

HOTLINE

The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility

Prager to Lead PPPL

Stewart Prager, director of the Madison Symmetric Torus experiment at the University of Wisconsin and an internationally recognized leader in the field of fusion energy research, has been named director of PPPL, effective this fall. A.J. Stewart Smith, Princeton's dean of research, announced the news to PPPL staff at a July 18 all-hands meeting.



Stewart Prager

Prager, who also is the Dexter Professor of Physics at Wisconsin, will become the sixth director of the Laboratory. His appointment as a professor of astrophysical sciences at Princeton is expected to be acted on in the fall.

"We believe that there is no better person than Stewart Prager to lead the Plasma Physics Laboratory as it moves into the next phase in its distinguished history," said Princeton President Shirley M. Tilghman. "The need for safe, abundant and environmentally benign sources of energy has never been greater, and we are confident that under his leadership PPPL will continue to make exceptional contributions to the field of fusion energy."

Provost Christopher Eisgruber added, "Stewart Prager is not only a superb scientist, but also a proven leader of the nation's fusion research community. All of us at Princeton are absolutely delighted that Dr. Prager has agreed to take the helm at the laboratory."

Prager joined the Wisconsin faculty in 1977 after conducting research for two years with the Fusion Energy Group at General Atomics in San Diego. He is a pioneer in

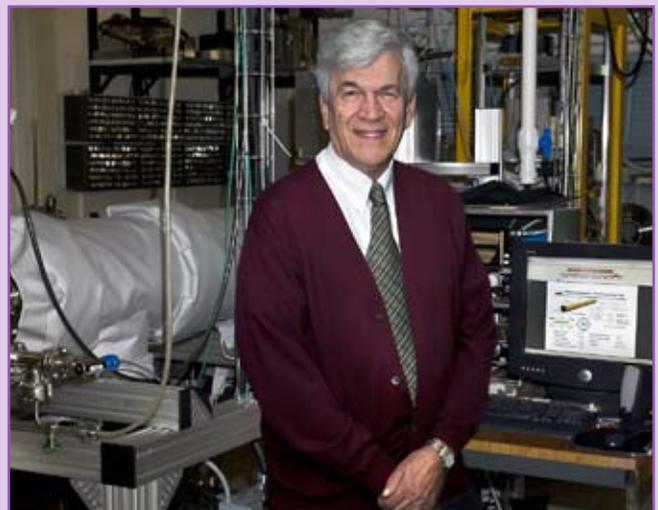
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PPPL's Davidson to Receive Maxwell Prize

Ronald C. Davidson, a professor at Princeton University and PPPL physicist, is the 2008 recipient of the American Physical Society's James Clerk Maxwell Prize for Plasma Physics. The prize recognizes Davidson for his outstanding contributions to the field of plasma physics. He will receive it at the American Physical Society-Division of Plasma Physics (APS-DPP) annual meeting in Dallas this November.

Davidson (at right) is being recognized for work relating to nonneutral plasmas and the behavior of charged particles making up intense beams, including the collective nonlinear interactions among the particles. A nonneutral plasma is a many-body collection of charged particles in which there isn't overall charge neutrality, with many applications such as improved atomic clocks and free electron lasers. Intense charged beams have applications in several areas of science and technology, including particle physics and nuclear physics, ion-beam-driven heavy ion fusion, high energy density physics, and proton beams used in cancer therapy.

PPPL Director Rob Goldston said, "Ron Davidson is a prodigiously productive scientist. His work, and the work



of his group, has defined the field of non-neutral plasmas, including the intense beams that are effectively very-fast-moving plasmas of this type. In parallel with this he has

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the field of plasma physics and is internationally known for experiments that have contributed to both fundamental knowledge and the design of future reactors.

Prager has made his name as an experimentalist in the quest to develop fusion energy and has played a key role for decades in efforts to harness the energy potential of nuclear fusion.

On the Wisconsin “Levitated Octupole” experiment, Prager worked with a graduate student, Michael Zarnstorff, now a PPPL principal research physicist, detecting for the first time the so-called bootstrap current, named because the electrical current is generated by the plasma itself. Prager and Zarnstorff will receive the American Physical Society’s Dawson Prize for Excellence in Plasma Physics this November.

