence Sandler and research assistant Yuichiro Hiraizumi say the trait actually seems to occur with increasing frequency. Scientists found it in flies in Wisconsin and California. It appears to have existed in flies for a considerable time.

The rare human diseases--for example, an anemia named thalassemia--should also disappear, the theory predicts, because they are genetically transmitted and are sufficiently damaging to constitute a real hazard to life.

Dr. Sandler explained that a curious destructive gene is responsible for the continued occurrence of the fruit fly trait. He thinks a similar gene might cause the unexpected high frequency of occurence of the inherited human diseases.

-more-

Genes--tiny elements which make up chromosomes in cells--are the messengers which transmit inherited characteristics. Genes occur in pairs in body cells--two for each characteristic--and normally do not affect one another. But the curious gene found by the UW geneticists does something no other gene has been found to do. It breaks up the chromosome containing its partner.

This curious gene--called the segregation-distorter, or SD, gene--breaks up its partner's chromosome during the formation of the sperm cells. The sperm cells getting the broken chromosome will not fertilize eggs. This means only the SD gene's characteristic is passed on.

Sex is determined by two chromosomes--named X and Y. Men have one of each, while women have two X's. During the formation of sperm cells, a Y chromosome with an SD-like gene could break the X chromosome and make the X chromosome's sperm cell unable to fertilize eggs. Thus, the chromosome for females would be passed on less often than the chromosome for males.

Though SD-like genes could force harmful traits on a species, Dr. Sandler said that the presence of such genes apparently does not mean certain extinction for the species. The explanation, he said, lies in the fact that the SD gene's partner seems capable of building up a "resistance" to being broken. Dr. Sandler explained how this might occur. He said that not all the SD gene's partners are susceptible to it; the sturdy ones survive, the weaker disappear.

The geneticist added that a species might also avoid the effects of the SD gene by altering the mechanism of sperm cell formation.

Dr. Sandler and another scientist, Dr. Edward Novitski, guessed in 1957 that SD-like genes--genes which do not obey the law of natural selection--might exist in nature. Hiraizumi found the fruit fly trait which violated this law. Research Assistant Elaine Johansen found the trait in California fruit flies. Combined work by Dr. Sandler and Hiraizumi revealed the SD gene.

add two--genes

Drs. Sandler and Novitski also guessed that SD-like genes might be responsible for the high frequency of occurrence of some inherited human diseases. The recent find of the SD gene provides evidence that such genes could exist in man.

Fruit flies are not the only animals containing SD genes. Dr. Sandler said SD-like genes seem to occur in corn, probably occur in tobacco, and might possibly occur in mice.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

Research Genetics

3/2/60 jl

RELEASE: Immediately

By JAMES A. LARSEN

MADISON, Wis.--University of Wisconsin medical scientists have learned that two unusual and fortunately rare types of severe congenital abnormality are due to the accidental presence of an extra chromosome, giving affected infants 47 instead of the normal human complement of 46 chromosomes.

The discovery is of limited clinical significance because such infants possess hopelessly severe physical deformities and seem to be mentally defective. But it has been described as a major advance in medical genetics because of the light it sheds upon basic genetic processes in man.

The work has been done by Prof. Klaus Patau and Dr. Eeva (cq) Therman of the UW Medical School's department of pathology and Prof. David W. Smith of the department of pediatrics.

The discovery points up the fact that certain types of congenital deformity are completely accidental and have no hereditary significance. They have not, in other words, been transmitted from parent to offspring in any usual hereditary sense.

It was only last year that two British scientists learned that mongolism is a genetic accident in which one of the parental reproductive cells possesses an extra chromosome.

In two types of infant abnormality now described by Patau and his associates, virtually the same type of genetic accident has been shown to occur to different chromosomes than the one involved in mongolism.

-more-

The Wisconsin scientists are the first to recognize that these two types of abnormality each represent a distinct pattern, apparently involving mental deficiency in addition to a variety of abnormalities including the heart, hands, feet, eyes, and palate.

In the research, the Wisconsin scientists cultured bone marrow tissue from deformed infants under special conditions and examined the cells microscopically to count the chromosomes.

They found that the infants with the typical complex of abnormalities all possessed an extra chromosome, a condition known technically as trisomy. Normal human cells have 22 pairs of autosomes plus two sex chromosomes, making 46 in all. In these abnormal infants, there are three instead of two of a particular type of the non-sex chromosomes known as autosomes, giving each body cell 47 chromosomes in all.

