

# SCHOLARSHIP

DR. WILLIAM W. L. "BILL" TAYLOR MEMORIAL



Scholarships are intended to recognize superior science students and encourage their continued course of study in the physical sciences.

Dr. William (Bill) W. L. Taylor was a leader in the field of space science education and public outreach. He co-founded and was president of INSPIRE, one of the pioneering successes in NASA Sun Earth Connection Education. In July 2005, Goddard Space Flight Center honored the late William W. L. Taylor with an *Excellence In Outreach Award* for his accomplishments.

Photo courtesy of TRW Systems & Energy Magazine, 1981

National Aeronautics and Space Administration



# EXPLORING VERY LOW FREQUENCY NATURAL RADIO



Photo © courtesy of ozones.com



Photo by Karin Edgett

**Dr. William (Bill) W. L. Taylor** (1943 – 2005) former Chief Scientist of NASA's Space Station Freedom and co-founder of the INSPIRE (Interactive NASA Space Physics Ionosphere Radio Experiments) Project, Inc. devoted his life to the advancement of space science education and public outreach.

As part of INSPIRE's commitment to furthering Bill's vision, we are pleased to announce the Dr. William W. L. "Bill" Taylor Memorial Scholarship through which we hope to encourage high school and college students to continue course study and excel in the physical sciences.

Scholarships will be awarded based on the strength of candidates' academic background, demonstrated leadership, and successfully completing a Very-Low-Frequency (VLF) electromagnetic waves research project.

Each academic year, scholarships will be awarded to students in two categories: 1) High school seniors who are planning to attend a Washington, DC metropolitan area college or university; and 2) College students (undergraduate or graduate) currently attending or planning to attend a Washington, DC metropolitan area college or university.

For more information and to obtain an application form, please visit:  
<http://image.gsfc.nasa.gov/poetry/inspire/>

Scholarships are provided by The INSPIRE Project, Inc. with its generous partners at the DC Space Grant Consortium, NASA/Goddard Space Flight Center, QSS, Raytheon, and Woman Friday, LLC.

# INSPIRE

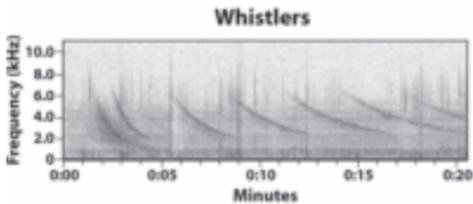
INTERACTIVE NASA SPACE PHYSICS  
IONOSPHERE RADIO EXPERIMENTS

The INSPIRE Project, Inc. is a non-profit scientific, educational 501(c)(3) corporation dedicated to the excitement of observation of natural and manmade radio waves.

**Kathleen Franzen**, *President*  
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**Bill Pine**, *Co-Founder and Secretary/Treasurer*  
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INSPIRE is operated solely by volunteers. Supplementary funding is provided by NASA, QSS Group Inc., Raytheon ITSS, District of Columbia Space Grant Consortium and Goddard Space Flight Center.



# INSPIRE

INTERACTIVE NASA SPACE PHYSICS  
IONOSPHERE RADIO EXPERIMENTS

# INSPIRE

## INTERACTIVE NASA SPACE PHYSICS IONOSPHERE RADIO EXPERIMENTS

The INSPIRE Project, Inc. is a non-profit scientific/educational corporation whose objective is to bring the excitement of observing natural and manmade radio waves in the audio region to students. Underlying this objective is the conviction that science and technology are the underpinnings of our modern society and that only with an understanding of science and technology can people make correct decisions in their lives – public, professional, and private. Since 1989 INSPIRE has provided radio receiver kits to over 2,000 students and other groups to make observations of signals from sources in the ionosphere at audio frequencies.

