

*Historical Electronics Museum*

# *Reflections*

Vol. 15, Issue 3

Fall 2005



## Historical Electronics Museum Gets a Face-Lift

The summer of 2005 brought dramatic changes to the grounds of the Historical Electronics Museum. A new Hilton Hotel complex is rising north of the museum. To service the new complex, Elm road is slated to become a major thoroughfare, eventually linking with the Elm road that leads into BWI Thurgood Marshall Airport. The change in Elm Road necessitated a change in the museum's parking lot. We lost the exhibit space used to park the Hawk and TPS-43 radars. There was near continuous construction for a good part of the summer - we lost our parking, we lost many of our trees, shrubs and flowers, and the museum was subjected dust and noise.



HEM, August 2005

There was a plan in this seemingly chaotic situation. Early in the spring, in conjunction with construction of the new hotel and the road upgrade, the owners of the building, The Kirby Trust, generously donated monies to be used in the redesign of the museum grounds. Staff and volunteers mapped out a wish list of landscaping and plantings. The collections committee de-accessioned the Hawk radar, the TPS-43 shelter, and the MK-45 Astor torpedo, which freed up space.

In April, the Hawk antenna and TPS-43 shelter were moved to Radio-Research Instrument Co., Inc. in trade for a piece of equipment to be named at a later date. Meanwhile staff and volunteers reopened negotiations with Johns Hopkins Applied Physics Lab (APL) to acquire a shipboard radar system, and the collections committee decided on a piece of equipment in trade for the Hawk. In June, the MK-45 was donated to the USS Torsk at the Inner Harbor. The folks from the Torsk were kind enough to pick up the MK-45 without any expense to HEM.

*(continued on page 8)*

# Letter from the President

If you have not been to the Museum in the last couple of months, you may not recognize the place. We now have an enclosed parking lot, a new radar antenna display next to the front door, and a lot of new landscaping. We expect a few more changes outside in the near future as well. Our interns have been hard at work touching up some of the inside exhibits. And we have a new full-time Assistant Director, Gwen Nelmes. Please stop by if you have not been around for a while.

Here we are, well into the 21<sup>st</sup> century, and you may have asked, “where are the flying cars?” This seems to be a common question from those who were reading science fiction way back in the 20<sup>th</sup> century. I recently came across some old Popular Electronics magazines, one of which is the March, 1955 issue. In the feature article “Electronic Miracles of the Future”, the author takes the reader on “an imaginary trip to the year 2005 A.D.” Wow, imagine that, all the way to the year 2005! Here is a brief rundown of that article.

An electronic sensing device detects the visitors’ approach and alerts the housewife (well, it *was* written in 1955). (Sound like a motion sensor?) Lights turn on and off automatically as people move from room to room. Looking around for bulky cabinets, the visitors wonder if they don’t have television in 2005. Mrs. Housewife shows them a “mural on the wall” that turns into a large TV picture at the touch of a button. (Were they already thinking about our flat panel LCD and plasma screens?) If they don’t want to miss a particular program, they record the program for later viewing. (Can you say “VCR”, or “TiVo”?) Magazines are received on special channels and viewed as television programs. All the back issues are available upon request by speaking a few words into the machine. (A portent of the internet?) Telephones have become hand-held units about the size of a cigarette case, having “a flat, dull screen”, with “a series of buttons and small controls” along one edge. She tells the visitors that it is “a combination television receiver, two-way communicator, and a pocket recorder. It’s completely self contained and uses a life-time atomic battery.” (Except for the atomic battery, it sounds a lot like the cell phones most of us carry around.)

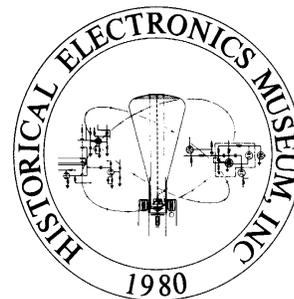
*(Continued on page 3)*

## ***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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The whole house is air conditioned, with electronic precipitators for dust control and ultraviolet lights to kill germs. The windows close automatically in case of rain. (Well, my house is a little behind here.)

In the kitchen, “food is cooked in the oven by high frequency radio waves.” (Glad I got that microwave.) [The same issue of PE contains an article describing two new Raytheon “Radarange” microwave ovens, that used QK-390 magnetrons to produce 800 and 1600 watts at 2450 megacycles. These commercial units were designed for restaurants, the larger one being about the size of a residential refrigerator.] Stove top cooking is done with “high frequency induction coils which heat only the pan.” (Hmm, I have seen these, but I’m still using gas.) Ultrasonic dishwashers and food sterilizers round out the list. Solar cells on the roof supply most of the electricity for all these appliances, except for the houses with their own atomic power plants. (I feel like I’m falling behind the times again.)