So far, mongolism and these two types of abnormality are the only syndromes known to be caused by the accidental addition of an autosome to reproductive cells. Mongolism involved the smallest of the chromosomes found in human cells, while the other two types of abnormality are caused by additional chromosomes in the medium-sized range.

It should be pointed out that the normal human complement of chromosomes is 46. For many years it was believed to be 48, but this was first shown not to be the case by scientists working in Sweden in 1956.

Trisomy upsets the normal developmental processes during embryonic growth, resulting in a variety of abnormalities.

Patau points out that this extra chromosome is added to an ovum or a sperm cell during formation, apparently as an accident occurring to a very small percentage of the reproductive cells.

The same is true of mongolism, although in mongolism another type of chromosome is involved and here the accident apparently happens much more frequently. It is estimated that one birth in every thousand is mongoloid; although the exact frequency is not known, it is probably lower in these two other types of congenital abnormality.

The scientists pointed out that trisomy involving still other chromosomes may well result in death of the embryo at a very early stage of development, terminating the pregnancy.

To date, the Wisconsin scientists have seen only two cases of each of the two types of abnormality. The syndromes are as yet unnamed.

"In any organism, cell division at times can take an accidentally abnormal turn," Patau explains. "The reproductive cells, ova and sperm cells, seem particularly susceptible to this kind of accident, and it is an accident that literally can happen to anyone."

"The infant resulting from such a genetic accident is a tragic event but a meaningless one as far as inheritance is concerned," Patau adds.

The Wisconsin scientists are continuing their investigations to learn whether other chromosomes present intriplicate may be the unrecognized cause of other rare complexes of congenital abnormality.

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Research Genetics

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

11/16/59 db

RELEASE: in PM's of Wednesday, Nov. 18

BLOOMINGTON, Ind.--(Advance for PM's of Wednesday, Nov. 18)--It isn't easy to throw a monkey wrench into a machine and predict how much damage it will do.

However, the damage from throwing the monkey wrench of human genetics into the hereditary machinery can be roughly estimated, University of Wisconsin geneticist Newton Morton told the National Academy of Sciences Wednesday.

The monkey wrench of human heredity is mutant genes. They can be thrown into the hereditary machinery by X-rays and atomic fallout, although normally they arise spontaneously.

Recent work, he said at the annual NAS meeting in Bloomington, "suggests that an increase in background radiation would increase the mutational load in a predictable way."

Genes are the messengers of heredity. A child receives one gene from each parent. The genetic load is the number of genes which, if given by both parents, would create hereditary defects in their child.

Limb-girdle muscular dystrophy is such a defect. The UW geneticist has studied the blood relationships of parents whose children have this affliction. Fifteen per cent of the parents of hereditary limb-girdle muscular dystrophy studied were first cousins, Morton said.

It's not easy to get from muscular dystrophy to atomic fallout. This is how geneticists do it.

-more-

Geneticists know that inbreeding--the marriage of close relatives--results in decline in vigor and an increase in mortality among the offspring. For example, infant deaths within the first year are twice as frequent among first cousin marriages as normally occur.

There are two theories that attempt to explain the accumulation within organisms of genes causing these damages.

The first says that damaging genes are kept in the population only through mutations--the products of hereditary monkey wrench throwing.

The second says that the genes are kept in the hereditary machinery because they improve the offspring who get such a gene from only one parent, even though they cause defects when given by both parents.

Each theory gives an estimate of the size of the genetic load which was mentioned before. Morton's finding, that 15 per cent of limb-girdle muscular dystrophy results from first cousin marriages, allows him to make an estimate of the actual genetic load.

His estimate agrees most closely with the prediction of the first theory--the theory that says hereditary damages are kept in the population only by mutation.

Other evidence from his work suggests that the second theory could explain only a small part of human hereditary defects resulting from inbreeding. Thus, Morton told the NAS, he thinks that damaging hereditary characteristics are maintained, in the great majority of cases, solely by spontaneous mutations.

Assuming this--which is the principal conclusion of his paper--and knowing a little about the radiation dose that will double the spontaneous mutation rate, Morton can then calculate the hereditary damage due to a given amount of radiation.

