

## Help Bring the Giant Wurzburg to HEM

Spring has arrived and with it fresh new changes to the Historical Electronics Museum. The most obvious is the redesigned newsletter. The museum recently employed a graphic artist to create a suite of collateral material including the new brochure and the masthead of Reflections. Other things to look for in the coming months include a new sign in front of the museum, a corporate donation brochure, and an updated gallery guide.

The exterior of the museum is shaping up. Workers installed benches, a picnic table, and trashcans. All of the exhibits now have weatherproof text panels. Also, the museum volunteers are hard at work elevating the barrel of the 90 mm AA gun and placing the Nike Ajax antenna at its correct angle. The new Hilton will be finished this summer. No doubt the attractiveness of the museum grounds plus the addition of hundreds of new hotel rooms, only blocks away, is going to bring an influx of foot traffic into the museum.

There are changes in the galleries to report. Planning for the redesign of the Communications Gallery is nearly complete. The focus will be on the history of military communications and the influences on and by parallel civilian advances. Preliminary work includes fabrication of additional parts for the SCR-399 diorama, the completion of the spark gap station diorama, and a remodeled HAM shack. There is a new exhibit showcasing the MS-30 magnetron in the Early Radar gallery and the Countermeasures upgrade is nearly complete.

The Historical Electronics Museum has a once in a lifetime opportunity to collect part of a rare World War II German radar. A representative from the Institute for Telecommunications Sciences, U.S. Department of Commerce alerted museum staff to the presence of a FuG65 Wurzburg-Reise or Giant Wurzburg radar antenna on federal land just outside Boulder, Colorado.

*(Continued on page 9.)*



Giant Wurzburg destroyed on D-Day.

# Letter from the President

We learned recently of the passing of past Board Member H. Warren Cooper III, on February 20, 2006. Warren served on the HEM Board of Directors from 1985 to 2001, and was Vice President, Operations from 1988 to 1995.

Warren received his BSEE from New Mexico State University in 1947 and his MSEE from Stanford University in 1948. He started working at Airborne Instruments Laboratory (AIL) in the design of octave bandwidth microwave countermeasures antennas. There he met Marie Jameson, another microwave antenna engineer, who had been at the Harvard Radio Research Laboratory during WW II. They were married in 1950 and had two sons and a daughter. In 1954, he moved to Maryland Electronic Manufacturing Corporation (MEMCO) (subsequently Litton-AMECOM) as Director of Research and Development. MEMCO provided Instrument Landing Systems to the FAA and foreign customers. He worked at the Westinghouse Defense and Electronics Systems Center from 1958 until he retired in 1986. His engineering managerial positions contributed to research, development, and production of aircraft landing, radar, electronic warfare, and space systems. He published or presented more than 20 papers and was awarded 15 U. S. Patents for microwave integrated circuits, surface acoustic waves, antennas, and aircraft navigational systems.

*(Continued on page 3.)*

## ***The Mission of the Historical Electronics Museum***

*Our mission is to educate, inspire, and excite the interest of students and the general public. We carry it out by presenting to them our electronics heritage through the collection, preservation, and display of significant artifacts and literature and the commemoration of the creativity and dedication of pioneers and all workers in the field of electronics. We focus on electronics developed for the defense of our country, the technologies that made them possible, and the commercial products derived from them.*

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## H. Warren Cooper 1920—2006



*(Letter from the President, Continued from page 2.)*

I met Warren when I started working at Westinghouse in 1974, where he was my boss's manager. Warren was always supportive of technical development and, and encouraged personal development through participation in professional activities such as IEEE (Institute of Electrical and Electronics Engineers) and MTT-S (Microwave Theory and Techniques Society of IEEE). Warren could also keep us entertained with his stories about building up and running a sophisticated radio station for the OSS (Office of Strategic Services, forerunner of today's CIA) in Ceylon (now Sri Lanka) in World War II, and his more recent world travels. Even after we no longer worked together in the company, we kept in contact through various IEEE activities, and through our mutual interest in HEM. Warren was President of the MTT-S Administrative Committee in 1975. He had been Chairman of the 1971 International Microwave Symposium in Washington, DC, and was a helpful member of AdCom in 1981 when the Baltimore Chapter proposed holding the International Microwave Symposium here in 1986. Warren served on that Steering Committee. When the IEEE MTT-S Historical Collection outgrew its original home with its founder Ted Saad (another early HEM Board member), Warren suggested to Ted that HEM would be a good home for it. The collection was transferred to HEM in 1987, which is how I became involved with the MTT Collection. Warren was responsible for recruiting several other Board members, including Louis Brown and John Bryant.

