

Calendar of Events

WEDNESDAY, JUNE 1

PPPL Colloquium

4:15 p.m. ♦ MBG Auditorium

[Extending the ice core record of atmospheric composition and the global carbon and oxygen cycles beyond 1 million years](#)

Professor John Higgins,
Princeton University

UPCOMING

JUNE 6-10

SULI program begins with one-week course for students

WEDNESDAY, JUNE 8

Inventors Recognition Dinner

6 p.m. ♦ Prospect House

MONDAY, JUNE 20

Mandatory All-Hands Safety Meeting

[See page 6 for details.](#)

JUNE 28-30

US-PRC Magnetic Fusion Collaboration Workshop

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All-Hands Safety Meeting **6**

Inventor Recognition Dinner **6**

Robotics Coaches Needed **6**

Colloquium **7**

Menu **7**

US DOE Secretary Moniz, dignitaries help dedicate PPPL's flagship fusion experiment

By Jeanne Jackson DeVoe

It was a day of celebration at PPPL on Friday, May 20, when U.S. Secretary of Energy Ernest Moniz, U.S. Sen. Cory Booker (D-NJ), and U.S. Rep. Bonnie Watson Coleman (D-12), all came to the Laboratory to dedicate the Laboratory's newly rebuilt \$94 million upgrade to the National Spherical Torus Experiment (NSTX-U).



U.S. Department of Energy Secretary Ernest Moniz, center, tours the \$94 million National Spherical Torus Experiment-Upgrade with, from left: Stefan Gerhardt, PPPL physicist; Christopher L. Eisgruber, Princeton University president; David McComas, Princeton University vice-president for PPPL; U.S. Sen. Cory Booker, U.S. Rep. Bonnie Watson Coleman, and Stewart Prager, PPPL director.

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Ronald Davidson, former director of the Princeton Plasma Physics Laboratory, pioneering physicist, author, and professor passes away

By Jeanne Jackson DeVoe



Ron Davidson

Ronald C. Davidson, a pioneering plasma physicist for 50 years who directed PPPL during a crucial period of its history and was a founding director of the Plasma Fusion Center at the Massachusetts Institute of Technology (MIT), passed away from complications of pneumonia at his home in Cranbury on May 19. He was 74.

"Ron was an anchor for the Laboratory both through his science and through his wisdom," said Stewart Prager, director of PPPL. "His prodigious contributions not just to PPPL's science but also to plasma physics writ large are clear and widely known. Within the Laboratory, he was a mentor and a guide to people young and old. His impact within the Laboratory was enormous."

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NSTX-U dedication

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Moniz, Booker, and Coleman, along with Princeton President Christopher L. Eisgruber, former Congressman Rush Holt, Princeton Mayor Liz Lempert, Plainsboro Mayor Peter Cantu, Assemblyman Andrew Zwicker (D-16), and state Sen. Linda Greenstein (D-14) all toured the new facility. Physicist Stefan Gerhardt, head of experimental research operations on the NSTX-U, described its operation.

Moniz then unveiled a plaque in the NSTX-U Control Room dedicating the NSTX-U as a “Star on Earth” that will “produce high performance plasmas, hotter than the core of the sun and explore the use of fusion power to create clean, safe and abundant energy for mankind.”

“I want to congratulate all of you,” Moniz said at the ceremony. “These are complex engineering challenges that lead to great science. We’re looking forward to seeing that science over the next 10 years. The challenges are enormous. We know that.”

“A big step”

“This is a big step for our fusion program, for the international fusion program and for the broad step as well of understanding the challenges in plasma science,” Moniz added.

Booker said his goal for the United States is to continue to lead other countries as “the exporter of innovation, of scientific breakthroughs. To do that you have to invest,” he said.

Booker said innovation can “help the poorest of our citizens make better lives,” and reduce air pollution that is linked to asthma in Trenton and in Booker’s hometown of Newark that are three times that of the rest of New Jersey. “These issues for me become very personal,” he said. “Of all the U.S. senators, I perhaps return to the poorest census tract. I live in an inner city community right next to some high-rise projects.”