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FEATURE STORY

[Research - Genetics]

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

5/7/59 eda

RELEASE: Immediately

By ED AEBISCHER

MADISON, Wis.--A current hypothesis, exciting to scientists who study the basic patterns of life, suggests that the complex structure of the protein molecule can provide a clue to the workings of heredity.

University of Wisconsin scientists have contributed significant findings to world-wide investigations of this relatively new view.

Among them are Profs. Van R. Potter, Charles Heidelberger, and Gerald Mueller, cancer researchers; bacteriologist Prof. Harlyn O. Halverson; and biochemist Prof. Robert M. Bock.

Proteins have been called the "living material" of the animal organism, the researchers explain. Proteins are essential constituents of all living cells, and of the diet. And along with carbohydrates and fats, proteins are the main organic substances in food. A protein molecule is a long chain containing hundreds of thousands of amino acid units, many of which are important to nutrition.

Recent studies have suggested that a substance called DNA (deoxyribonucleic acid) controls the making of proteins in the animal system, that is, that "putting together" of amino acid units.

Bundles of tiny fibers called chromosomes control heredity. And the "stuff" of chromosomes is believed to be DNA.

Genes, the factors within chromosomes that account for specific traits such as brown eyes or red hair, are thought to be segments of these long DNA molecules.

The DNA molecule, like the protein whose structure it controls, is a long chain. In fact, it is two long chains which entwine around each other and are

-more-

joined by cross-links.

These cross-links are thought to be check points in the protein constructior mechanism. Their order is a code which determines the order of various amino acids in the line-up of acid units which is called a protein.

Parallel structure between a protein and its parent DNA hints to scientists that the code of hereditary information carried by DNA in chromosomes and genes is also present in a protein.

This "information" manifests itself in the color of eyes, the color of hair, and the myriad other factors which make one human being different from another.

The DNA molecule is thought to have two functions. In addition to providing the molecular pattern for proteins, it makes copies of itself at the time cells divide.

DNA has nearly a foolproof system of duplicating itself, but it does make mistakes. Perhaps one in a million tries, reports Prof. Potter, and since the body contains billions of cells, the total number of "errors" is quite high.

By themselves these errors are quite harmless, but in the "right" conbination in a single cell they can lead to formation of a cancer cell. As the cell is copied further, the defect is transmitted into other cells.

Potter calls this "a realistic approach to the cancer problem," which explains the interest of the cancer researchers in the DNA hypothesis.

Just as the replication of cells is an aid to learning more about the life processes that are responsible for cancer, the suspected duplication of hereditary factors in proteins is a powerful tool for studying heredity.

Chemical analysis of the chains of amino acids which make up a protein is the project of Profs. Bock and Halvorson.

They hope to learn the nature of the code in DNA which controls heredity, and to determine the mechanism of the code's function in the bacterial or germ cell, the cells containing chromosomes and genes.

add two--DNA hypothesis

Bock and Halvorson are attempting to isolate molecules containing coded information, and to establish conditions in a test tube where this information can be used to make proteins.

Their work has an important foundation on the University campus.

Prof. Potter has isolated an enzyme from animal tissue which can make "copies" of DNA, if provided with a pattern DNA molecule.

Prof. Mueller has been able to "grow" virus proteins in a cell-free media or in a test tube.

Prof. Joshua Lederberg, Nobel Prize-winning geneticist now at Stanford, has shown that pure isolated DNA can carry genetic information from one bacterium to another.

And Prof. Heidelberger has interfered with the growth of cancer cells by preventing them from copying themselves; in other words, by "scrambling" coded information in the DNA.

As a necessary first step in analysis of proteins, Prof. Bock has developed a chemical method for breaking up long-chain proteins into shorter chains easier to handle in research--20 to 30 amino acid units long.

Previous protein splitting methods employed an agent such as the digestive enzyme trypsin. Trypsin and certain other enzymes can split with great selectivity because they are able to attach themselves to one particular amino acid unit, putting the splitting mechanism close to that unit.

