



HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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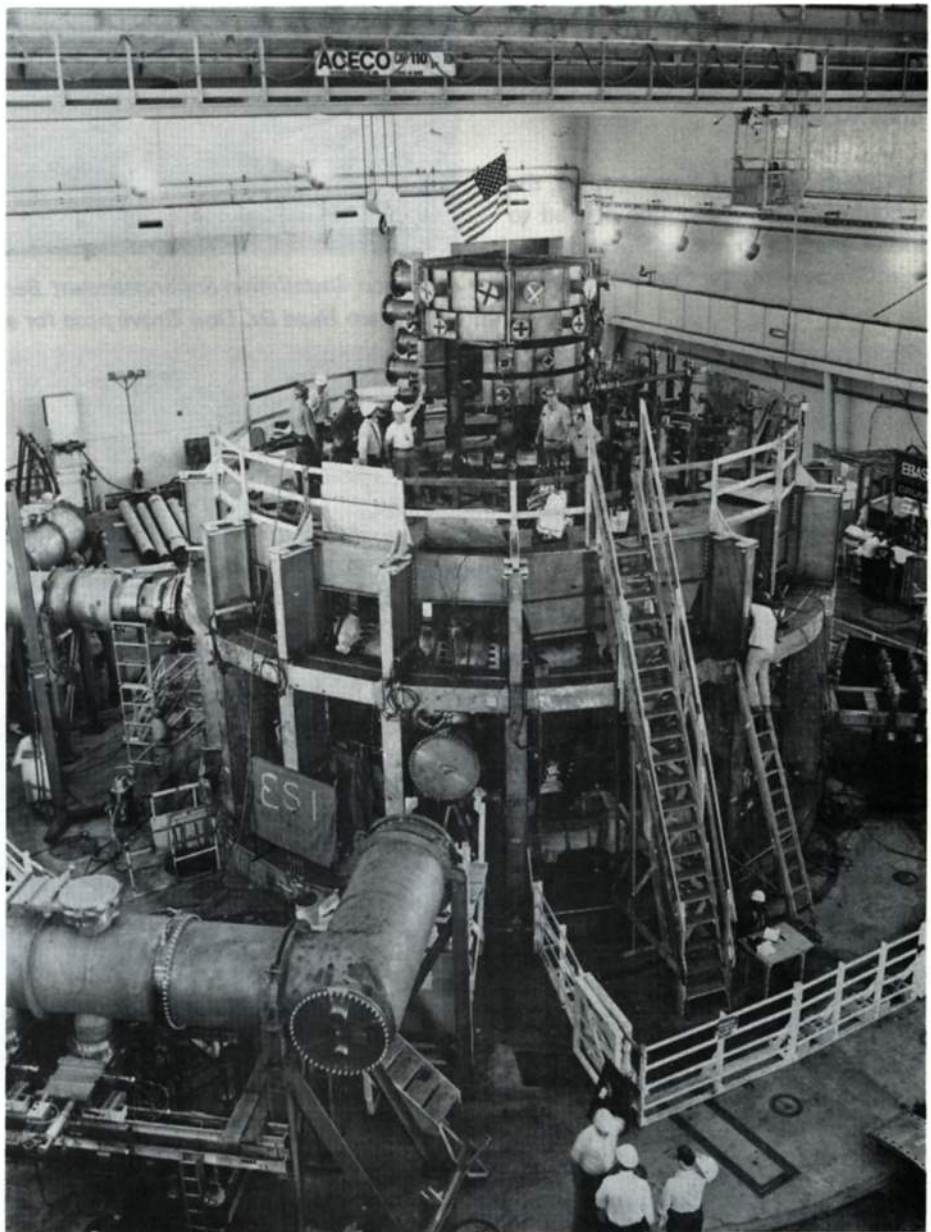
TFTR: The Road To First Plasma and Beyond

As the December date for TFTR's first plasma approaches, those involved with the project are becoming increasingly confident of successfully achieving the remaining milestones on time. According to TFTR Program Head, Don Grove, "Barring a serious problem no one is now saying it can't be done, a dramatic change from six months ago. The spirit, enthusiasm, and clear determination to meet our goals is really incredible."

A relatively modest first plasma is planned. Plasma current will be 100 kA for about 20 ms. The toroidal field will be 15 kG. The required base vacuum pressure is about 10^{-7} Torr for nitrogen and less than 3×10^{-7} Torr for water vapor. For startup, about 400 plasma discharges over a one-week period are planned. Special "startup" limiters will be used, since the regular limiters are not yet ready. The plasma will have a 65 to 68 cm minor radius. Twelve 1-MJ capacitor banks will be required for energy storage.