For the hobbyist, the old film camera has been replaced by a pocket-sized electronic camera that records full color pictures, with sound, that are ready to view “as soon as you take them.” And “you can remove the tape and play it through the living room television receiver.” (Sounds like that old VCR again.)

And yes, they all commute in their “auto-copters”, helicopter-like vehicles that fly by automatic pilot, guided at the proper speeds along the proper lanes by radar, while the driver and passengers watch television. (Ok, folks, you’re not supposed to be watching TV in the car unless the auto-pilot is in use! I don’t think those back-up warning radars and GPS that some vehicles do have today are quite up to the task, however.)

Except for the atomic batteries and the flying cars, the uncredited author of this article got amazingly close to what electronics would be like, way off in the future of 2005. Radio, television, facsimile (fax), computers, cell phones, the internet, and technologies from vacuum tubes to integrated circuits, have all come to us in just about the last 100 years. And once the basic technologies and systems were invented, the developments since the 1950’s are truly remarkable. The single-channel WW II handie-talkie that could barely communicate a few miles and weighed about 5 pounds, led to the 23 channel CB of the late 1950’s, the 40-channel unit of the 1970’s, and then the cell phone, “family radio”, and coast-to-coast walkie talkies of today, each about half the size of the previous generation, and about 10 times as capable. The Museum’s refrigerator-sized 100 watt AM/CW TBL-13 submarine transmitter from WW II has given way to the digitally synthesized AM/FM/CW/SSB/RTTY/PSK transceiver of today that will easily fit inside a briefcase. The room-sized vacuum tube computers of the 1950’s led to pocket-sized scientific calculators in the 1970’s. Moore’s Law predicted the doubling of circuit density every 18 months in items like the personal computers of the 1980’s and laptops of today. The same number of dollars today will buy a machine with 100 times the speed, 1,000 times the memory, and 10,000 times the storage capacity, compared to just 25 years ago. As fast as things are progressing in electronics, I wonder if anyone today could make as accurate a prediction about the technology of the year 2055, or even 2015, as was made in Popular Electronics 50 years ago?

This year marks the 25<sup>th</sup> Anniversary of the incorporation of the Historical Electronics Museum. We plan to keep up with the future of electronics, partly by having a brand new web page with much more content available, as well as by constantly upgrading our exhibits of the electronics developments of the past. Come in and see us.

Steve Stitzer

Reference: Popular Electronics, Ziff-Davis Publishing Company, March, 1955 issue

## HEM Welcomes new Assistant Director



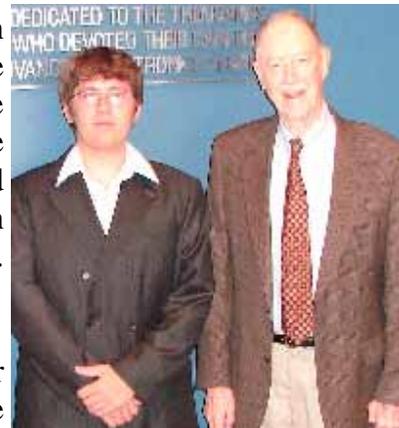
Gwen Nelmes joined HEM as Assistant Director in November. Gwen came to the museum from the National Museum of Civil War Medicine, Frederick MD and the Decatur House in Washington, DC. As the Collections Manager at HEM, Gwen will be responsible for overseeing the collection. She will also work on volunteer coordination, education, disaster planning and visitor services. She attended Juniata College in Huntingdon, PA, receiving a degree in History and Museum Studies and was a member of the Juniata College Women's Swim Team. Gwen currently lives in Gaithersburg .

## HEM Creates new Registrar Position

Lisa Conner, Registrar, former interim Assistant Director, will continue her work at HEM in the newly created position of Registrar. Lisa will be at HEM part-time as she earns her M.A. in Museum Studies from George Washington University. Lisa manages HEM's object database and file system, coordinates and documents all object transactions, and will be heading the storage clean-up project.