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AT A GLANCE:

1958 University of Wisconsin Buildings

	Gifts, Grants or Self-Amortizing	State Appropriation	Total
BUILDINGS COMPLETED IN 1958			
Wisconsin Center Building	$2,300,000		$2,300,000
Holt Hall dormitories and dining unit	2,150,000		2,150,000
Birge Hall addition	250,000	$1,613,086	1,863,086
Second Eagle Heights Apartments (100)	865,000		865,000
Camp Randall Stadium addition	500,000		500,000
Genetics and Poultry Research	33,000	400,032	433,032
Pine Bluff Observatory	200,000		200,000
Babcock Hall milk drying tower	65,000	34,419	99,419
Total	$6,363,000	$2,047,537	$8,410,537
BUILDINGS UNDER WAY IN 1958			
Central Heating Station		$4,254,432	$4,254,432
Dormitories West of Elm Drive	$3,500,000		3,500,000
Third Eagle Heights Apartments (400)	3,520,000		3,520,000
Service Memorial Institute addition 2	1,755,000	255,000	2,010,000
Sterling Hall addition	1,200,000		1,200,000
Chadbourne Hall	3,210,000		3,210,000
Total	$13,185,000	$4,509,432	$17,694,432
(GRAND TOTALS	($19,548,000)	($6,556,969)	($26,104,969)

U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

1/20/59 rt

RELEASE: Immediately

MADISON--Although financing is still a question, the University of Wisconsin is prepared to continue the biggest "building boom" in its history this year, Dean Kurt Wendt, chairman of the steering committee of the Campus Planning Commission, reported recently.

A tally of University building in 1958, prepared by Vice Pres. A. W. Peterson showed buildings worth $8,410,537 completed during the year, and additional buildings worth $17,694,432 under construction but not yet completed.

All the buildings in this tally serve the Madison campus. Of the $26,104,969 in major buildings listed, $6,556,969 worth were financed from state appropriations, $19,548,000 by gifts and grants or will be self-amortizing. (See accompanying table.)

In addition to continuing construction on the $17,694,432 building program now under way, the University expects to begin building a number of additional structures both on the Madison campus and at the University of Wisconsin-Milwaukee this year.

The State Building Commission has authorized plans for $9,900,800 in buildings including a $645,000 Law Library wing, a $1,660,000 Social Studies Building, all on the Madison campus; plus a $2,194,500 Science Building, a $1,675,000 Extension Division Office Building, and a $2,250,000 Mathematics Building, a $367,500 Heating Plant expansion, and a $1,108,800 Fine Arts Building, all at the University of Wisconsin-Milwaukee.

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Possible self-amortizing or gift buildings which University authorities see ahead are a $2,000,000 first unit of the new Gymnasium and possibly other inter-collegiate athletics facilities to be financed from athletic receipts; a Medical Research Building, a $250,000 Alumni House, a Medical Library and possibly a $2,000,000 Art Center, all to be financed by gifts or grants; and a $850,000 Student Union unit at Milwaukee, to be financed by student fees.

It is improbable that some of these buildings will be started this year, University officials point out. Gift funds are now being received for the Alumni House and Medical Library but no gifts have been received for the Art Center and Gallery.

The Coordinating Committee for Higher Education has approved a $54,231,880 list of additional University buildings for submission to the Legislature for 1959-61. Although planning can begin on many of these buildings in 1959, if funds are provided, none of the major buildings could be completed during the year.

The $820,000 in emergency remodeling and repairs which heads the list could be accomplished, however, this year. Other construction topping the priorities on this list include Engineering Building completion, $5,244,750; Chemistry-Pharmacy Research, $562,500; Psychology, $2,200,000; Plant Science Wing-Agronomy, $1,800,000; all on the Madison campus.

High on the priority list also is an item of $1,600,000 for land acquisition in University interest areas. This would provide funds for limited land purchases south of University Ave. for the Madison campus and for some expansion of the Kenwood Campus at the University of Wisconsin-Milwaukee.

The major financing question involves the long-term priority list of buildings. Under the present system of borrowing funds against a percentage of expected student fees, the $9,900,800 in buildings for which planning funds have been supplied could be financed, according to Vice Pres. Peterson.

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Add two--UW buildings

To finance the $54,231,880 in buildings on the 1959-61 priority list, the Legislature could increase the percentage of fees against which to borrow, or make a direct appropriation, or authorize a combination borrowing and direct appropriation.

Gov. Gaylord Nelson has indicated that he favors direct borrowing to finance the long-term building program of the state. That procedure, however, would require the time necessary for approval of a constitutional amendment, and thus could not be expected to finance in the near future the buildings on the 1959-61 priority list.