What needs to be done between now and December 15th to prepare for a first plasma? Early-morning coordination meetings of 30 to 40 people from all PPL divisions, Ebasco, and Grumman are held to plan each day's activities. Work is progressing on a three-shift-per-day, seven-day-a-week schedule.

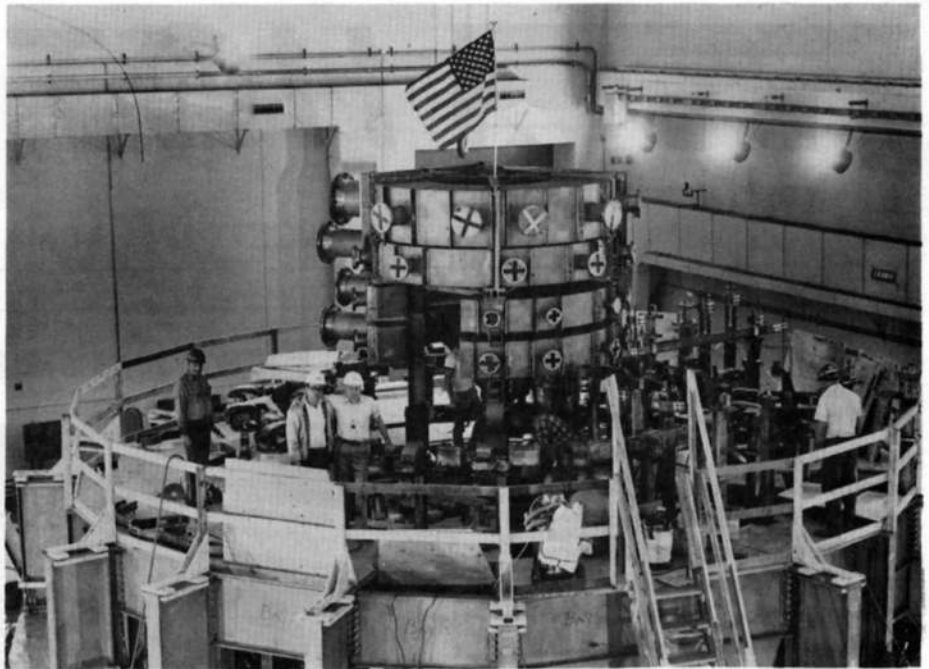
Motor generator set number 1 has already achieved the 325 rpm operating speed required for magnetic fields up to 2.5 Tesla. Of a total of 36 rectifiers needed for full power, seven are required for first plasma. There are 19 already on site, and the needed seven have been installed and tested.