“I’m so proud to be with scientists and engineers who are working on something that could really take humanity a bold step forward and deal with so many of our planet’s problems,” Booker said.



Engineers and physicists watch the dedication in the Control Room.

Solving problems caused by climate change

A breakthrough in fusion energy will help solve a wide array of problems arising from climate change, Booker said. “I just want to thank you on behalf of folks whose futures could be brighter,” Booker said. “A star is truly the right metaphor because the light you all represent is casting away a tremendous amount of darkness.”

Watson Coleman said she was honored to be at PPPL, where her predecessor, Rush Holt, was assistant director. “While I may not completely understand the science of it,” she said, “I do understand that we need to have clean energy, we need to have sustainable and predictable energy, and we need to have energy that we’re not dependent on other places for.”



Secretary Ernest Moniz, along with Senator Booker, and Rep. Bonnie Watson Coleman unveil a plaque dedicating the Princeton Plasma Physics Laboratory’s \$94 million fusion experiment, the National Spherical Torus Experiment-Upgrade (NSTX-U) in the NSTX-U Control Room at PPPL.



Senator Cory Booker makes remarks in the NSTX-U Control Room Annex.

Stewart Prager, PPPL’s director, said that about 350 researchers from all over the world collaborate on the NSTX-U as a research team. “Everyone shares data with everyone else to try to understand how this plasma behaves and to try to control it,” he said.

Jonathan Menard, program director for NSTX-U, noted that PPPL collaborates with 55 institutions, 33 of which are in the United States and 22 of which are U.S. universities. The NSTX-U will produce 2,000 plasma pulses a year, Menard said. “The overall goal is to really ramp up performance to get about 10 times closer to fusion,” he said.

A goal to reduce carbon emissions

Moniz said the international Paris Agreement to reduce carbon emissions, which he helped negotiate, was a “big first step in addressing the global warming and climate change challenges” facing the world. There will have to be major challenges in meeting those goals, he said. The two necessary steps are managing the demand for energy and “decarbonizing the electrical sector rapidly.”

The Department of Energy’s philosophy in accomplishing that goal, Moniz said, is to “support a portfolio of technologies that lead us to that deep decarbonization by the target year of 2025.” Fusion energy could be part of that solution by the middle of the century if scientists and engineers continue their progress on research, Moniz said. “This is the kind of innovation we need in our portfolio of alternatives,” he said. “We need to pursue it and our other options aggressively.”

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NSTX-U dedication

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Stewart Prager, director of PPPL, left, and Secretary Moniz, take questions from the crowd at the all-hands meeting.

The event was covered by 10 media organizations, including WHYY radio, the Philadelphia public radio station; CBS 3 Philadelphia, ABC TV6 Philadelphia, the Times of Trenton, New Jersey public television news; Gizmodo.com; and Princeton University. Several scientists, including Francesca Poli; Clayton Myers; Menard; Mike Zarnstorff, deputy director for research; and Prager gave interviews.

“A heroic effort”

In the all-hands meeting following the press event, Prager said the work of engineers and technicians on NSTX-U was “a heroic effort.” “When we meet here in 10 years, what might we have accomplished?” he asked. If research on NSTX-U is successful over the next decade, it will provide the scientific basis to “embark on the design and construction of a fusion power plant to demonstrate net electricity,” he said. It could also solve the problem of what materials can be used to surround the 100-million degree plasma, Prager said. And NSTX-U research will be applied to the international ITER experiment, which might be starting operations by then.

Moniz began his remarks by recognizing the eight PPPL physicists who won Presidential or DOE Early Career Awards. He also remembered physicist and former director Ron Davidson, with whom he worked at MIT and who passed away the previous day. “Ron was a great friend and obviously we miss him,” Moniz said.



Stewart Prager, director of PPPL, left; Christopher L. Eisgruber, Princeton University president, center; and David McComas, Princeton University vice president for PPPL, cut a cake celebrating the dedication.



Paul Henderson asks a question at the all-hands meeting in the MBG Auditorium.

Moniz said PPPL’s “strong connection” with Princeton University “is a big benefit to everyone, including us. I think we get great value from this.”