Prager has led research on another experimental device, the DOE-funded Madison Symmetric Torus, directing a group that was the first in the world to completely characterize the chaotic flow of the charged gases swirling within. Shaped like a donut, the MST holds plasma heated to 10 million degrees. But instead of using a strong magnetic field to hold the plasma, Prager and his team have explored whether weaker — and therefore more economical — magnetic fields could accomplish the same task. The work has led to new insights about the properties of plasma.

Experiments that help identify and understand such phenomena are critical to the eventual goal of producing commercially viable fusion power plants.

Prager also has led the Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas. Funded by the National Science Foundation, the “physics frontier center” involves Wisconsin, Princeton and five other institutions.

In addition, Prager has provided exemplary service to the plasma physics community through his role on many prominent national panels and advisory committees. He has served as chair

of DOE’s Fusion Energy Sciences Advisory Committee, chair of the Division of Plasma Physics of the American Physical Society, president of the University Fusion Association and a member of the fusion review panel of President Clinton’s Committee of Advisers on Science and Technology.

Prager received bachelor’s degrees from Queens College of the City University of New York and from Columbia University, and a Ph.D. in plasma physics from Columbia.

International Search

Prager’s appointment, which concludes an international search, comes at a time of transition for PPPL. At the direction of DOE, the Lab is in the process of phasing out construction of the National Compact Stellarator Experiment (NCSX) and enhancing its flagship program, the National Spherical Torus Experiment (NSTX). This approach is intended to ensure the Lab’s future as a world-leading center of fusion energy and plasma sciences.

PPPL is one of 10 national science laboratories funded by DOE’s Office of Science. As the department completes a series of competitive bidding processes for the management and operations contracts for all of these labs, Princeton currently is competing for a new contract to continue managing the Lab. The University has managed the Lab successfully since its inception in 1951.

“In Stewart Prager we have recruited the very best person to lead PPPL. Not only does he bring superb scientific credentials, but also proven experience in management, and an outstanding record on the national fusion scene,” said Smith, to whom Prager will report. “I simply could not be more enthusiastic.”

Prager will succeed Robert Goldston, who has been director of PPPL since July 1997. Goldston, who also is a professor of astrophysical sciences, announced last December that he would step down as director when a successor was in place to focus on a broad range of domestic and international fusion energy initiatives. ● — *Ruth Stevens, Princeton University*



Read The DOE Pulse

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HOTLINE

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The HOTLINE is issued by the Princeton Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. It is primarily an internal publication. Correspondence and requests to reprint material should be directed to the Editor, PPPL HOTLINE, P.O. Box 451, Princeton, NJ 08543; Interoffice correspondence should be addressed to MS-38, LSB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2757; e-mail pwieser@pppl.gov.

Davidson

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found time to contribute strongly to the leadership of PPPL's Theory Department, and working with the National Academy, to lead a group that has provided the fundamental road map for the future of high-energy-density plasma physics. Ron's successful and broad scientific career makes him more than deserving of this highest award in plasma physics."

Davidson is a professor of Astrophysical Sciences at Princeton and Deputy Head of PPPL's Theory Department and Head of PPPL's Beam Dynamics and Nonneutral Plasma Division. He is Deputy Director of the Virtual National Laboratory for Heavy Ion Fusion Science, a collaborative effort among PPPL, Lawrence Berkeley National Laboratory, and Lawrence Livermore National Laboratory. He has been the Editor of the journal, *Physics of Plasmas*, since 1991.

Champion of Plasma Physics

Davidson's colleagues lauded his achievements in plasma physics. "Ron is arguably the most significant and recognizable leader and champion of plasma physics alive today," said Tom Katsouleas, Professor and Dean at Duke University Pratt School of Engineering.

Added Amitava Bhattacharjee, Paul Professor of Space Science and Physics at the University of New Hampshire, and Chair-Elect, Division of Plasma Physics, APS, "Professor Davidson's fundamental contributions to plasma kinetic theory has had very broad impact in the diverse areas of beam and accelerator physics, free-electron lasers, space plasma physics, and non-neutral plasmas. His encyclopedic knowledge and deep understanding of these areas is reflected in his textbooks, some of which have become classics in the field and have educated several generations of scholars."

Grant Logan, Director of the U.S. Heavy Ion Fusion Science Virtual National Laboratory, said he and his staff are especially grateful for Davidson's important scientific

contributions and wise guidance. "Because of Ron Davidson, we still have hope for the eventual fruition of heavy ion fusion," Logan said.