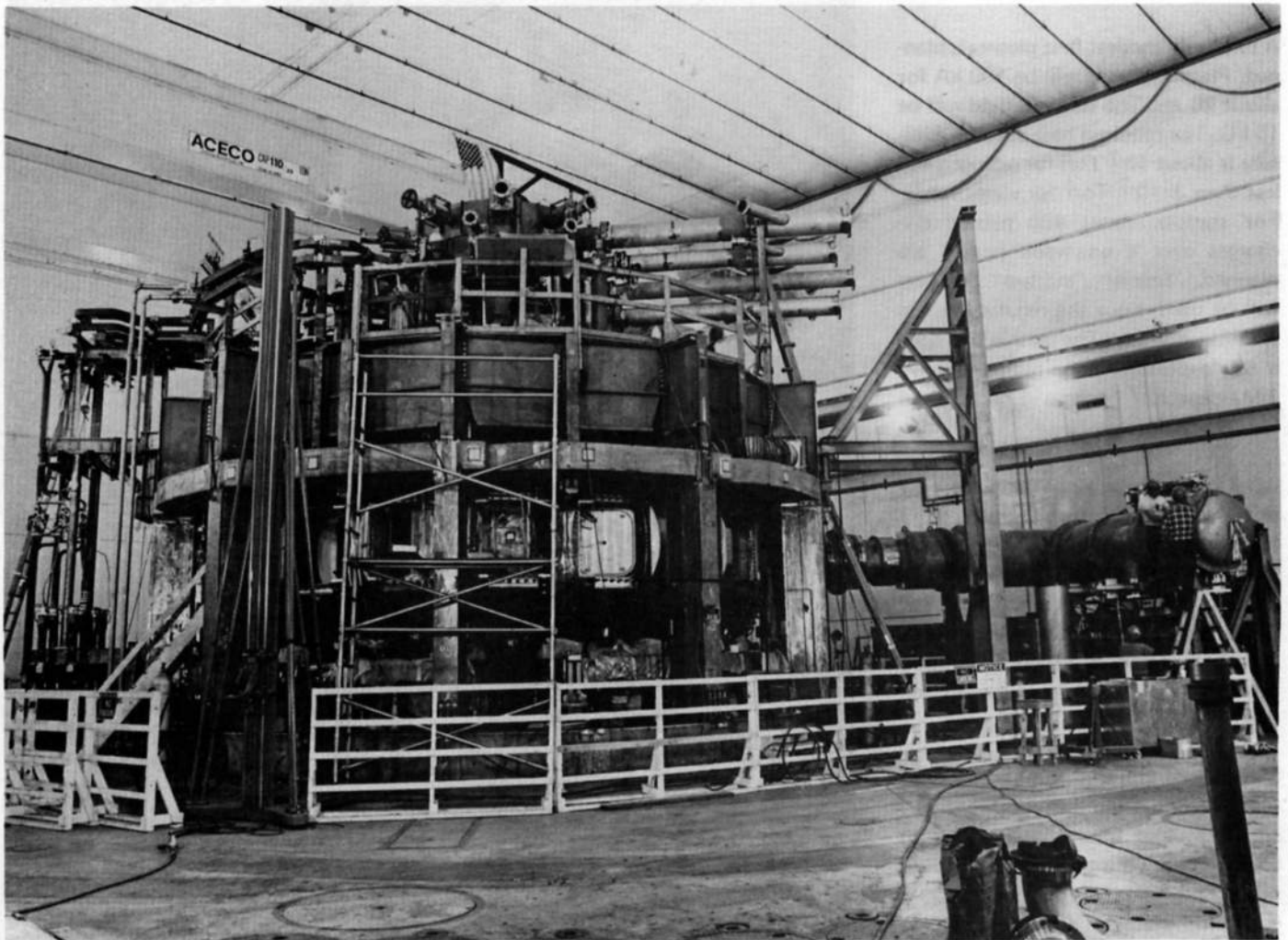
The American flag crowns TFTR's "crown" -- the manifold system installed atop the machine earlier this month. Piping for the manifold's heating and cooling systems is presently being connected. Work is also continuing on busbar assembly and coil lead connections.

The vacuum vessel was welded during the last weeks of October, and the first vessel pump-down occurred on November 3, using the first of 2 pumping ducts. A week of leak checking followed, and the base pressure requirements for first plasma were achieved. Connection of the poloidal field coils and final alignment of the toroidal field coils were performed in early November. The TF coil water system testing continued with deionized water run through the coils, pumps, and chillers, and into the storage tank. At the other end of the cycle, water has been running through the cooling towers since mid-summer.

During the week of November 15, the vacuum vessel will again be opened to install the "R" pumping duct, the gas injection system, the "startup" limiter,



Ebasco Installation Superintendent Bernie Fedor (second from left) and TFTR Program Head Dr. Don Grove pose for a picture at TFTR's "peak".



A back view of TFTR, showing buswork at left and a vacuum pumping system at right.

and about 11 diagnostic systems required for first plasma. Low-field magnetic testing will follow. Power testing into a dummy load in the test cell basement will also occur about this time.