## The Historical Electronics Museum Awards Scholarship

Since 2001, the Historical Electronics Museum has been supporting scholarships for engineering students at the University of Maryland, College Park. Starting in 2006 the program will be expanded to include a student at the Baltimore County campus (UMBC) as well. The scholarships are named after Robert L. Dwight, the founder of the museum. Each scholarship provides \$2500 toward tuition for a single year. Applications are made through the University of Maryland.



*James Seppi & Robert L. Dwight*

This year's recipient is James Seppi. James is a senior Computer Engineering and Chinese Language major at the University of Maryland College Park. He holds officer positions in three campus organizations: Eta Kappa Nu, Unite for Sight, and Chinese Culture Club. In addition, he is currently working toward the completion of the Gemstone honors program, for which he is participating in a team project focusing on the development of a practical GPS-based augmented reality system and the study of its possible social impact. This past summer, James worked for a local reliability engineering firm, DfR Solutions. His work included the design, implementation, and programming of a capacitor test unit. Last year, James studied Chinese language and culture abroad at Zhejiang University in Hangzhou, China. He has also spent two summers teaching English to middle school students in China. We would like to wish James good luck in his endeavors.

# The Saga of the TPS-43, Serial No. 1

By Robert L. Dwight

As the accompanying picture shows, we have recently relocated the TPS-43 Ground Radar Antenna to its new location right outside our front door.

The sign on the Antenna gives the following information:

**TPS-43  
AIR FORCE S-BAND  
TACTICAL SURVEILLANCE RADAR**

**This Westinghouse product is still the most widely used transportable tactical air surveillance radar for early detection of aircraft. Sold to over 20 nations, it proved its high performance and reliability many times and set the stage for the next generation—the TPS-70 series.**

- Shelter, folding compact antenna, waveguide, cable and cooling
- Transportable by truck, helicopter, or aircraft
- Anti-jamming features
- Range of up to 270 miles
- Over 170 sets produced, 1967-1984

As the sign above indicates, this radar, originally developed for the U.S. Air Force, was and still is used world-wide for detection of aircraft. Many countries desired to know at all times what their neighbors or others might be up to—and hence a long-range air surveillance of possibly unfriendly aircraft was imperative for their well being.

The TPS-43 antenna and shelter, believed to be Serial No. 1, were acquired in 1984. They had been in use by Westinghouse since 1967 on Blueberry Hill, the antenna test site back of the main Friendship plant.

Al Melvin, Manager, Antenna Building, Electronics Division, brought the two units up to our previous location at Airport Square III, and unfolded the antenna.



We no sooner had the TPS-43 in place as a new outdoor exhibit, than the phone rang. Westinghouse had just developed a new antenna (ultra low side lobe) with a new bearing. This bearing required a life test. The only antenna pedestal (the support structure) available was the one just given to us. And so they would like to borrow it back!

We couldn't very well say "no", so we asked "how long?" And the response was "19 months". So the antenna itself was crated and stored at the Halethorpe Warehouse and the pedestal went back to Blueberry Hill.

And then it turned out (the phone rang again!) that the new antenna was so successful that it would now be sold as a replacement update to the TPS-43 antenna. But just the antenna; not including the pedestal. And this would require an acceptance test by the customer for each antenna. And so they would have to keep “our” pedestal! So, again, we couldn’t very well say “no”. So three years later, the phone rang to tell us that we could not have our pedestal back. Incidentally, with this complete update of both shelter components and antenna, the radar had received a new designation: TPS-70.

Unfortunately, the pieces of the pedestal were somewhat scattered around on Blueberry Hill and the central casting (which holds the four legs together) was missing! It just happened we knew Russ Bahner, Manager, Surveillance Radars, pretty well. So we called and said “You owe us one.” (Russ later became a Museum Board Member.)

Well, it turned out there were no spare castings available, so a new part had to be machined. And the antenna had now spent over four years in a crate at Halethorpe. So now Al Melvin could bring it all back together again, which he did. But later, it turned out the antenna would not stay fully locked in the open position. So we had to drill and pin some sections together. So don’t try to fold it up—it won’t!

Next, we wanted to rotate the antenna, but the standard motor required 400 cycles—not 60 cycles. So we “liberated” a 400 cycle generator (from Westinghouse) to achieve this, but it was very large and very noisy. So two of our volunteers (Warren von Uffel and Warren Hartman) found and adapted a 60 cycle motor to do the job. Now we could rotate the antenna from “house” voltage-at 6 rpm. And all this was finally complete by the early 1990’s.