Warren was one of five microwave engineers who formed the Washington Microwave Education Committee in 1986 to interest local students in microwave engineering. He was instrumental in arranging authors for several chapters of a textbook entitled "Microwave Engineering and Systems Applications," that was prepared by the committee and published by John Wiley & Sons in 1988. More recently, Warren became more involved with the IEEE Aerospace and Electronics Systems Society (AES). He was active as editor of that society's Systems magazine from 1988 to 1994. Warren stayed in contact with MTT, and helped us with the presentation of the Microwave Pioneer Award to Ross Kilgore at the 1998 IMS in Baltimore. I was pleased to nominate Warren for the MTT-S Distinguished Service Award, which was awarded to him "For His Outstanding and Dedicated Service to the Society" at the 1999 IMS in Anaheim. Additional information on Warren is available on the MTT Awards web page at [mtt.org/awards/service99.htm](http://mtt.org/awards/service99.htm)

Steve Stitzer, President

We received these thoughts from some of Warren's associates, as well as from Ted Saad and Roger Kaul:

*I have fond memories of my association with Warren Cooper, which extended over more than thirty years. During part of that time Warren was my boss at Westinghouse, but all of that time he was a friend and colleague. We interacted on MTT-S matters and International Microwave Symposia affairs. Warren was always an active worker and leader in MTT-S activities and deservedly was elected president of that society.*

*Warren recognized and encouraged talented young engineers and facilitated their advancement. He was a good sounding board to try new ideas out on. He was a perceptive and constructive critic who helped others to develop and sharpen those ideas. Warren encouraged innovative ideas and projects and actively sought support (both financial and facilities) to bring those concepts to fruition.*

*He was a prime mover in introducing microwave integrated circuit technology and computer aided design procedures at Westinghouse. His foresight in initiating those areas of research and development was critical to the improved performance of subsequent Westinghouse electronic equipment and systems. (Continued on page 4.)*

*(H. Warren Cooper, continued from page 3.)*

*Herbert Warren Cooper left a legacy that will continue to nurture advancements in the future. - Marvin Cohn*

*I was first associated with Warren Cooper from 1965 till 1968 at the Westinghouse Electric Corp. in Baltimore, MD. My Microwave Development Group was one of three that reported to Warren. Warren was an outstanding Manager and took great interest in the projects that were underway in his Department. He was a good teacher for young engineers. He always had a story to tell about his early experiences as a Microwave Engineer and the early component developments that he had done at AIL and at Maryland Electronics. In 1968 I left Westinghouse for a position in Washington, DC. Although I left, my interactions with Warren continued for the next thirty years. Warren and I served together in the Washington, DC MTT Chapter and on the Steering Committee of three International Microwave Symposiums. Warren was General Chair for two of these. Our monthly Steering Committee Meetings were usually held in Warren's home and often included dinner.*



*We also served together on the MTT-S ADCOM from 1970 (when I was elected to ADCOM – Warren was already a member) to the present. Warren and I traveled together often to IEEE and MTT-ADCOM related activities. Within MTT-S ADCOM he was a leader and made major contributions to most discussion items. In 1975 Warren was elected President of the MTT-ADCOM where his leadership roll continued.*

*My wife, Margaret, and I looked forward to the annual MTT-Symposium where we got together with Warren and Marie to discuss our families and the years activities. Warren was a true pioneer in the Microwave area. He served the IEEE and the MTT Society in many ways. He will be missed by his many friends and colleagues. - Larry Whicker*

## **HEM STAFF NEWS...**

Lisa Conner left HEM at the end of April. Lisa will be interning at the National Museum of Natural History this summer as she completes her masters degree in Museum Studies from George Washington University. Lisa began as an intern last spring but soon filled in as interim Assistant Director. The museum offered Lisa a position on the staff, where she created the office of the Registrar, a first for HEM. Lisa's last task was drafting an updated Collections Management Policy based on her recent course work. She will be with the museum in a limited capacity until this is completed. Lisa's dedication and attention to detail will be missed greatly. On behalf of the Historical Electronics Museum staff, volunteers, and board, I want to wish her good luck in her career.

