



EE 500 GRADUATE COLLOQUIUM

Spring 2014

You are cordially invited to

**“The Life and Times of the Great Inventor,
Nikola Tesla”**

**(A Repeat of the 150th Tesla Anniversary Presentation by Prof. James
Breakall and Mr. David Blood in 2006)**

By

Dr. James Breakall

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Date: February 27, 2014

Time: 4:00 pm

Location: 160 Willard Bldg.

Abstract

To celebrate the 150th anniversary of Nikola Tesla in 2006, Prof. Breakall and Mr. David Blood presented a very memorable and popular public seminar and demonstration for the EE Department at Penn State. At this event, the life and times of Nikola Tesla were discussed and several Tesla coils were displayed and utilized for various live demos with audience participation. This seminar was videotaped and Prof. Breakall will play this DVD and slide presentation at this Spring, 2014, EE Graduate Colloquium.

Nikola Tesla is clearly one of the greatest scientists and inventors in the history of the technological development of humankind. His patents and theoretical work created conditions for the electrification of the world by his system of poly-phase alternating current, the system that is still presently used all over the world. His work in the field of high-frequency currents and wireless transmission of electromagnetic waves made the development of radio and telecommunications possible. Tesla's research also helped towards the invention of radar, and in many ways brought about the development of lighting. Tesla always arrived at an invention in a rather unusual way. He first would work out the whole idea of the way a device should work to the smallest detail in his mind, and then he would "see" how it works, and then he would proceed to prove it theoretically, sketch it, and finally make the device itself that would then work without any problem. Working things out in his mind and not on paper would insure that his inventions would be protected. Nikola Tesla was born in 1856 in Smiljan, a small village near Gospić, Croatia.

At the end of the 19th century in Colorado Springs, CO, Tesla performed various experiments with very high voltages and high-frequency currents. In the laboratory he managed to produce artificial lightning with the voltage discharge of many millions of volts and the length of the lightning of up to 40 meters. Nikola Tesla filed a total of some 300 patents all over the world. He received honorary doctorates for his work at numerous universities including Columbia University, Yale University, University de Poitiers, Polytechnic Institutes of Graz, Vienna and Bucharest, Universities of Belgrade, Brno, Grenoble, Paris, Prague, Sofia, and Zagreb. Nikola Tesla never married, he left no direct heirs, and he also suffered from many phobias. He was fascinated by cleanliness and the number three. At the end of his life he liked to keep company with pigeons.

Besides his native language, Tesla fluently spoke English, French, German, Italian, Czech and Hungarian. He died in 1943 in a hotel in New York. To honor the great inventor, the unit for magnetic induction in the SI system was named Tesla in 1960. In 1975, the Institute of Electrical and Electronics Engineers (IEEE) established the Nikola Tesla Award that is given to deserving individuals in the field of electro-energetics. As commendation for Tesla's achievements, a crater on the Moon carries his name.

Biography

James K. Breakall received B.S. and M.S. degrees in Electrical Engineering from Penn State University and a Ph.D. in Electrical Engineering and Applied Physics from Case Western Reserve University, Cleveland, OH, and has over 40 years of experience in numerical electromagnetics and antennas. He was a Project Engineer at the Lawrence Livermore National Laboratory (LLNL), Livermore, CA, and an Associate Professor at the Naval Postgraduate School (NPGS), Monterey, CA. Presently he is a Full Professor of Electrical Engineering at Penn State. Dr. Breakall began his career in both theoretical and experimental research as a graduate student at the Arecibo Observatory in Puerto Rico working on antenna analysis and radar probing of the ionosphere. At LLNL, he and his group worked on the development of the Numerical Electromagnetics Code (NEC), the first sophisticated antenna modeling program. At Penn State Dr. Breakall was engaged in a project to design and construct the world's most powerful and sophisticated ionospheric modification facility, HAARP, leading him to design a unique antenna invention, the Three Dimensional Frequency Independent Phased Array (3D FIPA), which was awarded an U. S. patent.

Dr. Breakall has also led work at Penn State on several programs with the Navy to study high frequency (HF) antenna sitting in irregular terrain with helicopter measurements, a propagation project named the Polar Equatorial Near-Vertical Incidence Experiment (PENEX), a project named TACAMO for VLF communication to submarines from trailing aircraft 5 mile long wires, a UHF Electronically Scanned Array (UESA) for the antenna design on the E-2C Hawkeye radar dome aircraft, and most recently a National Science Foundation (NSF) project for the design of a new high power HF feed at the Arecibo Observatory 1000 foot dish antenna.

Dr. Breakall has been actively involved in the Applied Computational Electromagnetics Society (ACES) of which he helped found in 1985 at LLNL and has been elected to two 3 year terms on the Board of Directors by the more than 600 worldwide members. He has graduated numerous Ph.D., M.S., EE Honors and Math Honors students at Penn State and is currently the thesis advisor for Ph.D., M.S., and E.E. honors students. Dr. Breakall is also a member of the IEEE Antennas and Propagation Society, IEEE Broadcast Technology Society, Eta Kappa Nu, International Union of Radio Science Commission B, IEEE Wave Propagation and Standards Committee, has been an Associate Editor for the Radio Science journal, and served as an Arecibo Observatory Users and Scientific Advising Committee Member. He has won many prestigious awards and honors, including the Applied Computational Electromagnetics Society Mainstay Award, the Outstanding Research Award from the Penn State College of Engineering, and has been named the Charles H. Fetter Fellow in Electrical Engineering. He has also advised Nittany Scientific, Inc., on several Penn State licensed projects involving new antenna software and hardware sold commercially. He was also on

the Board of Directors for a company, Star-H, that is involved in antenna design and manufacturing. With Star-H, he has also received a patent on his invention of a low-profile AM broadcast radio station antenna. He finished a sabbatical leave in 2011-2012 at the Army CERDEC, Aberdeen Proving Ground, MD and Arecibo Observatory, Puerto Rico. He has also been employed as a Summer contractor to the Army in Aberdeen, MD for the past 3 Summers. He has spent this past year at the Army in Aberdeen, MD engaged in off-campus research from Penn State.

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