And then, in late 2004, it was announced that a new Hilton Hotel would be built beyond the existing Marriott Hotel, on Elm Road. This would require Elm Road widening, repaving, new sidewalks, new landscaping, and a complete revision to our outdoor exhibits on the north side of the Museum. These were TPS-43 antenna, TPS-43 shelter, Hawk trailer with antenna, and an Astor Torpedo. The Torpedo was donated to the Torsk submarine in Baltimore. The Hawk and the TPS-43 shelter were traded to Radio Research (our surplus dealer in Waterbury, Connecticut) for a Nike Ajax Missile radar antenna

And so we now have a very fine display in the new location—joined by a TPS-70 on loan from Northrop Grumman!

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

Supporting

R. James Fritsch  
James D. Hendry  
James R. Nowotarski  
Robert Stratbucker

Family

Joe & Barbara Bruce  
Jeffrey P. Buchheit  
Charles Francis  
Robert A. Gardenghi  
John A. Russell

Individual

Bruce Carpenter  
Walter S. Ciciora\*  
Craig Close  
Steven E. Fick  
Constance Finney  
William Frazier  
Douglas A. Gwyn  
Ted E. Hartson\*  
Todd W. Nichols  
Albert Nims  
Joseph A. Zamoyta

\*new members

## “The Life of James Clerk Maxwell” IEEE MTT Distinguished Lecture by James Rautio

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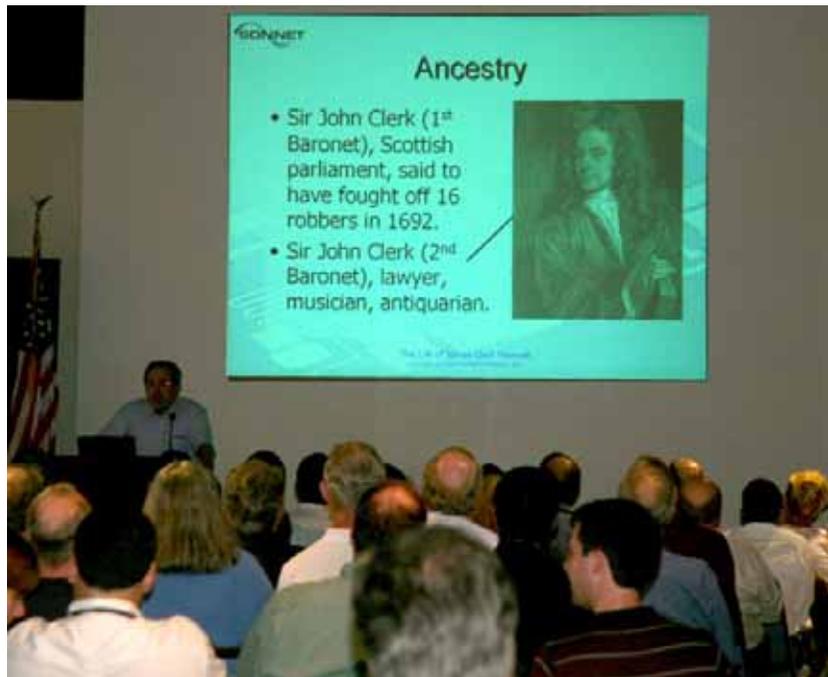
On Monday evening, September 26, the Museum joined with the Baltimore Chapter of the IEEE Antennas and Propagation (AP) and Microwave Theory and Techniques (MTT) Societies to sponsor MTT Distinguished Microwave Lecturer Dr. James Rautio. Dr. Rautio spoke on the “Life of James Clerk Maxwell” to an audience of over 68 attendees. His talk was received very favorably, judging by the results of a questionnaire we supplied after the talk. Dr. Rautio is founder and President of Sonnet Software, a supplier of advanced modeling software used extensively in the microwave community. Baltimore AP/MTT Chapter Chairman Douglas Kremer and Past Chair Hyo-Kun Hahn helped with local arrangements for the talk.

A buffet dinner beforehand allowed members of the audience to talk with the speaker, and Jim told us he enjoyed this part very much. Unlike most AP/MTT talks, this one was not entirely technical. The museum had publicized the talk through the HEM Amateur Radio Club, through the Northrop Grumman engineering departments, and to the HEM community in general, which helps explain the large audience. Jim is a ham as well, and enjoyed seeing the HEMARC station. As part of the MTT’s Distinguished Microwave Lecturer program, Jim has given the talk 33 times all over the world; his last email was from Yokohama, after having given the talk in Malaysia! Our audience had been his largest to that date, and has been exceeded only once since.