He noted that President Obama and 19 other leaders at the Paris climate talks committed to doubling research and development funding over the next five years. The DOE has committed an additional \$5 million to that funding, Moniz said.

In answer to a question regarding the various approaches to fusion energy in the international fusion program, Moniz said that U.S. scientists are collaborating with fusion scientists all over the world. “This is a field where there is a better balance between international collaboration and international cooperation than there is in several other fields,” he said.



Enjoying the party celebrating the NSTX-U dedication are from left to right: Barbara Mooring, Marissa Zara, Arlene White, Angela Breland-Jackson, Alana Coleman and Casey Collins.

Toasting a new era

At the conclusion of the Moniz talk, dozens of PPPL employees gathered in the LSB lobby for the celebration. Stewart Prager, director of the Laboratory, noted that the celebration was bittersweet due to the deaths that week of Davidson and Susan Dever, an administrative assistant in Best Practices and Outreach, who had been at PPPL for about a year.

PPPL staff members raised glasses of sparkling cider and grape juice to toast the dawn of a new era at PPPL. Princeton University President Christopher Eisgruber and Dave McComas, Princeton vice president for PPPL, helped Prager cut the celebratory cake and joined in the toast.

Prager said he and other Laboratory leaders are “very proud” of the work on the NSTX-U. “Use your imaginations and make believe you’re drinking real champagne,” Prager said. “We’re toasting the future and the next decade or more of energy science that’s going to come to PPPL.” 🍷

(Photos by Denise Applewhite/Princeton University)

Ron Davidson

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The physicist won numerous honors in his lifetime, including the prestigious James Clerk Maxwell Prize in Plasma Physics in 2008, the highest national honor in plasma physics. He was a fellow of both the American Physical Society and the American Association for the Advancement of Science.

Davidson was known as a prolific researcher, writer and academic who managed to keep many professional balls in the air at one time. He was editor of the *Physics of Plasmas* for 24 years from 1991 until last year. At the same time, he was a professor in Princeton University's Department of Astrophysical Sciences until 2011. A prolific researcher up until his death, Davidson was the author of four graduate-level plasma physics textbooks and more than 500 articles.

Davidson was an expert in fields that include high-intensity charged particle beams, which studies the collective behavior of billions of charged particles that speed together through accelerators and can fly apart and burst against the accelerator's walls and ruin experiments. His contributions to understanding the behavior of these huge collections of particles, which are denser than those in today's accelerators, could be applied to inertial confinement fusion and could greatly increase the scientific contributions from future accelerators.



Davidson, right, with Harold P. Furth, front left, who preceded him as the director of PPPL, Lyman Spitzer Jr., back left, the founder of PPPL, and Melvin B. Gottlieb, the second director.

Director of PPPL from 1991 to 1996

The director of PPPL from 1991 to 1996, Davidson "led the Laboratory through the tremendous accomplishments of the Tokamak Fusion Test Reactor," Prager said. Davidson led PPPL when TFTR began using a mixture of half deuterium and half tritium for fuel in 1993. In November 1994, the TFTR achieved 10.7 million watts of fusion energy, a world record at the time and enough to power up to 3,000 homes. The machine was shut down in 1997 after Davidson stepped down as director. It set many world records.

Davidson was a native of Canada who grew up on a family dairy farm near Norwich, Ontario. He was driving a tractor by age 11, while attending elementary school in a one-room schoolhouse. He credited the hard work of farm life with teaching him the value of a strong work ethic, rising early, and getting work done on time.

He became interested in plasma physics while studying physics at McMaster University in Hamilton, Ontario. He had considered attending graduate school at the University of Illinois, but his fiancée, Jean, who was his high school sweetheart, wanted to go to the Princeton area. Davidson enrolled in the new Princeton Program in Plasma Physics, then directed by physicist Thomas Stix, and graduated in 1966 after just three years when he was 25.



Davidson in his office when he was director of PPPL.