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FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

12/11/58 eda

RELEASE: Immediately

Research Genetics

By ED AEBISCHER

MADISON, Wis.--Man's inquisitive mind is bringing him in ever-closer contact with nature's building blocks, the minute particles that comprise matter, but intrusion in this world would be impossible if it were not for instruments of increasing precision.

Such an instrument is the electron microscope, which probes matter not with rays of light as an ordinary microscope does, but with electrons, the elementary charges of negative electricity.

At the University of Wisconsin, purchase of a powerful new German-made Siemens electron microscope two years ago has aided research in fields such as cell biology, botany, chemistry, biochemistry, and medicine.

It's been possible with this instrument to observe smaller and smaller details in the organization of cells and viruses. More significant, however, is the important link it has provided between research in these diverse fields.

A good example is the tie between biology and chemistry evidenced in Dr. Hans Ris' studies on the structure of chromosomes, those rod-shaped bodies in the nucleus of every cell which are carriers of hereditary potential.

From chemistry it's known that chromosomes are a composite of nucleic acids and proteins. But that doesn't tell how the hereditary material is built into the chromosome or how it's duplicated during cell reproduction. Nor does it give information on how the gene, the biologic unit of heredity, acts.

The electron microscope provides Prof. Ris and his colleagues with the "view-power" to study fine structure and organization of chromosomes down to the size of large molecules.

-more-

Add two--electron microscope

With the "eye" of the instrument, structures that correspond to nucleo-protein molecules have been seen. Visible are fibers with thickness less than a millionth of a centimeter. Chromosomes seen previously with light ray microscopes turn out to be bundles of such nucleo-protein fibers.

Viewing of chromosome structure coupled with knowledge of chemical makeup has permitted Dr. Ris to arrive at a picture of how the cell is able to put nucleic acid and protein molecules together into a chromosome.

When the University purchased its Siemens microscope valued at nearly $30,000 in 1956, it was only the third of its kind in this country, and the first on a university campus. Now they are coming into the country at the rate of one a month.

The Siemens instrument is equipped to magnify over a range of 200 to 160,000 diameters. This peak order of magnification would make an inch look like 2½ miles.

Resolving power, the most important criterion employed in describing the capability of microscopes, is the distance between two objects in a field of view which can still be distinguished as separate objects. Resolving power of the Siemens is about 10 times the diameter of the smallest atom.

Prof. Ris feels that the most useful generalization to come out of his studies on chromosomes since 1951 is that they have the same basic organization in all cells, regardless of species. He cites as example the similarity in cells of algae and those in the human body.

Studies in progress at the University using the electron microscope include biochemistry Prof. Paul Kaesberg's work in determining size, shape, and general structure of viruses. Since different viruses show great similarity in structure, Dr. Kaesberg and his technicians use those that are easy to find. From analysis of these, the UW scientists are able to understand viruses difficult to isolate, such as the viruses of polio, and foot and mouth disease.

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U. W. NEWS

[Research/Genetics]

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

RELEASE:

7/10/58 cfg

Immediately

Dr. Ernst Freese, German-born genetic scientist presently at Harvard University, will present a lecture, "Specific Mutations Caused by Base Analogs," at the University of Wisconsin July 17.

Dr. Freese, who has spent the past five years lecturing and conducting research at California Institute of Technology, Purdue University, and Harvard, will report on recent research findings.

The research involved taking genetic material in simple organisms like bacterial viruses and causing mutations through the use of compounds similar but not identical to known mutation-causing chemicals.

This controlled research has led to interesting finds on some of the basic rules of genetic mutation.

Dr. Freese was brought to the UW campus through the combined invitation of the departments of biochemistry and genetics and is sponsored by the Graduate School.

The public is invited to the lecture which will be at 4 p.m. in 101 Biochemistry Bldg. The building is located at the corner of University Avenue and Henry Mall.

A question and anwer period will follow the lecture.

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WIRE NEWS

[Research] Genetics

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

4/7/58 cfg

RELEASE: Immediately

MADISON, Wis.--World authorities on genetics are assembling at the University of Wisconsin Medical Center for a four-day "Symposium on Genetics in Medical Research," beginning Tuesday.

Dr. John Z. Bowers, dean of the UW Medical School and chairman of the meeting, explained, "The objective of the Symposium is to crystallize knowledge in the broad field of medical genetics--ranging from man to bacteria.