Since graduating from Princeton University with a Ph.D. in plasma physics in 1966, Davidson has held a number of distinguished positions, including PPPL Director and Director of MIT's Plasma Fusion Center, in addition to being a professor at several academic institutions. He has made fundamental theoretical contributions to many areas of pure and applied physics, is the author of more than 350 archival journal articles and books, including four advanced graduate-level texts and research monographs, and has made important contributions to graduate education and the training of research scientists.

Davidson is the recipient of numerous awards, including the IEEE Particle Accelerator Science and Technology Award, the Kaul Foundation Award for Excellence in plasma physics and fusion energy development, the DOE's Distinguished Associate Award, and the Fusion Power Associates' Leadership Award (1986). He is a Fellow of the APS and the American Association for the Advancement of Science.

The James Clerk Maxwell Prize for Plasma Physics, presented annually, consists of \$10,000 and a certificate citing the contributions made by the recipient. It was established in 1975 by the Maxwell Technologies, Inc., in honor of Scottish physicist James Clerk Maxwell, and is presently sponsored by General Atomics in San Diego. The prize is given for outstanding contributions to the advancement and diffusion of the knowledge of properties of highly ionized gases of natural or laboratory origin.

Past PPPL recipients of the Maxwell Prize include Lyman Spitzer in 1975, Thomas Stix in 1980, Harold Furth in 1983, Russell Kulsrud in 1993, and Nathaniel Fisch in 2005. ●

Dusty Plasma Experiment Team Takes Flight

Four students from The College of New Jersey who are collaborating with PPPL took their Dusty Plasma Experiment (DPX) on a special zero gravity flight in June. Team DPX went to NASA's Microgravity University in Houston to carry out, "Using Fluorescent Dust to Obtain a Three-Dimensional Analysis of a Dusty Plasma," in a weightless environment aboard a DC-9 plane affectionately known as the "Vomit Comet." PPPL Science Education Program Head Andrew Zwicker is one of the team's advisors. At right are Rachel Sherman (left) and Team DPX leader Mike Hvasta. Other team members are Brandon Bentzley and Justin Nieusma. The DOE Office of Science-Fusion Energy Sciences provided some funding. ●