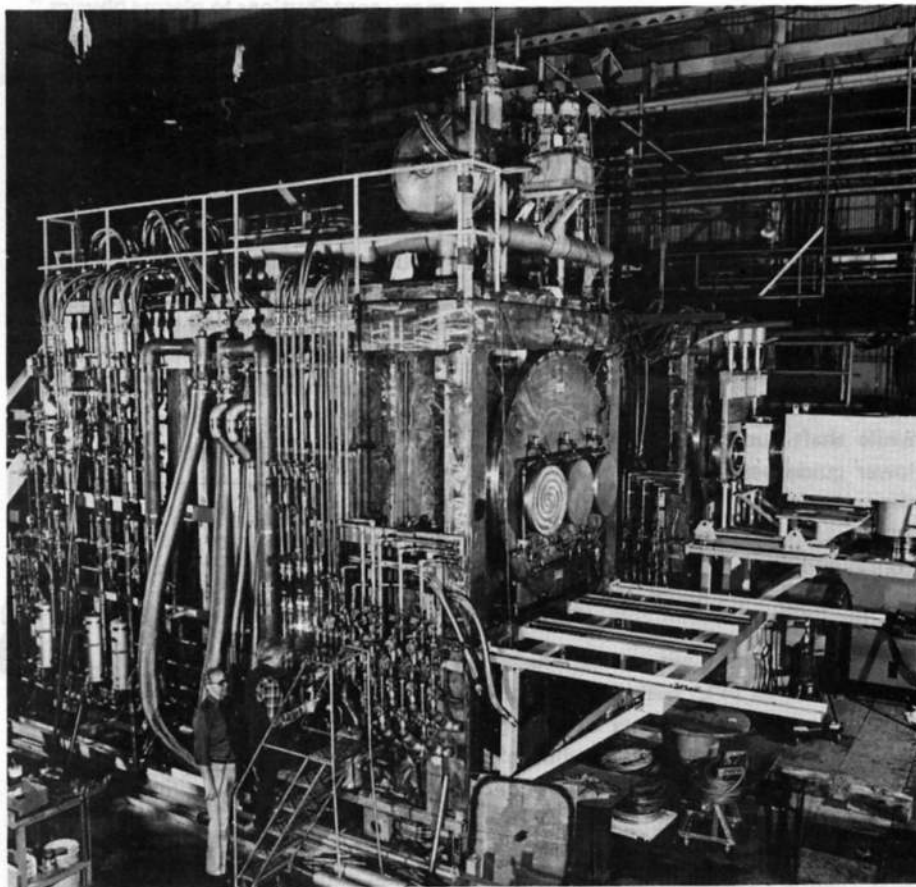
Around the week of November 22, machine assembly for first plasma will be essentially finished, and the contractor's craft laborers will be replaced in the test cell by PPL personnel. Actual preparation for the first plasma shots will then begin.

Starting about December 1, the vacuum vessel will again be pumped down and checked for leaks. Glow discharge cleaning can then be started. Integrated systems testing, whereby all systems are energized into the machine, will be the last hurdle before actual plasma shots are run.

The sigh of relief after reaching first plasma will be brief, if however heartfelt, because preparations for a one-year period of ohmic heating operation will start almost immediately. Following about 400 startup pulses, the vacuum vessel will again be opened toward the end of January. The large movable limiter and about one-quarter of the surface pumping system will be installed inside the vacuum vessel. The Inconel bellows cover plates will also be added. Should they not be ready in time, three or four graphite "slabs" similar to those used on PLT will be substituted until the Inconel ones are ready. Also at this time, about 20 more diagnostics will be added.

Before ohmic heating experiments begin, the motor/generator operation will be upgraded to 375 rpm. At least 20 rectifiers will be installed and tested for the energy conversion system.

In March, discharge cleaning will begin. This time, about one month of low-field pulses will be needed to sufficiently clean the vacuum vessel. A mild vessel bake out is also being considered for this period. Further integrated systems testing will be done during March in preparation for begin-



TFTR's neutral beams are being assembled in Building 1-H. The neutral beam target tank was recently transferred to the neutral beam test cell.

ning high-power ohmic heating operation in April, 1983.

Several major experimental objectives have been set for this period of ohmic heating operation. Most importantly, sufficient experience will be gained to boost the plasma current to 1 MA and the toroidal field to about 40 kG by January 1984. Compression of a 600 kA plasma to 1 MA will be demonstrated. The plasma will be formed at a major radius of 305 to 310 cm and compressed to a major radius of 210 cm.

Another important objective will be to determine the disruption characteristics of TFTR plasmas. The decay rate of the plasma current will be of particular interest in designing limiters for later installation. The scaling of plasma parameters as a function of changes in plasma size (major and minor radius)

and current will also be investigated. Impurity transport in the plasma will be another major item of investigation. Surface pumping for impurity control will be evaluated.

Following ohmic heating operation, TFTR will again be shut down for several months at the end of 1983 to add the first two neutral-beam lines, internal hardware, and more diagnostics in preparation for the first neutral-beam operation in 1984.

Accomplishing all of these goals in the available time will necessitate maximum use of TFTR. Plans are to run the machine for ten experimental shifts per week. Following a maintenance period during first shift on Monday, machine operation will begin on Monday's second shift and continue through the first shift on Saturday.

MG TESTING

The first phase of TFTR MG set testing was completed October 21, when the machine successfully powered four field coil energy conversion system rectifiers connected in parallel.

The testing, conducted by a combined PPL/General Electric Company team under the direction of GE test engineers, produced a 120 MW two second pulse. The MG output frequency dropped by about 5 Hz during the pulse, while shaft runout in the upper and lower guide bearings remained within design tolerances. The pulse was directed into the OH resistor yard, which was configured as a dummy load for the test.