Davidson worked at several institutions over the next decade or so. He did postdoctoral research at the University of California-Berkeley for two years. He went on to become a physics professor at the University of Maryland for a decade, with one year as a visiting researcher at Los Alamos National Laboratory. He spent two years as assistant director for Applied Plasma Physics in the Department of Energy in Washington, D.C., before going to M.I.T.

Director of MIT's Plasma Fusion Center

As director of MIT's Plasma Fusion Center, Davidson was able to unify various departments into one central organization at a time when the Alcator C, an early version of today's Alcator C-Mod tokamak, had just been completed.

"His biggest contribution was taking the plasma activities at MIT from a group of warring fiefdoms to a unified and productive laboratory," said Ronald Parker, a professor of nuclear engineering and electrical engineering and computer science emeritus who succeeded Davidson as the director in 1988. "He basically put MIT's Plasma Fusion Center on the map."

"He established a whole new organization. I was very impressed with what he did," said Miklos Porkolab, an MIT professor of physics and another former director of the Plasma Fusion Center. "What we have now is more or less following the way he set it up."

After spending a decade as director at MIT and three more years on the faculty, Davidson became director of PPPL in 1991. He came to the Laboratory during a challenging time when the Lab was preparing the TFTR for experiments with deuterium and tritium, recalls Dale Meade, who was deputy director at that time. The experiment was a 24-hour-a-day, seven-day-a-week enterprise and broke new ground in fusion energy research, Meade said.

Davidson kept notes on all the experiments in small green spiral notebooks, Meade said. Every Sunday morning, he would call Meade and department heads for a full report. "He was just amazing in terms of how organized he was and how thorough in terms of analyzing the situation and developing plans to move forward," Meade said. "What made it all even more pleasurable is he was so easy to work for and work with. He was extremely personable."

Rich Hawryluk, the head of ITER and Tokamaks at PPPL, was head of TFTR when Davidson was director. He recalled Davidson was always a straight shooter. "You could go and talk to him and get a straight clear answer that let you move forward," he said.

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Ron Davidson

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Davidson poses in a mock-up of the Tokamak Fusion Test Reactor.

PPPL physicist Rob Goldston, who succeeded Davidson as PPPL director, said he often went to Davidson for advice. “He just had a very clear moral compass,” Goldston said. “Many of us looked over his shoulder to see which way it was pointing. It was pretty clear to him what was right and wrong.”

Early textbook in the field

Nat Fisch, director of the Princeton Program in Plasma Physics, recalls using Davidson’s 1972 book, “Methods in Nonlinear Plasma Theory,” in graduate school. “He believed in explaining himself and people grew up on his textbooks,” Fisch said. Davidson also wrote “Theory of Nonneutral Plasmas” (1974), “Physics of Nonneutral Plasmas” (1990), and, with PPPL physicist Hong Qin, “Physics of Intense Charged Particle Beams in High-Energy Accelerators” (2001).

A professor at Princeton University for 20 years, Davidson served as associate chair in the Department of Astrophysics. Adam Sefkow, a physicist at Sandia National Laboratory, one of many graduate students whom Davidson advised, recalled that Davidson was “an excellent mentor. He was very patient - a top-shelf scientist,” Sefkow said. “He led by example with his wisdom and judgment, his intelligence and productivity.”

Numerous research projects

After stepping down as director of PPPL, Davidson continued his work editing the journal *Physics of Plasmas* and working on numerous research projects. He was deputy director of the U.S. Heavy Ion Fusion Science Virtual National Laboratory, a collaboration with the Lawrence Livermore and Lawrence Berkeley national laboratories. He also worked on the Paul Trap Simulator Experiment at PPPL, which simulated a particle accelerator. Both projects ended in 2012. “I felt like I couldn’t have been luckier to work under someone like Ron,” said PPPL physicist Erik Gilson. “The scientific direction, the way he led our programs, but also the mentoring, professional development, and guidance, were just invaluable.”