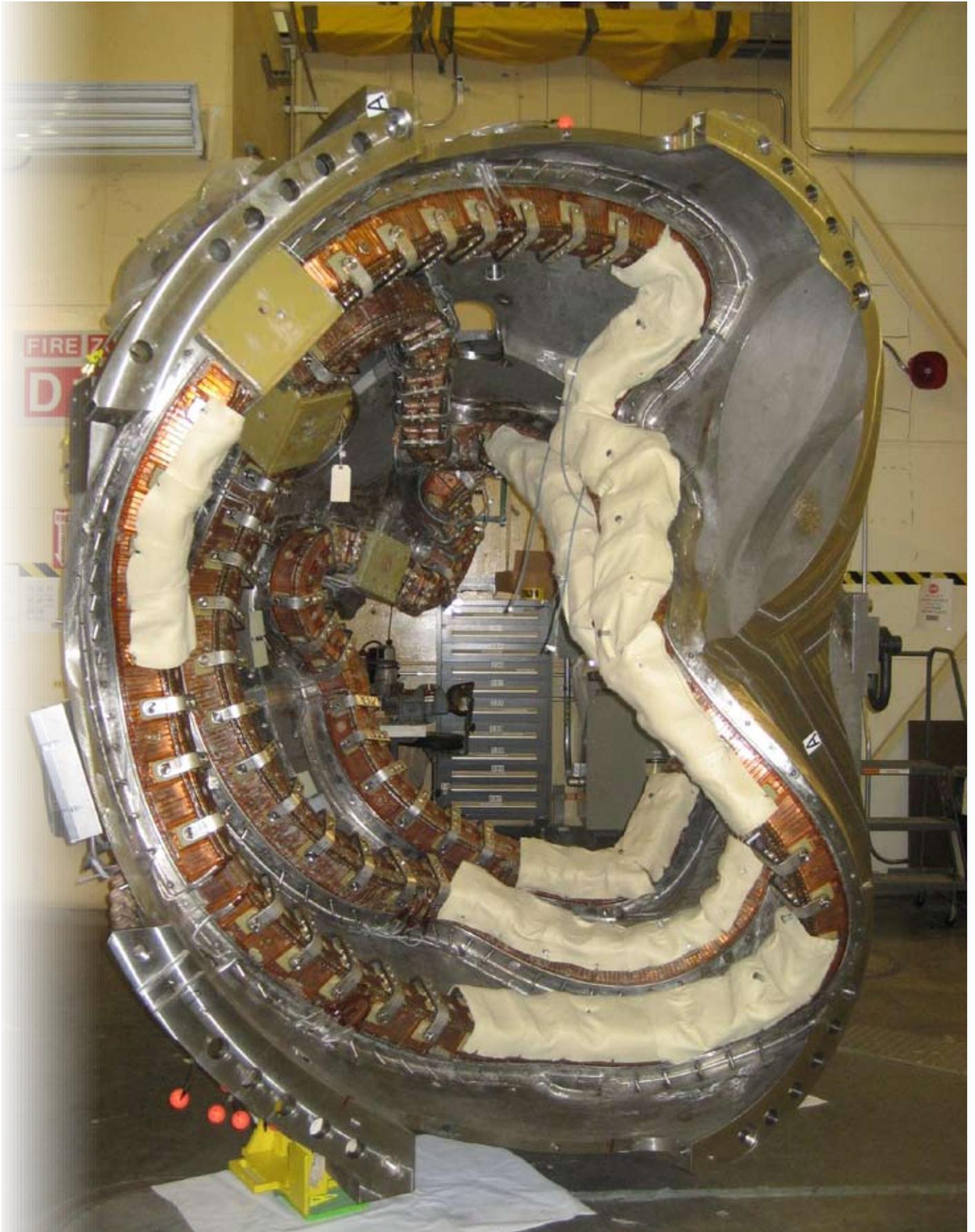
NCSX Team Completes Three-Pack

As part of the closeout of the National Compact Stellarator Experiment (NCSX), the project team brought together three modular coils into a half-period assembly, or "three-pack."

At right are the fully welded, dimensionally compliant coils. The design includes 18 modular coils. This is one of six sets — each comprised of three coil types — that were to be fabricated. The coils would have provided magnetic fields to shape plasma inside the machine's vacuum vessel. The Lab is phasing out construction of NCSX. The team plans to test the fit-up of this three-pack around a vacuum vessel sub assembly, and to weld together a second three-pack before the components are stored.

"The team deserves our thanks and praise for this major accomplishment!" says NCSX Project Head Don Rej. Adds PPPL Director Rob Goldston, "Astonishing! Great job!"

Photo by Mike Viola



PPPL's Plasma Camp Celebrates 10th Year



Plasma Camp Master Teacher Nick Guilbert (far right) works with 2008 Plasma Camp participants in the Science Education Lab.



Teachers (from left) Christopher Davis and Russell Verburg work on a DC glow discharge experiment at Plasma Camp.

Iowa science teacher Russell Verburg jotted down measurements as he watched a purple gas glow in a tube at the PPPL Science Education Laboratory.

"I knew very little about plasma before I came here," said Verburg, who teamed up with Franklin High School (New Jersey) teacher Christopher Davis for a science exercise during the tenth annual Plasma Camp at PPPL July 21-25.

The two were among 10 high school physics teachers from across the country who participated in the camp, officially called The Plasma Science and Fusion Energy Institute. The teachers worked with plasma balls, half-coated fluorescent light bulbs, and DC glow discharge tubes, toured the experimental areas at the Lab, and wrote original plasma-specific curricula to use in their classrooms this year.

Plasma Camp Master Teacher Nick Guilbert, a physics teacher at the Peddie School in Hightstown, led the workshop, with help from PPPL Science Education Head Andrew Zwicker and administrator James Morgan.

"The participants are eclectic. They have a wide range of college, teaching experience, and geographic locations," said Guilbert, who has been a Master Teacher for all 10 years.

Zwicker, who created the Plasma Camp, said, "We are excited to complete our tenth successful year."

Survey Past Participants

As part of the tenth anniversary, all past participants were surveyed to determine how they incorporate into their classrooms what they learned in the workshop. "Initial results indicate that most teachers institutionalize their plasma curricula using it on a yearly basis with their students," Zwicker said.

Old Bridge High School teacher Doreen Nuzzolese, a past summer student at PPPL, conducted the surveys and will be presenting the findings at APS this year.

Several 2008 participants said they would bring their new-found knowledge to their classrooms.

"I've definitely learned a lot about plasmas," said Verburg, who teaches physics and chemistry to Hull, Iowa, high school students.