Mike Simons, Director

# YESS!!

## Young Engineers and Scientists Seminars (YESS) had another successful year

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The 2005 Young Engineers and Scientists Seminar (YESS) program for high school students, funded by a grant from Northrop Grumman, was very successful again this fall.

The attendance ranged from 57 to 90 students (with an average of 75 students at each session). Twenty four students attended all of the seminars, 78 students attended the majority of the seminars and 108 students attended at least two of the seminars.

The project-based program helped students understand the engineering method - the way engineers perform their jobs. In seven sessions from September through December, students learned how to go from theory to modeling, designing, building, and testing a vehicle to compete in an engineering challenge. The challenge was to design, build and race a vehicle powered by the spring on a mousetrap. The vehicles competed on December 14<sup>th</sup> for distance, speed, and load pulling ability. A new feature of the program this year was a tour of the [Northrop Grumman BWI facilities](#) on October 19th.

The YESS web site at [www.yesshem.com](http://www.yesshem.com) shows the program and the lecture slides.

September 22, 2005.

### Let It Launch! Design Challenge

- Design and construct a mechanism to launch a ping pong ball for distance and accuracy bragging rights:
  - X \* Y

where:    X – Distance in inches (best of two)  
                  Y – Accuracy percentage






Team Name	Distance (inches)	Accuracy (%)	Bragging Rights
BAM	165	100	165
Arundel	120	50	60
Lighting	216	25	54
Baam!	72	50	36



The program began with an overview of the “Introduction to Engineering” course at UMBC. A presentation titled “So You Want to be an Engineer” introduced students to the engineering profession. The evening ended with a mini engineering challenge to build a machine to launch a ping pong ball a maximum distance toward a target. *(Continued on page 6.)*

## ZOOM Across the Finish Line! Design Challenge

- Design and construct a self propelled vehicle in the shortest time possible (after the 20 minute design and planning), construct and race a self propelled vehicle using ONLY the materials



Team Name	Distance (inches)
Arundel	75
BAM	72
Sarcasm	67



**UMBC**  
AN HONORS  
UNIVERSITY  
IN MARYLAND

On October 5<sup>th</sup>, Roland Anders, Chief Scientist of Northrop Grumman Space Systems, explained the Engineering Method. This was followed by a mini competition to design a self-propelled vehicle in a minimum of time.

October 19, 2005

## Let's Sail Away! Design Challenge

- Construct a Sail vehicle from the materials provided (K'Nex) to maximize distance and minimize cost



Team Name	Distance (inches)	Cost (\$)	Bragging Rights
BAM	306	16.30	220.6
MOO	226	13.50	196.7
AMICK	244	15.00	191.3
DJC	193	13.60	166.8

(Continued on page 7.)

On October 19<sup>th</sup> Dr. Bill Wood, a professor of mechanical engineering at UMBC, presented a lecture on vehicle design. Dr. Woods explained some of the math and physics involved in optimizing the performance of the mousetrap-powered vehicles. The engineering challenge that night was to build a sail-powered vehicle.

November 2<sup>nd</sup>

## Power It UP! Design Challenge

- **Construct a waterwheel from the materials provided to maximize Power (maximize the weight lifted over the greatest distance while minimizing time**



Team Name	Mass (g)	Distance (inches)	Time (s)	Power (W)
Lightning	100	28	2.8	0.25
BOB	150	39	8.4	0.17
DJC	100	13	2.3	0.14

On November 2<sup>nd</sup> the YESS program leader, Dr. Taryn Bayles, Professor of Chemical Engineering at UMBC, gave an extensive lecture on the challenge of producing enough energy for the U.S. This was followed by a mini competition on energy conversion using water wheels.

The program on November 16<sup>th</sup> consisted of a lecture on computer modeling and performance prediction by Mr. Dean Sheridan, the YESS coordinator and a math teacher at Glenelg High School.

Students built their vehicles on November 30<sup>th</sup> and competed for \$2000 in prizes on December 14<sup>th</sup>.