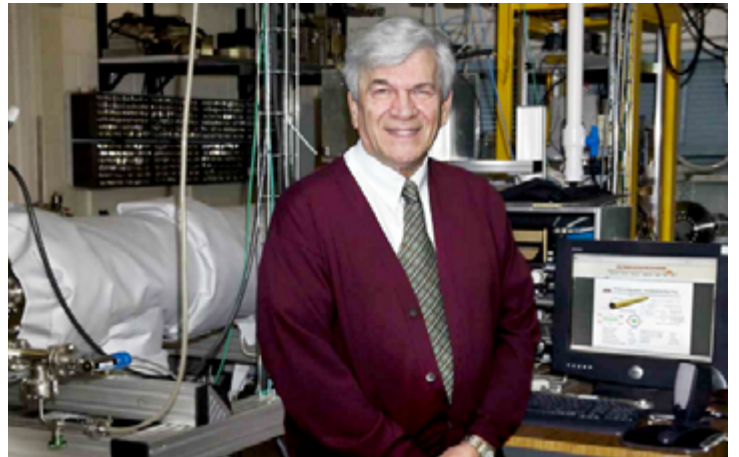
Davidson had a reputation for being a meticulous researcher and writer whose articles and equations needed little editing. “He was able to write just about flawlessly,” Hawryluk recalled. “The first thing he wrote down was just about ready to go to proof.” Davidson also amused colleagues by handing out holiday poems he had written at Christmas.

Qin, a physicist at PPPL and executive dean at the University of Science and Technology of China, received handwritten notes from Davidson on a paper the two were working on two days before he died. “Ron had a set of rules and standards to follow but he was not a perfectionist,” Qin said. “He was gentle and considerate to his collaborators.”

“A story Ron told me is that his mother asked him to play piano when he was in that one-room country school,” Qin said. “He had to practice a few hours every day. Ron said he hated every minute of it and would rather use that time to derive equations, a habit that he kept all his life.”

Davidson served on nearly 30 review committees on fusion and plasma physics at institutions all over the United States and as far away as Japan and the former Soviet Union. He was chair of the American Physical Society’s Division of Plasma Physics and Division of Particle Beams and was co-chair of the National Research Council Review Committee on Inertial Fusion in 2010.

Davidson often talked about his early life as a farmer, but Fisch said his ability to chart a clear course as an administrator, a researcher, a professor, and a mentor, reminded him of a sailor. “He had a sailor’s instincts, just to pick the right direction, whether it was science or administration, in full view of the winds and currents of life. He had to guide the Laboratory and he just seemed to do it like a sailor.”




Davidson in 2008, the year he received the Maxwell Prize.

A lifetime doing what he loved

In a 2014 interview, Davidson said he was optimistic about fusion energy becoming a reality, noting that “scientific progress in fusion has been enormous. What the field has accomplished with increasingly sophisticated diagnostic tools, major experimental facilities, and advanced numerical simulations is quite stunning,” he said.

In reflecting on his long career, Davidson said he had spent a lifetime doing what he loved. “When you talk about physicists working,” he said, “you should keep in mind that they are engaged in activities that they enjoy very much.”

Davidson is survived by Jean Davidson, his wife of 53 years; his daughter, Cynthia Premru, of Groton, Massachusetts; son, Ronald Crosby Davidson Jr., of Princeton Junction; and four grandchildren, Will and Maddy Premru, and Crosby and Cayley Davidson.

A memorial service for Davidson was held on Thursday, May 26. In lieu of flowers, contributions may be made in Davidson’s memory to the “Prof. Ronald Davidson Memorial Scholarship Fund” at Princeton University. Contributions can be made online at makeagift.princeton.edu. Please note the fund’s name in the comments box. 

PPPL Science Editor John Greenwald contributed to this story.

Mandatory all-hands safety meeting on Monday, June 20

There will be a mandatory all-hands safety meeting on Monday, June 20 from 1 to 2:30 p.m. in the MBG Auditorium.

Betsy Dunn, director of Environment, Safety & Quality Assurance at Argonne National Laboratory, will discuss a fatal accident that occurred last October at the Florida State University National High Magnetic Field Laboratory. Dunn led the team that investigated the accident. There will be time for questions and answers and staff will participate in an exercise based on the discussion.

Everyone at the Laboratory is expected to participate, so please plan accordingly.