Jim had been in Scotland just before presenting his talk here, and had visited Maxwell’s birthplace and museum, his high school, his first University (Edinburgh University), his home in Glenlair, and his grave site. He had stayed several nights in the servant’s cottage next to Maxwell’s home, and so he presented some new information from that trip. His talk was informative and entertaining.

James Clerk Maxwell (1831-1879) is a major figure in the development of the theory of electromagnetic fields, which are crucial in designing communications systems, electrical machines, and all types of electrical and magnetic devices. The “Maxwell’s equations” that tie electricity and magnetism together are used today in a different form from the ones he developed, but it was his insight that created them. For example, he correctly predicted that radio waves (that would not be demonstrated by Hertz until some years after Maxwell’s death) would travel at the speed of light. The talk focused on Maxwell’s life, family influences, and education on his way of thinking, rather than on the math, and made Maxwell come to life for us.

Thanks, Jim, for a well done presentation.



Construction began in earnest in July. Anne Arundel County and the developers mapped out a series of new sidewalks and a parking lot. To this HEM added three gravel pads just north of the museum entrance to display radars. A concrete pad was poured south of the entrance to support the APL radar. Mulch walkways to the SCR-270 antenna and the 90mm gun were replaced with concrete walks and the mulch around the gun and bogie wheels was replaced with gravel. A second sidewalk was laid to the east, parallel to West Nursery road, opening up the entire building frontage to additional exhibits.

At the end of August the TPS-43 was plucked from its old spot and placed in the center gravel pad. The landscapers returned to lay sod on the museum grounds and in September the parking lot reopened. In one day of heavy lifting, Radio-Research delivered the collections committee choice - an antenna from the Nike-Ajax missile system. Thanks to the diligence of Bob Dwight, Northrop Grumman delivered on loan, a freshly restored TPS-70 antenna. Both antennas were placed on their gravel pads astride the TPS-43.



But we are not done! A handicap accessible sidewalk now leads to the front door. In front of the museum the sidewalk and surrounding area was graded and replaced to prevent water from pooling and freezing in front of the door. Two park benches, a picnic table, and matching trash cans are on order. We are working to develop a new HEM sign to face both West Nursery and Elm roads. Look for new beds and plantings in the spring.



What we gained from all this is a new look, enhancing greatly the visual impact of the outside of HEM. This comes as area tourism and business travel increases. It is sure to increase public awareness of the museum. As we move in to 2006, more improvements are planned for the interior of the museum. Stop by and see why the Historical Electronic Museum is becoming the premier venue for the study and appreciation of Baltimore and the nation's defense electronics history.

## Young Engineers and Scientists Seminars (YESS) gets off to a good start....

The 2005 Young Engineers and Scientists Seminar (YESS) program for high school students, funded by a grant from Northrop Grumman, has been very successful again this fall, with approximately 90 students and 15 adults attending each session. The project-based program helps students understand the engineering method - the way engineers perform their jobs. In seven sessions from September through December, students are learning how to go from theory to modeling, designing, building, and testing. The structure of the program is the same as last year's program, but with different engineering challenges this year. The main engineering challenge is to design, build and race a vehicle powered by the spring on a mousetrap. The vehicles will compete on December 14<sup>th</sup> for distance, speed, and load pulling ability. A highlight this year was a tour of the Northrop Grumman facilities.

The YESS web site at [www.yesshem.com](http://www.yesshem.com) shows the program schedule for this year and has downloadable copies of the lecture slides.



The program began on September 22<sup>nd</sup> 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



On October 5<sup>th</sup> Roland Anders gave an excellent lecture explaining the Engineering Method. This was followed by a mini competition to design a self-propelled vehicle in a minimum of time.