"We hope to emphasize how medical progress may be furthered by genetic studies of infectious organisms as well as of their human host.

"Medical genetics has lagged behind plant and animal genetics but has shown a comparable rapid growth in the past ten years. It is hoped that an even greater interest in medical genetics in medical schools and research institutions will result from this meeting."

About two-thirds of the medical schools in the United States, a number of major research centers, the United Nations, and outstanding authorities from England, France, Italy, Japan, Australia, Canada, Sweden, and Scotland, are represented in the roster of about 125 attendants.

Ten major papers will be presented during the symposium, including one general lecture open to the public Tuesday evening.

Interested citizens are invited to attend the lecture by Dr. Curt Stern, Berkeley, Calif., on "The Chromosomes of Man." It will be given at 8 p.m. Tuesday in the Commerce building auditorium on the UW campus.

All regular sessions of the Symposium will be conducted in the Service Memorial Institutes auditorium in the Medical Center.

Formal activity will commence Tuesday morning with a welcome by UW Pres. E. B. Fred.

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[Research]
(Genetics)

University of Wisconsin
NEWS SERVICE
Madison 6, Wisconsin

OFFICE OF THE DIRECTOR

March 18, 1958

Science Editor:

A four-day "Symposium on Genetics in Medical Research" will be held at the University of Wisconsin April 7-10.

Dean John Z. Bowers of the UW Medical School has suggested that we send you a special invitation to attend since the program and roster of participants appear outstanding.

World genetics experts from England, Scotland, Sweden, Italy, and Japan are included in the listing of speakers and discussants for the program, in addition to outstanding authorities from universities and research centers throughout the United States.

We have enclosed a copy of the program and the tentative list of speakers and discussants to give you a better picture of the scope of the symposium.

The four-day affair is under co-sponsorship of the department of genetics in the College of Agriculture and the department of medical genetics in the Medical School. Chairman is Dr. John Z. Bowers and funds for the meeting were provided by a grant from the Heart Institute of the U.S. National Institutes of Health.

Purpose of the symposium is to stress the growing importance and recognition of genetics in medical research in the United States.

Sincerely,

James Larsen
Science Editor

SYMPOSIUM ON GENETICS IN MEDICAL RESEARCH

University of Wisconsin

April 7 - 10, 1958

Program

The formal program will begin on Tuesday morning, April 8. Participants will be welcome to visit their friends and colleagues, and some informal sessions may be held on Monday.

Monday, April 7

Registration, informal sessions and private visits.
Evening: "Mixer". (Tripp Commons Room, Memorial Union)

Tuesday, April 8

H. Koprowski - U.S.A.: Importance of genetics of mammalian viruses in medical research
B. A. D. Stocker - England: Bacterial genetics and infectious disease
K. C. Atwood - U.S.A.: The cellular lesion in radiation injury
Evening lecture: C. Stern - U.S.A.: The chromosomes of man

Wednesday, April 9

G. Pontecorvo - Scotland: The genetics of somatic cells
R. Ceppelini - Italy: Physiological genetics of erythocyte antigens
R. Owen - U.S.A.: Transplantation and acquired tolerance
Evening banquet: J. Neel - U.S.A.: Genes and hemoglobins

Thursday, April 10

J. B. Graham - U.S.A.: Genetic control of blood coagulation processes
A. G. Steinberg - U.S.A.: Methodology in human genetics
Panel: Selective factors in the ABO polymorphism
W. C. Boyd - U.S.A., C. A. Clarke - England, P. Levine - U.S.A., H. B. Glass - U.S.A., E. Matsunaga - Japan

In addition, a number of eminent scientists will lead informal discussions in smaller groups.

Inquiries should be addressed to James Larsen, Science Editor, UW News Service, Observatory Hill Office Bldg., Madison 6, Wis.

Speakers for Symposium on Genetics in Medical Research

Dr. K. C. Atwood III, Research Biologist, Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Dr. W. C. Boyd, Professor of Immunochemistry, Boston University School of Medicine, 80 E. Concord Street, Boston 18, Massachusetts.

Dr. R. Ceppelini, Visiting Investigator at Columbia University, Institute for Human Variation, New York 27, New York (permanent address: Research Biologist, Istituto Sieroterapico Milanese, Via Darwin 20, Milano, Italia).