As a pilot effort to assess the effectiveness of the YESS program, student participants completed surveys at the beginning and end of the seminar series. The survey instruments were designed to capture changes in student interest in science and engineering as well as a host of related attitudes and confidence levels related to math, science, and engineering of interest to the seminar designers. In addition, a third survey will be sent to each of the YESS student participants (during the month of May) to determine if the YESS program has influenced what they plan to study when entering college. Dr. Taryn Bayles is analyzing the surveys and will present the results in June at the annual convention of the American Society of Engineering Education. *(Continued on page 8.)*

The YESS steering committee consists of Mr. Roland Anders, Dr. Taryn Bayles, Dr. Ted Foster (chair), and Mr. Dean Sheridan.

## YESS Program Design Project

### Mousetrap Vehicle Judging Criteria

- Safety
- Maximum distance traveled (feet)
- Maximum load pulled over a distance of three feet
- Maximum speed over 20 foot distance
- Minimum distance traveled is 20 feet
- Accuracy of stopping at 8 feet (accuracy measured in inches greater than or less than the 8 foot mark)

UMBC  
AN HONORS  
UNIVERSITY  
IN MARYLAND



*(Giant Wurzburg, continued from page 1.)*

The Giant Wurzburg radar was the primary gun laying radar for the German Army and Luftwaffe during WWII. It featured a 7.4 m antenna and a powerful transmitter with a range of up to 70 kilometers (44 miles). Azimuth accuracy was 0.2 degrees and elevation 0.1 degree. A Giant Wurzburg was the target of the infamous Operation Biting in 1942. British commandos conducted a daring raid on a Wurzburg station in Bruneval, France and made off with most of the set.

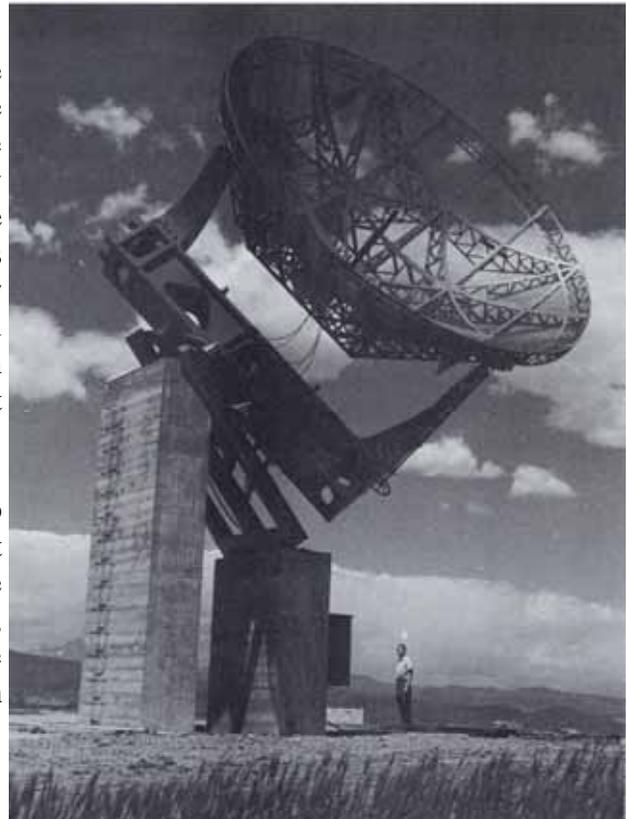
After the war some of the antennas were transported to the States for study and later used to conduct solar investigations. The ITS antenna was one of three moved from Virginia in the early 1950's to serve as collectors for the study of solar radio noise. Painted red, white, or blue (this was the red antenna) they were used throughout the 1950's. The fate of the other antennas is unknown but it is assumed they were destroyed or scrapped. An internet search has identified only three remaining antennas, all in Europe, out of the thousands constructed. Ralph Strong traveled to Boulder in April to examine the antenna close up and pronounced it stable and in good condition. At press time the museum is entertaining bids to disassemble, pack and ship the antenna to HEM. Plans are to display the Giant Wurzburg on the side of the museum facing West Nursery Road.

HEM needs your help. The museum is accepting donations at all levels. These monies will be earmarked specifically for the Giant Wurzburg Project. As always, we have appreciated your support in the past. Please be a part of this exciting opportunity to preserve, protect and display this important piece of electronics heritage. Please make your check payable to the Historical Electronics Museum, and note Giant Wurzburg Project.