Save the date!

PPPL's Inventor Recognition Dinner will be held on Wednesday, June 8th, from 6-9 p.m. at Princeton University's Prospect House.

If you have questions, please contact Laurie Bagley, x2425, lbagley@pppl.gov.

Robotics coaches needed for all-girls robotics teams

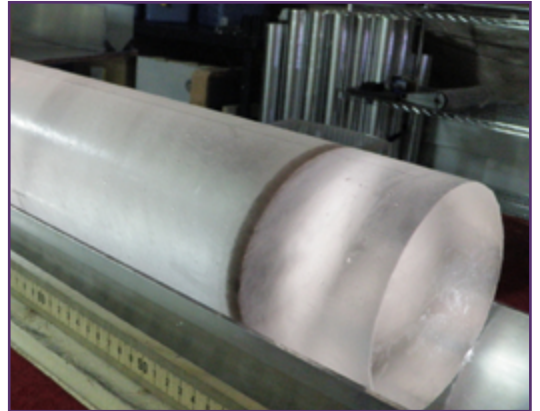
PPPL's Science Education team is looking for volunteer coaches for a new all-girls FIRST Lego League Robotics team (ages 9 to 13) and the new FIRST Tech Challenge Team (ages 13 to 18) being organized in collaboration with the YWCA-Princeton.

Please call Shannon Greco ASAP to volunteer: sgreco@pppl.gov, 609-243-2208.

COLLOQUIUM

Extending the ice core record of atmospheric composition and the global carbon and oxygen cycles beyond 1 million years

Professor John Higgins
Princeton University



Wednesday, June 1
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

BROCK

MARK GAZO
Chef Manager



BREAKFAST 7 a.m. • 10 a.m.
CONTINENTAL BREAKFAST 10 a.m. • 11:30 a.m.
LUNCH 11:30 a.m. • 1:30 p.m.
SNACK SERVICE until 2:30 p.m.

	Monday May 30	Tuesday May 31	Wednesday June 1	Thursday June 2	Friday June 3
COMMAND PERFORMANCE Chef's Feature	Memorial Day	Ota-Ya Sushi	Chicken, Sausage, Potatoes, Peppers, Onions & Marsala Wine served with Garlic Breadstick	Carved Roasted Pork Loin served with Potato Salad and Corn on the Cob	Rigatoni Bolognese served with Garlic Bread
Early Riser		Grilled Cheese with Ham & Egg	Chicken Cheesesteak Omelet with Home Fries	Cranberry-Walnut Pancakes	Sausage Gravy & Grits served with 2 Eggs any style
Country Kettle		Chicken Rice	Lentil	White Bean Escarole	New England Clam Chowder
Grille Special		BURGERLICIOUS Use it or Blues it Buffalo Turkey Burger Grilled turkey burger with melted blue cheese crumbles, sliced celery, shredded lettuce, tomato, red onion and fiery buffalo sauce on a grilled brioche roll	Tuna Melt on Rye with Swiss Cheese & Tomato	Chicken Breast on French Bread with Broccoli Rabe & Aged Provolone Cheese	Greek Gyro
Deli Special		Grilled Portobello Mushroom with Red Onion, Red Pepper & Provolone on Wheat Roll	Peppered Ham & Muenster Cheese on Pumpkin Bread	Curry Tuna Fish Salad on Sourdough Bread	Grilled Jerk Chicken with Grilled Pineapple, Peppers & Onion on a Kaiser Roll
Panini		Seafood Salad Quesadilla with Cheddar & Avocado	Smoked Chicken Quesadilla with Peppers, Onions & Jack Cheese	Falafel on a Pita with Tzaziki Sauce	Breaded Chicken Cutlet with Lettuce & Tomato on a Kaiser Roll with Choice of Cheese

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Layout and graphic design: **Kyle Palmer** ♦ Photography: **Elle Starkman**
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The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout the year except for holidays.

DEADLINE for calendar item submissions is noon on WEDNESDAY. Other stories should be submitted no later than noon on TUESDAY.

Comments: commteam@pppl.gov ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.