Dr. C. A. Clarke, Department of Medicine, Liverpool University, Brounlaw Hill, Liverpool, England.

Dr. H. B. Glass, Professor of Biology, Johns Hopkins University, Baltimore 18, Maryland.

Dr. John Graham, Professor of Pathology, University Medical School, Chapel Hill, North Carolina.

Dr. Hilary Koprowski, Director of Wistar Institute, 36th and Woodland, Philadelphia 4, Pennsylvania.

Dr. Philip Levine, Ortho Research Foundation, Raritan, New Jersey.

Dr. J. V. Neel, Chairman of Human Genetics, University of Michigan, Ann Arbor, Mich.

Prof. Ray Owen, Professor of Biology at California Institute of Technology, Pasadena 4, California and Visiting Investigator at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Box Y.

Dr. G. Pontecorvo, The Professor of Genetics, University of Glasgow, Scotland.

Dr. Arthur G. Steinberg, Professor of Biology and Preventive Medicine, Western Reserve University, Cleveland 6, Ohio.

Dr. Curt Stern, Professor of Zoology, University of California, Berkeley 4, Calif.

Dr. Bruce Stocker, Principal Investigator, Research in Genetic Microbiology, Lister Institute, Chelsea Bridge Rd., London SW 1, England.

Some of the discussants include:

Dr. G. W. Beadle, Chairman of Biology Department and recent president of the AAAS, California Institute of Technology, Pasadena 4, California.

Dr. L. L. Cavelli-Sforza, Professor of Genetics at the University of Pavia, 18 Via Fatebenesorelle, Milano, Italia.

Dr. Alexander Hollaender, Director of the Biology Division, Oak Ridge National Laboratory, Box Y, Oak Ridge, Tennessee.

Dr. George Klein, Professor of Tumor Biology, Karolinska Institutet, Stockholm 60, Sweden.

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Dr. Ei Matsunaga, Professor of Legal Medicine, Sapporo Medical College, Minami 1, Nishi 17, Sapporo, Hokkaido, Japan.

Dr. Avrion Mitchison, Lecturer in Zoology, Harvard University, Cambridge 38, Mass.

Dr. H. J. Muller, Professor of Zoology, Jordan Hall, Indiana University, Bloomington, Indiana, and a Nobel-Laureate for his work in Genetics.

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U. W. NEWS

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

File RESEARCH

RELEASE:

3/11/58 cfg

Immediately

MADISON, Wis.--Robert L. Metzenberg, Jr., research associate in physiological chemistry at the University of Wisconsin Medical School, has been appointed a Scholar in Medical Science by the John and Mary R. Markle Foundation of New York City.

The UW faculty member is one of 25 appointees who will share in $750,000 which has been appropriated toward their support to the schools where they will teach and do research.

For each Scholar appointed, the Foundation has allocated $30,000 to the school at a rate of $6,000 per year.

The 27-year-old UW scientist has been engaged in research in the fields of biochemistry and genetics. His work in biochemistry has been connected with certain aspects of the metabolism of the liver while his genetics investigation has involved the metabolism of a mutant, how a mutant with changed metabolism requires new nutrition.

He has been involved in teaching graduate and medical students at the discussion group, laboratory, and seminar level, and has lectured on his speciality.

Purpose of the Markle Foundation program is "to strengthen medical education by offering academic security and financial help to teachers and investigators in medical schools early in their careers." In 11 years of operation, the plan has awarded $6,800,000 to 231 doctors in 74 medical schools.

The 25 Scholars were appointed from 57 candidates nominated by medical school deans throughout the country. Appointments by the Foundation range from

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13 to 25 Scholars each year.

The Foundation was established in 1927 by the late John Markle, Pennsylvania coal operator "to promote the advancement and diffusion of knowledge... and the general good of mankind."

Metzenberg came to the University of Wisconsin in 1955 as an American Cancer Society Fellow in the department of physiological chemistry. He had compiled an outstanding record in undergraduate and graduate work, receiving an A.B. degree Summa Cum Laude from Pomona, Calif., College and the Ph.D. degree from California Institute of Technology.

The undergraduate degree and honors were earned with a major in chemistry and his graduate work was in biochemistry.

Undergraduate honors included election to Phi Beta Kappa and Kappa Mu Epsilon, holding an Honorary Scholarship for three years, and designation as the outstanding senior chemistry student.