The website has been a huge success. We are averaging over 100 unique hits a day. Folks are mentioning the website as the way they found the museum. It attracted film crews from New York City and the Outdoor Channel. The local chapter of the Society of Motion Picture and Television Engineers found the site and are now making HEM their new home. We welcome any comments and thoughts you may have on improving the site. Remember you can access old copies of the newsletter on line at [www.hem-usa.org](http://www.hem-usa.org).

I am well into my second year at HEM but I want to take the time to thank everyone for making it a great year and supporting HEM. With your help in 2006, we are taking HEM to new levels of professionalism, learning, and enjoyment. If you have not seen the museum, or not seen it recently, make it a destination this summer.

Mike Simons  
Director

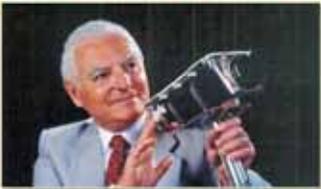


GIANT WURZBURG

# Lunar TV Camera to Australia

**Free Public Lecture:**  
**Apollo TV from the Moon**

See the TV camera which brought us  
"one giant leap for Mankind"



To bring us live television from the Moon, a team of Westinghouse engineers worked for 5 years to reduce a 180kg studio camera down to a 1kg handheld camera that could operate in the extreme conditions on the lunar surface. In doing so, they started the revolution of small handheld TV cameras we know today.

**Hear Stan Lebar**  
Program Manager for the Westinghouse Apollo TV Camera

Also learn about the key role of Australia in the first Moon landing, and view never-before-released footage of the Apollo 11 Moonwalk as it was seen at the Honeysuckle Creek Apollo Tracking Station in the ACT.

Join us for a fascinating evening  
**7:00-9:00pm Thursday March 16, 2006**

In the Visions Theatre at the **National Museum of Australia**  
Lawson Crescent, Acton Peninsula. Free, no need to book. Doors open at 6:30pm.

For more details, please see: [www.honeysucklecreek.net/lecture](http://www.honeysucklecreek.net/lecture)

Part of the Celebrate Canberra Festival — with the generous support of Northrop Grumman Corporation

Stan Lebar and the Lunar TV camera traveled to Australia for a pair of presentations, one at the Powerhouse Museum in Sydney and the other at the Australian National Museum in Canberra in conjunction with the Celebrate Canberra Fair. Stan reported both were successful and well attended by a “diverse audience of scientists, engineers and just ordinary people”. “The facility in Canberra was beyond anything I’ve ever seen” Stan said, “with large windows looking out on a lake with the full moon rising over my shoulder during the presentation. Nearly 200 people attended the main event in Canberra and over 100 were present in Sydney.

Stan spoke of his role as Project Manger of the team that designed the camera. Canberra was attended by many veterans of the Honeysuckle Creek Apollo Tracking Station one of several tracking stations in Australia during the Apollo 11 mission. Honeysuckle Creek is recognized as the first station to transmit images of Neal Armstrong’s historic first step on the moon. The Lunar TV camera was a slow-scan black and white camera with a vertical resolution of

320 lines scanned at 10 frames per second; chosen because the available bandwidth from the Moon (700kHz) was not sufficient for a standard TV signal. Honeysuckle Creek received the slow scan signal and converted it to a standard TV picture using specially built scan converters. The signal was then sent to Houston via Intelsat.

Also on hand for the Canberra event was Edward von Renouard, a former technician at Honeysuckle Creek. Von Renouard brought an 8 mm camera to work the day the Apollo 11 images were received at the station. Von Renouard filmed the images coming over the monitors. These films had never been seen by the public.

Stan’s presentations were hosted by the by a Honeysuckle Creek Apollo Tracking Station veterans group and the Sydney Space Frontier Society. Northrop Grumman lent its support, funding the shipping of the camera to and from Australia, and providing on the ground assistance in Sydney and Canberra. The staff of the Historical Electronics Museum prepared the camera for shipment and provided logistical support.

The Lunar TV camera is back on display in the Space Gallery after its international trip. Seeing the camera first hand sparked the interest of many Aussies in the Historical Electronics Museum and brought promises to visit the website and the museum!

