Overview of the Congress From the Coe College Chapter

by Kit Wobeter and Eric Hemesath, SPS Reporters

FEATURE

Having founded the Coe College chapter of Sigma Pi Sigma in the spring of 2004, we at Coe were very excited to send students and faculty to what is arguably the society's most sparkling event. We had seven students and three faculty in all representing our chapter, which included Dr. Steve Feller, the current president of Sigma Pi Sigma; and Sara Campbell, the Associate Councilor for Zone 11. Our students presented four posters during the poster sessions, the subject of three of them being past student research, and one on our annual outreach program of hosting physics demonstrations at our college for elementary school children.

The Congress also included several plenary sessions spread throughout the two-day event. The topics ranged from Nobel Prize winning research to Einstein's greatest discoveries to ethics facing today's scientists. The speakers with their respective lecture titles included: Jocelyn Bell Burnell, "Pulsars and Extreme Physics"; John Rigden, "Einstein, 1905, 1999: Legacy and Hope"; John Marburger, "Science Ethics: A Governmental Perspective"; Dwight Neuenschwander, "Taking the Ethics of Einstein into the 21st Century"; Carl Wieman, "Bose-Einstein Condensation"; and Worth Seagondollar, "The First Man-Made Nuclear Explosion." With each speaker being so well known in his/her respective field, it was amazing to listen to each person's experiences and first-hand knowledge.

Jocelyn Bell Burnell's presentation titled "Pulsars and Extreme Physics" stunned the crowd of undergraduates, professors, and alumni with facts about the evolution of stars and incredible details of a neutron star.

Einstein and the World Year of Physics in 2005 were introduced in two other presentations. Einstein's feat of publishing five pioneering papers within a timeframe of less than six months and the ethical issues that he had to deal with were explained.

Another set of sessions dealt with ethics in physics. Sigma Pi Sigma members voted on several recommendations which were then sent to the SPS Council for possible adoption as new society resolutions.

John Marburger, the Science Advisor to the President of the United States, spoke during dinner on Friday evening. His topic, Governmental Ethics, interested many in the crowd, and he was able to answer a few questions at the conclusion of his speech.

Carl Wieman, a Nobel Laureate, discussed his award winning research on the topic of Bose-Einstein Condensation (BEC). Although his research is very complex, Wieman talked about it in a manner that was easy to understand by all in attendance, even to undergraduates who had never been previously exposed to the topic. We were also privileged to spend some time talking one on one with Dr. Wieman following his presentation (more on this below).

The Congress concluded with a speech by past Sigma Pi Sigma president Dr. Worth Seagondollar, in which he shared personal recollections of his experience with the world's first atomic explosion at the Trinity Site in the New Mexico desert nearly 60 years ago. His incredible memories of the event held the crowd in suspense as he told stories of dropping radioactive spheres, avoiding snakes, collaborating with world-famous physicists, and the actual moment of witnessing the bomb's detonation. His speech capped off the night and was a perfect conclusion to the 2004 Congress.

Now back to Dr. Wieman. In addition to giving those of us in attendance a fascinating lecture on BEC, Nobel Laureate Carl Wieman showed that not only is he impressive as a talented scientist but also as a man willing to share his knowledge with others. At the conclusion of his presentation, he entertained questions and comments from those interested to speak with him for as long as anyone was left.

Following this, Dr. Wieman sat down with Kit and me

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Dr. Carl Wieman is flanked by Kit Wobeter & Eric Hemesath, Coe College SPS Reporters.

Photo credit: Kit Wobeter and Eric Hemesath.

for what we thought would be a brief interview. We had the extreme pleasure to speak with him for over 30 minutes. His passion for science and learning was abundant. Despite having won the Nobel Prize, we were impressed to find that he was humble, approachable, and easy to understand.

Since winning his Nobel Prize in Physics in 2001, Carl has concentrated less on pure physics and shifted his research focus and a large amount of his research dollars towards physics education. When asked why, he responded by saying that after receiving the Nobel Prize, he was forced to look for an arena where he could have an impact. For him, this arena is physics education.

Some of Wieman's current efforts involve obtaining input from physics undergraduates through a survey scheme he developed. The surveys are designed to investigate how varying attitudes towards science and specifically physics affect the student's ability to learn. The ultimate goal of the project is to identify the correlation between academic attitudes and scientific learning and apply the results of the study to improve the educational process for a vast range of students over all the sciences.

Carl went on to tell us about the second of his main endeavors, the Physics Education Technology (PhET) Project. The result of this project is a website which "…produces fun, interactive simulations of physical phenomena that make bridges to the real world." The website contains various Java simulations highlighting laws of motion, thermodynamics, wave theory, electricity, and even quantum phenomena, to name a few. The simulations are downloadable at no cost, demonstrate the dependence of parameters in real time, are very user-friendly. Dr. Wieman commented that his main purpose for the simulations is for them to be engaging and educating and are meant to provide a greater background of numerous physical phenomena.

We also asked Carl about the time when he was studied BEC and how he felt when his group discovered its existence. He said that big engineering obstacles require a long time to see results. Not being swayed by the possibility that it could not exist, his curiosity gave him the motivation to pursue the project to its completion. He told us that it was an ultimate thrill to see that it worked and that at that time he was "bouncing off the walls."

The backbone of Sigma Pi Sigma: Past Presidents George Miner, Thomas Olsen, and Worth Seagondollar; and current President Steve Feller (second from left).

Photo credit: Kit Wobeter and Eric Hemesath.

When asked about the future applications of BEC, Dr. Wieman said that, like any major scientific discovery, 20 years or so might be required to realize the practical applications of such a novel innovation.

In retrospect, we will forever be thankful that we were presented the opportunity as physics undergraduates to have an in-depth conversation with a world-renowned scientist of the highest caliber. Carl Wieman was extraordinary in the sense that his speech was fascinating, yet understandable in addition to demonstrating a passion to share his knowledge for the benefit of others.

NOTE: For more information on the Physics Education Technology (PhET) Project, visit: http://www.colorado.edu/physics/phet/. ◆

QUOTES (OR NEARLY SO, MORE LIKE PARAPHRASES TAKEN FROM NOTES) OF VARIOUS SPEAKERS AT THE 2004 SIGMA PI SIGMA CONGRESS

Why is Einstein the standard of greatness? Both for what he thinks and how he thinks....What did he think: On March 17, 1905, came the photon paper. The idea of photons was accepted only in 1922. Only in mid-1925 did Bohr accept it....Forty-four days after the photon paper came the dissertation on atomic sizes. Ten days after that the Brownian motion paper. Fifty-one days later, the first paper on Special Relativity. Twenty-nine days afterwards, $E = mc^2$. Other thoughts of Einstein: in 1909 came Wave-particle duality; in 1916, General Relativity; in1917, Stimulated Emission; in1924, Bose-Einstein Condensation; and in 1935 came Foundations of Quantum Entanglement...How Einstein thought it: He was not unique, but he was rare. He was not distracted by trivialities. He worked alone. He approached physics through the power of pure reason. He illustrates the difference between a scientist and a technical expert. Einstein's legacy transcends his physics.... — John Rigden