Following enrollment at California Institute of Technology, he was elected an associate member of the Society of Sigma Xi and served as a graduate assistant. He was named a McCallum Fellow in 1952 and later that year received a National Science Foundation Predoctoral Fellowship, which he held for three years.

During graduate work at CIT, he received the Thomas Morgan Hunt Memorial Award for the graduate student doing outstanding research.

The Markle Foundation appointee has contributed to numerous publications in the field of biochemistry.

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Genetics Research

FEATURE STORY

FROM THE UNIVERSITY OF WISCONSIN NEWS SERVICE, MADISON 6, WISCONSIN

12/18/56

RELEASE: Immediately

(Editor's Note: This is the second of a series of articles concerned with radiation effects and current scientific discussions over H-bomb testing and the use of x-rays. This article summarizes the geneticists' viewpoint.)

By RALPH CLARK

MADISON, Wis.--Man is not able to take any radiation into his body without risking some ill-effects -- such as an altering of genes which may produce handicapped descendants.

So stated the National Research Council's Committee on Genetic Effects of Atomic Radiation, of which Profs. James F. Crow and Sewall Wright of the University of Wisconsin's genetics department are members.

"Wherever one goes over the surface of the earth." the committee pointed out. "There is always a small amount of radiation, more in some places than in others. It is called 'background' radiation. It comes mainly from two sources. One is naturally radioactive substances, such as uranium and radium, found in rocks and soil.

"The other is cosmic radiation. Cosmic rays are absorbed as they pass downward through the atmosphere so that background radiation from this source is greater the higher one goes."

There are also man-made sources of radiation. Of these medical and dental x-rays are by far the most important.

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ad one--effects of radiation on the body

"Any amount of radiation is harmful to the future welfare of mankind," Crow said. "From the genetic standpoint, there is no such thing as a 'safe' amount of radiation. Any unnecessary radiation that reaches the reproductive cells is too much radiation. Of course, if the amount is small, the risk is correspondingly small."

"Medical and dental x-rays and fluoroscopic examinations are a necessary adjunct to scientific medicine. But every precaution should be taken to reduce to a minimum the amount of radiation received by the reproductive cells. This can be usually done by proper shielding.

"Beneficial effects of radiation must be balanced against the possibility of harm to future generations. No one can question the necessity for certain medical radiations, but, in my opinion, such things as x-ray shoe fitting machines are likely to do more harm than good," Crow added.

Another source of radiation comes from the fall-out of atomic explosions.

"Every bomb or 'device' that is set off throws into the air huge clouds of radioactive particles, some of which are carried great distances by the winds of the upper air, and settle out gradually over the whole earth," the genetic committee stated.

"The H-bomb testing program gives another source of radiation to add to that which mankind already receives," Crow explained. "But the amount so far is much less than that from natural sources. However, this does not mean it is entirely harmless.

"Disagreement occurs on the dangers of radioactive bone-cancer producing strontium-90 because we don't know how harmful it actually is," he said. "We haven't had enough experience with it on man."

What are the effects of radiation on humans?

The gonads -- sex organs -- are by far the most sensitive to radiation, the genetic committee stated. Any radiation which reaches the reproductive cells causes mutations that are passed on to succeeding generations.

-more-

ad two--effects of radiation of the body

What are mutations?

Hair and eye color, color of skin, straight or curly hair, height and other physical characteristics, are inherited from ancestors. The carriers of these features are the minute genes which are passed on to generation after generation. When a gene's makeup is altered, mutations--such as six fingers on one hand--result.

"But most mutations do not have such conspicuous results," Crow said. "They simply add to our existing health burdens by making persons more prone to disease, or by shortening life, or causing impairment of body functions in many ways."

Any amount of radiation that reaches the reproductive cells, or genes, can cause mutations, the genetic committee stated. The more radiation, the more mutations occur.

How can we control the amount of radiation we receive?

The genetics committee gives this advice:

Accurate records should be kept for every individual, showing his total accumulated lifetime exposure to radiation, and the medical use of x-rays should be reduced as much as is consistent with medical necessity.

"The concept of a safe rate of radiation simply does not make sense," the genetic oommittee stated. "Geneticists prefer differing ways of describing this situation, but they all come out with the unanimous conclusion that the potential danger is great."

(The third article of this series will explain in greater detail the viewpoints of the radiologists about the use of x-rays.)

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