# The Saga of the Phased Array Antennas

*By Robert L. Dwight*

The Historical Electronics Museum probably has the world's only complete chronological collection of phased array antennas. For this we have to thank Warren Cooper, an early Board Member, and responsible for recruiting Ted Saad, Steve Stitzer, and other microwave experts and collectors.

Warren was aware that Texas Instruments and the U.S. Air Force Avionics Laboratory at Wright Field, Dayton, Ohio, had developed the MERA antenna in 1964. MERA stands for "Molecular Engineering for Radar Applications". This concept involved having many separate small antennas mounted on a stationary face plate.

Each antenna, connected to a module of "molecular" size components would in turn be connected to a computer which would control the radiation from each antenna, thus replacing entire "black boxes" for the transmit and receive function. And the entire package could be small enough to mount in the nose of a fighter aircraft or bomber. And thus an antenna with no moving parts!

By controlling the phase relationship of the radiation from each individual antenna, multiple functions could be performed such as target search, target track, ground mapping, and moving target identification—and very rapidly, or "electronically agile". The MERA has 604 individual modules. The display includes a complete antenna as well as an individual module.

It was with some difficulty that we obtained the MERA antenna from the Avionics Laboratory, initially achieving a Loan Agreement directly with the Laboratory rather than with the Air Force Museum.

The next development was by Raytheon in 1967, the RARF antenna. RARF stands for "Reflective Array Radio Frequency". This antenna, part of the APQ-140 radar, operating at K-Band, was a massive device, containing 3500 modules. It was flight tested in the nose of a KC-135 transport aircraft.

Warren Cooper found that Raytheon had re-acquired the antenna and since it was no longer in use, was willing to donate it to us. It arrived safe and sound, although it had been stored outdoors and its crate had filled with leaves! The antenna and sample module are on display.

The next development was by Westinghouse in 1971, in the form of the "Electronically Agile Radar", or EAR. The antenna, designed for bombers, featured a Terrain Avoidance capability which allowed for

safe low-level flights. A special test facility was built at Stoney Run Road. A tower (which actually looked down on the airport!) was erected from which the entire horizon could be scanned for "obstacles". Only three antennas were built, but enough to prove the concept.



Also, received in 2004 from Northrop Grumman, but not on display, is a mockup of their competition (lost to Raytheon) for the new F-18 radar "active electronically scanned antenna" (AESA). This is the new nomenclature for "electronically agile".

## Welcome New and Returning Members

We would like to welcome the following new members of the Historical Electronics Museum, as well as those who are renewing their memberships:

### Life

Steven N. Stitzer

### Supporting

David J. Beck  
Frank M. Butler  
Kernan Chaisson  
Arthur T. Henshall  
Charles Layton  
Edgar H. Parker  
Rosemary Shearer &  
John Heasley  
Joseph C. Ryan  
Allan L. Spencer  
Ralph A. Strong  
William F. Zoller

### **\*New members**

### Family

Thomas Ballard  
David B. Dobson  
Ernest C. Farkas  
John Fogarty  
C. A. Fowler  
Donald C. Friedmann  
Carolyn M. Fry  
John J. Guarrera  
Karl Holub\*  
Stanley Lebar  
Gordon M. Melby  
D. A. Nimick  
Walter Sutcliff  
William & Eleanor Thompson  
Emmett B. Wheeler

### Individual

Michael T. Belmonte\*  
David Boyd  
Weston G. Bruner  
John W. Coltman  
John Cross  
Mrs. Roy Dodd  
Ted Foster  
Harold Goldberg  
Richard M. Henry  
William Kisse  
George W. Massing  
James McGuinness  
John G. McKinley  
Thomas A. Panfil  
Michael Pobat  
Joseph E. Pratt  
Stanley Sachs  
Rob Schroer  
Bill Semenuk  
Eugene Stanton

## VOLUNTEER LOUNGE: BUSY BEES!



It has been a very productive spring so far for the Volunteers at HEM. They have been busy preparing the museum for this year's tourist season. Our volunteers help the museum with a variety of tasks. This spring, they have been hard at work updating information and obtaining special cases for the display of objects in the galleries. Other volunteers that also serve on the Collections Committee have helped the Assistant Director and Registrar work on the Warehouse cleanup project which provided space to store more objects and also helped to raise money for the collections. In the lab, we have many volunteers that fix the props for exhibits, developing demonstrations for tour groups and helping with building maintenance. Many volunteers work to update the archives, photo archives and the IMLS Library database project.