Natural VLF Radio:

### SFERICS



### TWEAKS



### WHISTLERS



### CHORUS



Our eyes are only sensitive to a very narrow range of the electromagnetic spectrum. There are large parts of the electromagnetic spectrum that we cannot see. One of these parts is radio waves. If we could see at very low radio frequencies, called VLF, we would be dazzled by electromagnetic emissions such as sferics, tweaks, whistlers, chorus, and many others. These are natural radio waves or emissions coming from such common phenomena as lightning. There are also VLF emissions that reach the ground that come from outer space, tens of thousands of miles from the Earth. VLF radio emissions are at such low frequencies that they can be received, amplified and turned into sound that we can hear. Each natural VLF radio emission has a distinctive sound.

### INSPIRE VLF-3 NATURAL SOUND RECEIVER

Components for field observation of natural VLF radio:

- INSPIRE VLF-3 receiver with stereo cable
- Portable cassette tape recorder with headphones
- Whip antenna
- Ground stake



The INSPIRE VLF-3 receiver receives radio waves in the 0-10 kHz range. It has jacks for a cassette recorder, microphone, and an audio output jack and volume that will send the signal directly to headphones without the need for a recorder. A switch selects between receiver output on both stereo channels and receiver output on one channel and voice via the microphone on the other channel.

The VLF-3 can be ordered from the INSPIRE website:

<http://image.gsfc.nasa.gov/poetry/inspire/orderform.html>

### WORKSHOPS

- Natural VLF radio signal theory
- Data taking and data analysis
- Construction of the VLF-3 natural radio receiver

For information about an INSPIRE workshop can be made by contacting INSPIRE (see contact information on next page).



Photo by Karin Edgett



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Students measure very low frequency natural radio with the INSPIRE VLF-3 natural sound receiver.



Photo by Karin Edgett



Photo by Karin Edgett



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### THE INSPIRE PROJECT IS FOR TEACHERS, PROFESSORS, STUDENTS & RADIO AMATEURS

INSPIRE:

- Provides hands-on opportunities for students to make scientific observations of very low frequency (VLF) natural radio waves
- Makes available a low cost radio receiver kit and supporting documentation to allow the integration of INSPIRE into the academic curriculum
- Encourages students to continue their study of space physics, and to consider a science or engineering career
- Reduces students' anxiety about the process of scientific inquiry through hands-on participation
- Analyzes data recorded and submitted by INSPIRE participants

Students, from area high schools and universities, assembling an INSPIRE radio receiver kit.

**1989** The organization that will become INSPIRE participated in the ACTIVE Program in collaboration with the Russian Space Agency. Attempts were made to receive VLF radio signals from the ACTIVE satellite.

**1991** The INSPIRE Project, Inc. is formed as a nonprofit educational/scientific 501(c)(3) corporation.

The INSPIRE RS-4 VLF receiver kit is designed, produced and sold.

**1992** INSPIRE teams participated in SEPAC, the electron gun experiment, on STS-45, a mission of Space Shuttle Atlantis.

**1994** INSPIRE teams monitor natural VLF radio signals during the annular solar eclipse of May 1994.

**1996** The VLF-2 receiver is designed, produced and sold.

An agreement between INSPIRE and the Russian Space Agency (IKI) defines the INTMINS Project, a series of experiments using the electron gun on the MIR Space Station.

**1998** Natural VLF signals are monitored during the Leonid meteor shower in November of 1998, 1999 and 2000.

**2000** Observations of transmissions from the IMAGE satellite begin.

Live streaming of INSPIRE data from Marshall Space Flight Center (MSFC) begins. <http://spaceweather.com/glossary/inspire.html>

**2002** Live streaming of INSPIRE data from University of Florida Radio Observatory (UFRO) begins.

**2003** The VLF-3 receiver is designed, produced and sold.

**2004** INSPIRE leaders travel to Fairbanks, Alaska, to observe natural radio during aurora. A team from BBC Radio accompanies them as part of the production of the BBC feature, "Songs of the Sky".

**2005** Dr. Bill Taylor dies suddenly and unexpectedly. INSPIRE continues with his wife, Kathleen Franzen, filling the role of president of INSPIRE.

**2006** The Dr. William W. L. "Bill" Taylor Memorial Scholarship Competition is launched.

New logo is introduced and extended into a new brochure and website in order to expand the mission of INSPIRE.