At its core, the Sigma Pi Sigma Quadrennial Physics Congress (PhysCon) is about building community and looking forward. Early congresses brought together students from the first chapters of Sigma Pi Sigma to talk about the future of the society and how to transform the fraternity into a widely recognized honor society. As the society has grown, its congresses have engaged an increasing number of students and alumni, who come to set priorities for the organization and to explore the future of physics more broadly.

But looking forward can best be done in the context of looking backward; previous generations can provide the newest generation with advice and a foundation on which to stand. At the 2012 PhysCon, this spirit was perhaps best exemplified by Freeman Dyson’s talk, “Living Through Four Revolutions.” Society of Physics Students (SPS) student reporters from the University of Louisville (UofL) who attended the talk describe it here in their own words:

“Pacing gently on stage and speaking candidly, Dyson guided 800 people through the knowledge revolutions that made history and brought humanity to where it is today. Beginning with the atomic revolution, Dyson touched on both the excitement of successfully splitting the atom and the devastation caused by the first nuclear bombs. Looking to get a start in physics, a young Dyson [to take the reader back in time] sought out the scientific minds who first worked on the bombs at Los Alamos National Laboratory in New Mexico. He eventually became a graduate student at Cornell University in Ithaca, New York, where many had gone after the war. ‘Within one week, I hit the jackpot,’ Dyson recounted. ‘I got to know Dick Feynman, and it was obvious this guy was a genius. He was a marvelous guy, a clown, a buffoon, a great teacher.’ Dyson then told stories of how Feynman once learned never to care for another person’s boa constrictor and refused to sleep in a tennis-themed hotel.

The second revolution also began with the Second World War, but involved developments in the field of rocketry that would eventually lead humanity into space. Dyson worked on Project Orion, a mission to use nuclear bombs as the launching mechanism for a spacecraft, a program that never quite took off. The bomb, developed as a means of destruction, would have been used for purposes of exploration and scientific advancement.

Next came the biological revolution, which started with the model of DNA established by Rosalind Franklin, James Watson, and Francis Crick; the last two earned a Nobel Prize for their work. Dyson warned the audience never to take his advice, as he had tried to convince Crick to stay in physics rather than go into biology.

The most contemporary revolution described by Dyson was the computing revolution. Dyson’s colleague John von Neumann advised the US government that the country would never need more than 18 computers, an unfathomably low number from today’s perspective, considering the smartphones, graphing calculators, televisions, cars, and other modern conveniences that now run on computers. The proliferation of computation has left humanity, in Dyson’s words, ‘living on little islands of understanding in a sea of information,’ which is ‘cheaper to collect . . . than to understand.’

More than just a history lesson, Dyson’s talk was the personal story of a career physicist making his way to the top. When asked for advice on juggling career and family, he jokingly told everyone that he had lots of advice, ‘but you don’t have to take it.’ Then he spoke briefly on the detrimental impact that going through a PhD program can have on one’s personal life. ‘If you don’t need to get a PhD,’ said Dyson, ‘don’t.’ Flexibility and good fortune, according to the accomplished physicist, go a long way: ‘The important thing in life is to be lucky.’ Remaining on a single path limits options, claimed Dyson, citing software as an example of flexibility. The programming skills a student learns on one research project can be applied to future projects, allowing for respecialization down the line.

Dyson clearly struck a chord with the crowd. Hordes of students mobbed him between sessions. Seeking photos, advice, opinions, and stories from one of science’s most esteemed figures, they lined the stage, pre-
The Other-Worldly Career of Freeman Dyson

by Phillip F. Schewe
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Freeman Dyson is not one man but 10. His most famous scientific achievement, as a physicist, was his contribution to establishing quantum electrodynamics. But Dyson has also performed notable engineering feats, such as designing nuclear reactors and rocket ships. He has served in a crucial governmental advisory capacity, helping to secure a limited test ban treaty (whose 50th anniversary just occurred) and keeping tactical nuclear weapons out of Vietnam. While doing research in biology, he proposed a novel theory for the origin of life and wrote a book about it. As an astrophysicist, he helped launch in 1960 the search for extraterrestrial intelligence with his speculations about large-scale orbiting habitat platforms powered by stars, now better known as Dyson Spheres. He also helped create adaptive optics, a corrective system now used on most of the world’s large ground-based optical telescopes, and he ushered in the formal study of the cosmos at very distant times.

Dyson admits to having a short attention span and believes that the current PhD system, which commits students pretty much to a fixed course of research on a single topic for five years or more, is too restrictive. Consequently, with the exception of two years at Cornell University in the 1950s, he has never taught at a university or supervised students. Nevertheless, he is committed to teaching in the larger sense, through his essays and his frequent appearances before student audiences. Dyson has been given two dozen honorary doctorates and has won many of the major physics prizes. But in his home, on the wall near the staircase, he displays a single framed award: the Oersted Medal, the highest award bestowed by the American Association of Physics Teachers, given to individuals who have had an outstanding, widespread, and lasting impact on the teaching of physics.

Dyson is better known now, at least among the general public, for his essays both in books and in The New York Review of Books. At the age of 90 he is still writing actively, and still proving controversial. His favorite topics: how the Internet and solar energy will eventually bring prosperity to poorer nations, without the need for expensive resources, as those countries become integrated into the world economy, the need for scientists to recognize the importance of religion and the arts in understanding the world; his argument that the current climate change debate is overheated, and that the good consequences of the changes will probably outweigh the bad; and the idea that biotechnology innovations should be carefully policed but promoted to raise standards of living.

Most daring of all are his long-term predictions—as a sort of cheerleader—concerning the eventual human migration into space. He is critical of the current human presence in space (the International Space Station) and believes that a grander human exploration of the solar system will begin only when the costs come down a lot. He figures that human habitation of space (probably on moons and comets in the Oort cloud but not planets) will be both liberating and scary, like the early voyages of Polynesians across the Pacific and Europeans across the Atlantic. Even if, through the use of genetic engineering for adapting to space conditions, the human race splinters into several rival species, Dyson believes such a gigantic upper migration is our ultimate destiny.

Putting these ideas into cogent essays as a way of getting society to ponder its far future will, I believe, prove to be Dyson’s most important legacy.

CONTINUE READING

Schewe is Dyson’s first and only biographer, the author of Maverick Genius: The Pioneering Odyssey of Freeman Dyson, published in 2013 by St. Martin’s Press: www.phillipschewe.org.