However, our volunteers not only work hard, but they have fun too! Many of our volunteers also are members of different organizations such as AOC, IEEE, and HEMARC, as well as busily preparing for a summer of activities with the museum. The volunteers will be taking a tour of the Smithsonian Udver-Hazey Center for Air and Space in July and the staff is busy planning other events for our hardworking volunteers.

Our group of volunteers love to inspire a variety of people to enjoy the world of electronics and engineering. They work hard every day to enhance the museum so that it will continue to inspire generations to come. It's easy to become a volunteer at HEM. Just contact Gwen Nelmes, Assistant Director at 410-765-9617 or [gwen.nelmes@ngc.com](mailto:gwen.nelmes@ngc.com). Come join the fun!

# HEMARC NEWS

*From the Museum's Amateur Radio Station Club*

As in past years HEMARC displayed both Museum and Club exhibits at the Greater Baltimore Ham and Computer Fest at the Maryland State Fairgrounds at Timonium. This year the sale of museum surplus, amateur radio sales, museum exhibits and amateur radio exhibits were combined into one booth.

The objective of the exhibits table was to display promotional exhibits for both the ham club and the museum. Visitors took away over 70 Museum pamphlets, 50 HEMARC infosheets and a number of amateur training notices.

The museum exhibit was a Russian Thermolectric Lamp which was designed to operate a vibrator power supply for a tube radio (The technology of the 6 Volt car battery.) This lamp was given to the museum by a Westinghouse manager many years ago and is still in working order. It was designed to operate by burning kerosene in the lamp but no one wants the job of cleaning it up afterwards. Therefore it was not lit. (Not sure we could find the necessary cylindrical wicks.) In the picture the chains are held up to simulate the intended suspension of the TE assembly (which is quite heavy) from the ceiling.



*Russian Thermopile Radio Lamp*

The main amateur radio display was a 1931 beginners amateur transmitter (Hartley oscillatory) and plug in coil receiver. These were made by Jules Kozma and were very much admired by everyone who stopped by.

On Saturday morning Jules stopped by with a big surprise. He had built a beautiful working model of the first commercial electrical power plant - The Edison Dynamo for New York City. The steam engine was powered by a small air compressor and the tiny dynamo provided enough power for a pilot lamp. This was the hit of the show. Word got out and a crowd gathered in front of the tables. On Sunday people were still asking where it was and we had to tell the ARRL and Hamboree folks that it was not there that day.

The show was a success in many ways. In addition to realizing some cash for the museum, good homes were found for old electronics gear and redundant books. Many people went away with a visit to the museum added to their agenda. The toughest sell was convincing visitors that the museum was at the airport and not at the inner harbor. The most frequent question was: "when is the museum open?" (Continued on page 14.)

(HEMARC NEWS, continued from page 13.)

A brief summary of 2005 HEMARC activities:

### Training

The Federal Communications Commission amateur radio service provides for three classes of licenses with commensurate operating privileges. The HEMARC training program annual cycle of these three levels - Introductory, General, Extra, was once again conducted with excellent results. A dozen new amateurs were licensed as technician class, six were upgraded to General class (which also requires Morse code) and six others made it all the way to Amateur Extra Class. This year marked a decade that Rol Anders has instructed these courses at the museum.



Steam Driven Edison Dynamo

### The Station

Over the year many improvements were made in the general operational effectiveness and the appearance of the amateur radio station in the communications gallery (W3HEM). The ceiling to station cable tangle was neatly eliminated and superfluous items were removed to storage. Much work on the digital communication and information handling capabilities resulted in a fine coordinated logging program and all the most frequently used digital communication modes became operational. These modes included slow scan amateur television on the 20 meter band.

HEMARC is plagued with a very high electrical noise level on the amateur bands and many contacts have been made with appropriate and generally cooperative BG&E personnel. The increasingly industrial nature of the area and new construction have made this quite a challenge.