The MG set has been conditionally turned over to PPL, with a limitation of 340 rpm placed on its operating speed. Operation and maintenance of the set is now the responsibility of TFTR operating crews, and will remain so through the continuing period of first plasma experimental operations. The speed restriction will fully meet first plasma operational requirements, according to TFTR Program Head Don Grove.

General Electric will complete the balancing of the MG set to 375 rpm and the remaining acceptance tests prior to OH experimental operations in April 1983.

DR. EUBANK RECEIVES AWARD

Dr. Harold P. Eubank received the Elliot Cresson Medal from the Franklin Institute at its Medal Day Awards ceremony November 10. According to Institute spokesmen, the Cresson Medal is awarded "for discovery or original research adding to the sum of human knowledge . . . and inventions, methods or products embodying substantial elements of leadership in their respective classes, or unusual skill in their workmanship."

Dr. Eubank's award recognized "his many contributions to plasma physics," and was presented "for his technical expertise and leadership in the achievement of new temperature levels in tokamak plasmas through the injection of neutral beams."

Founded in 1824, the Franklin Institute has always recognized and encouraged outstanding scientific work and new and important technological developments. Medal recipients are recommended to the Institute's Board of Managers by the Committee on Science and the Arts.

EMERGENCY TELEPHONE STICKERS



You're working late one evening. Suddenly a fire begins in the hallway, or someone tries to break into your office. Despite the panic these situations would produce, could you remember and call the laboratory's emergency telephone number?

Most employees couldn't; that's why the emergency number is printed on stickers that should be affixed to every telephone in the facility. But stickers get doodled on, or dirtied, or torn off. Telephones get moved from office to office as their owners relocate.

Don't wait until an emergency happens. It is the responsibility of each employee to make sure his telephone bears a sticker listing the emergency number. In addition, the current building and room number for each telephone should be filled in in the space provided on the sticker. Then if you're hurt and unable to place the call yourself, anyone entering your work area will have the emergency number and your location at his fingertips.

Stickers are available by calling the Telecommunications Department, ext. 2694.

P.U. DRAWING

In an attempt to continue moving forward in the face of budget cuts, Princeton University has decided to look backwards. University officials have revived a benefit drawing established in 1772, offering winners free use of University facilities as prizes.

Formerly called the "Delaware Lottery," the campaign serves as an affordable fundraiser for the Princeton University community. Tickets may be purchased for one dollar each, and are available through December 10. Six winners will be selected in a Dec. 14 drawing; each winner may pick his prize from a list of 12 options.

This season's prize list includes a weekend for four at Dunwalke, the University's country club; a dinner party for eight catered in your home by Food Services; season tickets for all Princeton home basketball and hockey games; dinner for two at the Princeton Club of New York City, complete with Broadway theatre tickets; one year paid memberships for two at the Dillon and Jadwin Gym facilities; private parties at the Dillon pool or the Baker skating rink; a one year all area parking permit; a limited edition Steuben vase bearing the Princeton seal; and several other special goods and services.

PPL ticket sellers are Roseann Wurst, Irene Long, Sonja Patterson, Pam Johnson, Sheryl Cargill, Debbie Anastasio, Jerry Gething, Gerry Hart, Terri Williamson, Bill Chester, Steve Ragolia, Suzen Bayer, John Hirthler, Ginny Zelenak, Pat Melsky, Marge Barnett, Leon Suster, Kay Finch and John Luckie. John Anastasio is area ticket coordinator for C-Site, while Frank Knorr is coordinating A and B-Site ticket distribution.

All monies raised by the drawing will be contributed to "A Campaign for Princeton" on behalf of Princeton University employees.

RUN FOR FUN RESULTS



Bill Heidbrink breaks the tape to win the fall edition of the PPL Run for Fun (above). As they finished, runners like Carol Phillips (right) checked their times with event organizer Barbara Sarfaty (left). Carol finished second in the women's division of the Run.



Bill Heidbrink outdistanced 59 other competitors -- and sprinkles of rain -- to win the fall edition of the PPL Run for Fun November 12. Bill completed the two and three-quarter mile circuit in 14 minutes and 22 seconds, while second place finisher Dennis Mueller turned in a 14:45 time. Dennis was the winner of the spring Run for Fun.

Ann Palladino was the first woman to cross the finish line, posting a time of 19:42. Carol Phillips placed second in the women's division with a time of 20:38.