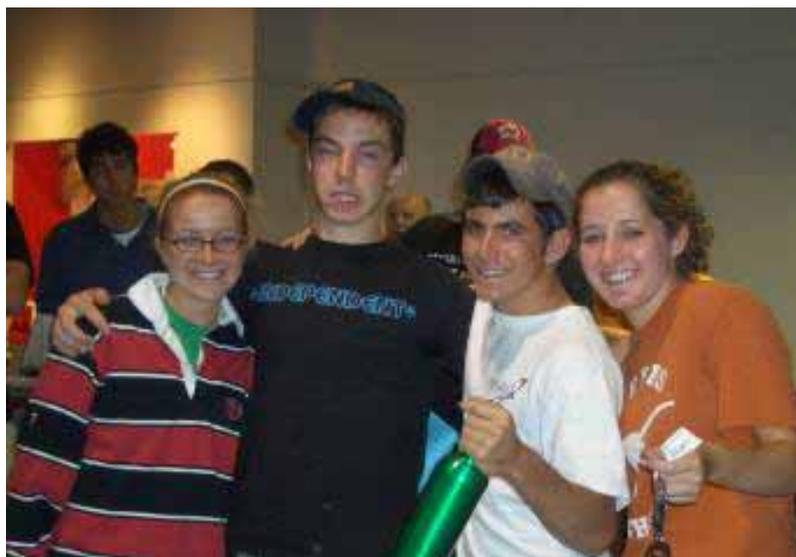
On October 19<sup>th</sup> Dr. Bill Wood, a professor of mechanical engineering at UMBC, presented a lecture on vehicle design. Dr. Woods explained some of the math and physics involved in optimizing the performance of the mousetrap-powered vehicles. The engineering challenge consisted of building a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

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.



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 prizes on December 14<sup>th</sup>. The YESS steering committee consists of Roland Anders, Dr. Taryn Bayles, Dr. Ted Foster, and Dean Sheridan.

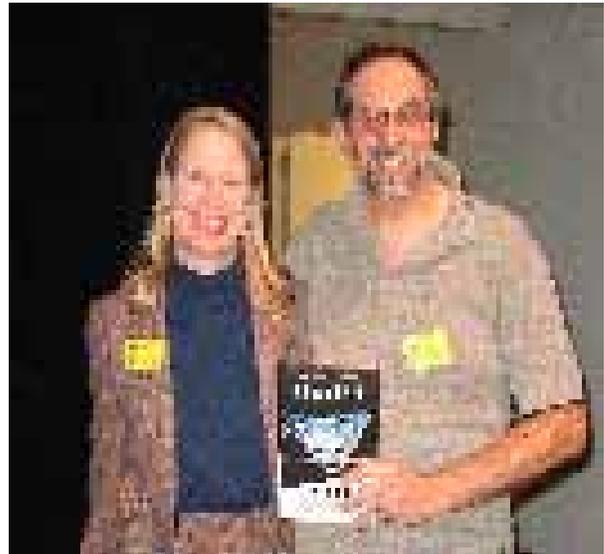


# HEMARC NEWS from the Museum's Amateur Radio Station

This November the Amateur Radio Club presented a talk in Pioneer Hall by Bob Zimmerman, WB3IWD, titled 'Without Gravity.' Bob is the award winning science journalist and writer who has been acclaimed for his books on space. His latest book, *Leaving Earth: Space Stations, Rival Superpowers, and the Quest for Interplanetary Travel*, provides a detailed accounting of the space station programs of both the U.S. and Russia. From his personal knowledge of the Astronauts and Cosmonauts and their missions he gave us considerable insight into both the ISS program. He also pointed out the favorable regard they have for the amateur radio service to both MIR and the ISS.

His overview of the role of space stations and the present program was significantly different and much more inspiring than the perspective found in the general media and both interesting and thought provoking.

Bob was accompanied by his wife Dianne, AA3OF, who is the head of the Volunteer Examiner Program that has been very cooperative with the HEMARC training program and has tested our students for FCC licenses. Dianne also is the chairperson of the Foundation for Amateur Radio Scholarship program which grants 70 plus scholarships to amateurs in college each year. This committee meets in the museum for several days each year for the selection of scholarship winners.



The most recent activity of the amateur radio club was the special event station commemorating the use of electronics in the invasion of Pearl Harbor in 1941.

The special call sign W2W is registered for the event. This annual two days of intense operations brings us in contact with amateurs throughout the world and provides a much sought after certificate depicting appropriate memorial graphics. This year over 1,850 contacts were made.



Some of the stations look forward to contacting us every year. One of the contacts this year was with the carrier Lexington's museum amateur radio group.

The Wednesday afternoon Northrop Grumman Family Net continues to meet every week with good communications among NGC plant amateur radio clubs and many retirees from all over the NGC world.



# HISTORICAL ELECTRONICS MUSEUM

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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 \_\_\_\_\_

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Phone \_\_\_\_\_

Email \_\_\_\_\_

Please check one:

Student \$15

Individual \$25

Family \$30

Supporting \$100

Life \$1000

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