High frequency communication is very dependent on the number of sunspots. 2005 was near the bottom of the 11 year sunspot cycle and this engenders very poor radio signal propagation. Despite this fact both the D-Day invasion of Europe and the Pearl Harbor special events were very successful both across the US and around the world. The Pearl Harbor special event alone resulted in two way contacts with 2,735 amateur stations. This breaks down into 1,599 in the contiguous 48 States and 1,135 with foreign countries. Both code and phone were used.

Some of the countries contacted were: Monaco, United Nations NY, Isle of Man, Guernsey, South Africa, Australia, Uruguay, Azores, Spanish Africa, Svalbard, Kaliningradsk, Russia, Lichtenstein, Balearic Islands, Canary Islands, Israel, Barbados and The Dominican Republic.

The amateur station has logged (formally recorded) over 20,000 contacts from the museum since the station went on the air as W3GR in 1995. Calls used have been: W3GR, W3HEM, N1S (for the Marconi anniversary) and W2W. (Continued on page 15.)

(HEMARC NEWS, continued from page 14.)

Contacts with 119 foreign countries have been confirmed by postal cards (known as QSL cards, a sample of a few of the more interesting ones are displayed at the station.) This qualifies the club for an amateur radio achievement award, the American Radio Relay League (ARRL)



Shawn Rogers brings in distant contacts during Pearl Harbor special event

DXCC (DX Century Club for confirmed contacts with 100 "countries"). The long range goal of HEMARC is to confirm all US states and 100 foreign countries on each of the 5 major amateur bands. These awards are made separately for both code and phone. The logging software at the station is programmed to keep track of progress toward these coveted awards.

### HEMARC Meetings

The second Thursday of every month is the club meeting night and meetings were held every month. In addition to the business discussions, technical

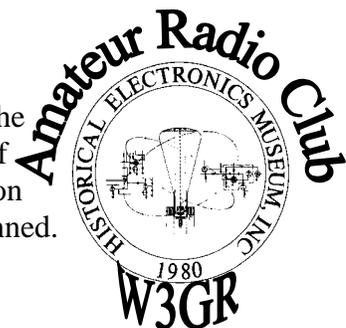
presentations included in 2005 meetings were: Near Vertical Incident Radiation, wire antenna simulation, how household appliances can cause high frequency interference, modern digital communication modes for the amateur bands, US Coast Guard Morse code communications in Alaska in the 60's, low power operations, The National HRO receiver, and the special "Life Without Gravity" lecture.

### The Northrop Grumman Family Net

Every Wednesday at noon west coast time W3HEM served as net control station for a network of Northrop Grumman club stations, employees, retirees and anyone associated or with interest in the company or any of its predecessors. NGC operations on the west coast and Florida are almost always present and many retirees from throughout the US join in. Even in the worse conditions successful communications have been obtained.

### Plan for 2006

This year the special events, Field Day and the exposition at the Foundation for Amateur Radio (FAR) hamfest are high on the list of event objectives for the club. The major station project is station appearance and a much more 'ham station' look is being planned. HEMARC will continue and improve its support of the Museum.



Chip Weems  
W4PBG

# HISTORICAL ELECTRONICS MUSEUM

P.O. BOX 1693, MS 4015  
BALTIMORE, MD 21203

TEL: (410) 765-0230  
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E-mail: hemuseum@verizon.net  
Web Site: <http://www.hem-usa.org>

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**ADMISSION IS FREE!  
OPEN TO THE PUBLIC**

### Our mailing address is:

Historical Electronics Museum  
PO. Box 1693, MS 4015  
Baltimore, MD 21203

### The museum's location is:

**1745 W. Nursery Road  
Linthicum, MD 21090**  
(Next to the Marriott Hotel)

*(This is not a mailing address)*

### The museum hours are:

*Monday through Friday  
9 a.m. to 3 p.m.  
Saturdays  
10 a.m. to 2 p.m.  
(and other hours by appointment)*

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## Historical Electronics Museum Membership Application

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

Please check one:

- |                          |                       |        |
|--------------------------|-----------------------|--------|
| <input type="checkbox"/> | Student Membership    | \$15   |
| <input type="checkbox"/> | Individual Membership | \$25   |
| <input type="checkbox"/> | Family Membership     | \$30   |
| <input type="checkbox"/> | Supporting Membership | \$100  |
| <input type="checkbox"/> | Life Membership       | \$1000 |

*Please make checks payable to Historical Electronics Museum, Inc.*