The strong showings of Bill, Dennis and Carol boosted PLT into first place in the team division of the Run. Other members of the winning squad were Jim Strachan, Dave Cylinder, and David Hwang.

First place finishers in all three categories received trophies from Human Resources Manager Len Thomas at the conclusion of the race.

Event organizer Barbara Sarfaty expressed her thanks to Security, the Emergency Services Unit, Dolly Harris (who designed the Run posters), and all those who lent a helping hand during the Run. She offered special thanks to the PPL runners, who presented her with a bouquet of flowers in recognition of her work on the Run.



FIRST AID ALERT

Questions have recently been raised regarding response modes for the laboratory's Emergency Services Unit (ESU). This article is an attempt to clarify employee understanding of the dual first aid capabilities available to the squad.

When responding to a first aid call, ESU members initially determine the condition of the injured individual. A preliminary set of vital signs (which include blood pressure, pulse and respiration) are taken on the victim, who is conveyed to the squad's ambulance on a cot. Once in the ambulance, another set of vital signs is taken for comparison to the first readings.

Squad captain Greg Tompkins explained that the double set of vital signs is required by the hospitals working with the ESU. "A change in the vital signs can be very important in determining what's happening to the patient," he pointed out. "That's why we wait for several minutes after placing a victim in the ambulance; it's impossible to get an accurate blood pressure reading in a moving vehicle."

The procedures vary somewhat when the emergency requires the Princeton Lifemobile and its two paramedics to be called. Greg likened the Lifemobile's presence to "bringing the Emergency Room to the patient." The Lifemobile can establish telemetry with Princeton Medical Center, sending electrocardiogram and other vital information directly to the hospital. It also provides a voice channel to doctors and nurses at the medical center, who provide instructions on stabilizing the patient prior to transportation to the hospital. The stabilization process can take up to 15 or 20 minutes, according to Greg.

So when you see an ambulance stop after picking up a patient, don't assume it's just saving gas. For inside, the Emergency Services Unit may be saving a life.

VOLUNTEERS: PEOPLE PEOPLE

Often people forced to deal with a debilitating disease or the weaknesses accompanying old age aren't the only ones facing their infirmities. Caring for a family member handicapped by physical or emotional disorders can be an unremitting burden for a relative or spouse. Many of the caretakers' needs are ignored while providing for the stricken family member.

The Respite Care program, offered through the Middlesex County Voluntary Action Center (VAC), seeks to share some of the burden with these families. Trained volunteers spend time with an individual needing care, freeing the family to take a walk, go to a movie, or visit friends.

Respite Care volunteers DO NOT take the place of doctors, nurses or housekeepers; they act as temporary substitutes for concerned family members. Volunteers may plump a pillow, keep a water glass filled, answer a telephone, read aloud, or just provide company for the handicapped individual.

The VAC has received a development grant for this vital program from the United Way of Central Jersey. Working in conjunction with five selected agencies, volunteers are recruited, interviewed and trained to work with either handicapped children or with the elderly. Some volunteers can be placed with families immediately, depending on their past training or experience.

All those interested in signing up for the Respite Care program should contact the VAC at (201) 249-8910 and ask for Bonnie or Harriet.

SINGLES SOCIAL

The Princeton University League's monthly singles wine and cheese social will be held December 9 at 5 p.m. in the Fine Tower faculty room on main campus. All single members of the University faculty and staff are invited to attend. For further information, contact Naoma Dorety at 272-4097.

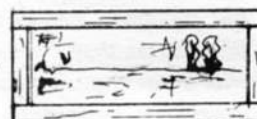
MAJOR MEDICAL EXCLUSIONS

Teachers Insurance and Annuity Association (TIAA) is the University's/Laboratory's Major Medical insurance carrier. When submitting a claim for Major Medical benefits, please remember that Major Medical coverage is provided for *medical* expenses only. Items not covered by Major Medical include eye refractions; eye glasses; dental work; hearing aids; and preventative medicine, such as flu shots or yearly physical examinations.

LIBRARY

ART

EXHIBIT



A series of 10 paintings by Graphic Services artist Terry Birch is currently on display in the PPL library. The frames for the oil paintings, which feature Maine landscapes, were also made by Terry.

The exhibit is housed in the reference area of the library, and will remain there through Christmas.

The PPL Hotline is issued by the Princeton University Plasma Physics Laboratory, a research facility supported by the U. S. Department of Energy. Correspondence should be directed to PPL Information Services, Module 2, C-Site, James Forresta Campus, ext. 2754.