Added St. Johnsbury, Vermont, teacher William Vinton, "I plan to take [what I learned about plasmas] back to the classroom." ●



PARTY TIME



Summer high school, college and grad students mingled with PPPL staff and Plasma Camp participants at an ice-cream party in July for the Lab's Science Education summer program participants. The revelers scooped up chocolate chip mint, cherry and other frozen confections in the Science Ed Lab. ●

Spotlight



Name: Tiana Dodson

Position: Dodson is a mechanical engineer. She joined PPPL as a summer intern in 2006 after receiving a bachelor's degree in mechanical engineering from Howard University. She became a term employee a few months later.

Dodson is the lead engineer on the photogrammetry software and systems at the National Compact Stellarator Experiment (NCSX) and is working on the NCSX closeout. In addition to field period assembly work and performing laser tracker measurements at NCSX, Dodson's responsibilities have included measuring various diagnostics in the National Spherical Torus Experiment (NSTX) vacuum vessel and designing the planned platform extension for NSTX. She also is a member of the PPPL Work-for-Others project on the High Average Power Laser program, where she worked on a magnetic intervention concept for keeping hot ions off the walls of an Inertial Fusion Energy target chamber. Dodson is a member of the American Society of Mechanical Engineers and the Coordinate Metrology Systems Conference Society. She is currently pursuing a professional engineering license and preparing to take her Engineering-in-Training exams.

Quote: "It's almost like I'm getting paid to play; translation: I find the Lab to be challenging and fun. I enjoy being part of a future solution to the energy crisis," says Dodson. "The Lab is absolutely fascinating. It's a place where I couldn't get bored."

She arrives each day at 7 a.m. to tackle various engineering tasks under the supervision of PPPL's Charles Gentile. She also is active in PPPL's outreach activities, including co-organizing the Young Women's Conference with the Lab's Chris Ritter and Lena Scimeca, volunteering as a timekeeper at the middle school and high school science bowls hosted by the Lab, speaking to visiting student groups about careers in engineering, and serving as a tour guide. "I love doing outreach," says Dodson, who also works with summer student interns at PPPL.

Dodson says she intended to become a math teacher but a high school experience shadowing an engineer shifted her focus to engineering. "I was in the tenth grade when I spent a day at an engineering firm," she says. "And I always tinkered with things. I liked to take things apart and see how they worked."

Dodson says she chose mechanical engineering because it is the broadest engineering discipline. "I am able to transfer my skills to other types of engineering," she notes.

Other Interests: Dodson enjoys music, art, vacationing, and mentoring and teaching students, as well as visiting her family

in Colorado. She presently teaches SAT test prep at area schools, including West Windsor-Plainsboro North High School. "To whom much is given, much is expected," she quotes.

She unwinds at lunchtime, joining fellow engineers in the Cafeteria to discuss a range of topics, from golf and politics to personal lives and travel. Dodson is especially passionate about travel. She has a Wyndham timeshare at the Skyline Towers in Atlantic City. In 2009, she hopes to use some timeshare points for a Hawaiian vacation. In November, she's renting a place in Mexico for Thanksgiving with her best friend. "We may not eat turkey, but we'll be tan."

The Philadelphia native, who grew up in Colorado Springs, Colo., also makes frequent treks home to visit her mother and sister. Growing up in Colorado, she was interested in art and music, as well as math. As a fifth-grader, she won the Crayola DREAM MAKERS Award with a chalk drawing, "Deer Roaming at Night." The piece traveled nationally and she made an accompanying commercial that aired in Denver.

By the end of middle school, Dodson took up the accordion. "I wanted to play violin, but the instruments were expensive and so were the lessons." The Rocky Mountain Accordion Society offered free lessons and provided an accordion for introductory classes. "Accordions are not cool, so it was a secret side project," Dodson says.

While no longer a practicing accordionist, Dodson remains a music aficionado, with choir, solo, and duet experience during her formative and college years. Now, she says, she enjoys singing informally.

"I like to sing in the shower and in the car — wherever I can discretely belt it out," Dodson says. (*Maybe there's a spot for Tiana in this year's holiday skit.*) ●





How Does Your Garden Grow?



PPPL staff and summer students (from left) Thomas McGeachen, Jerry Siminoff, Joanne Bianco, Carl Stokley, Anthony Brooks, Virginia Finley, and John Bennevich donated, planted, and tend a garden outside the Harold Furth Library.