

## Spotlight on Hidden Physicists

### **Brian J. Coppa, Ph.D., Senior Process Engineer, Phoenix, AZ**



I was a Spring 1999 BS graduate in Physics, with an economics minor, from the University of Arizona, and also served as the '98-99 SPS President and Zone 16 National Councilor. SPS was my major extracurricular activity for all four years of college, and as president, I regenerated the Sigma Pi Sigma chapter, my final year. Moreover, SPS helped connect me to the well-developed, greater student organization system on campus, which also subsidized SPS travel to zone meetings and fundraising events.

After finishing at Arizona, I pursued graduate studies in materials science and engineering at North Carolina State University (NCSU) in Raleigh. In Fall 2001, I received a master's in this field, before finishing my Ph.D. dissertation in the summer of 2003, entitled "Electrical, Chemical, and Structural Characterization of Au Schottky Contacts on Remote Plasma-Treated n-Type ZnO {0001}" under the direction of Dr. Robert F. Davis, advisor, and Dr. Robert J. Nemanich, co-advisor, and former international MRS President.

My research dealing with interface studies associated with gold Schottky diodes on zinc oxide wafers was published in *Applied Physics Letters*, *Journal of Applied Physics*, and "MRS Bulletin." This innovative work has been cited numerous times in subsequent literature regarding applications towards UV photodetectors, LEDs, solar cells, and gas sensors. In addition, I completed a one-year "real-life" high-technology entrepreneurship program towards my minor and served as treasurer and president of the NCSU Materials Research Society.

In 2004, I joined Micron Technology Inc. in Boise, Idaho, as a process development engineer

focused on next-generation memory devices for computers, cell phones, iPods, digital cameras, servers, and routers. Several of my inventions have been published as US patent applications regarding semiconductor process and device integration technology. During a sabbatical year, I worked as a technical consultant for Gerson Lehrman Group Inc. and the Society of Industry Leaders as an electronic materials industry analyst for major investment firms on Wall Street and other financial centers.

In the summer of 2008, I returned to the state of my alma mater to join ASM America, Inc. (<http://www.asm.com>) in Phoenix as a senior process engineer focused on atomic layer deposition R&D for semiconductor devices. This company develops processes and deposition equipment used at major microelectronic foundries and companies such as Intel and Samsung. Throughout my engineering career, I have been involved in K-12 Science Outreach programs and an avid volunteer for MentorNet, an international program dedicated to advising student-level upcoming scientists and engineers.

### **Robert C. Derschang Aurora, CO**

I was elected into Sigma Pi Sigma at Syracuse University in 1959. I graduated in 1959 with a B.S.E.E. Then I moved up through North American Philips, part of N.V. Philips of Holland. I started as a product manager and eventually became a V.P. of marketing for four divisions in the late 60's.

I resigned from Philips in 1970 and founded Electronic Processors Inc. in Denver Colorado. My partner and I produced a special computer for blood analysis and supplied it to the market leader for many years. We also invented a special portable tape drive for the computer numeric control and

robotics industries. This product became the standard of the industry and was very successful for years.

In 1986 I sold out and retired to sail in Florida for 10 years. When the boat sunk in a hurricane, I had enough and moved back to Denver. I consult for various companies, but in 2006 I joined Your Travel Biz and became an Association Specialist to set up search engines for colleges, universities and other nonprofit organizations.

### **David Maruszewski Instructor, Simulation and Digital Entertainment, Hagerstown Community College, Hagerstown, MD**



I have had an odd journey on my way to becoming a "Hidden Physicist." I received my physics degree from Marquette University. I liked my mechanics course most of all and ended up following that into a Masters in Mechanical Engineering. My thesis was in reverse engineering, which allowed me to learn computational geometry.

I ended up using both degrees to work for the Navy doing detonation physics and working on large finite element codes. The government is a good employer, but the job wore on me after a while for multiple reasons. I quit, started a small company, and pursued a third degree in art. On the way to getting the fine arts degree, I learned animation which was quite interesting to me.

The reason that I am recounting all this to you is that all of my learning rolled into my dream job. As it turned out, I got enthralled by PC games during the journey, and at the end I realized I knew all the parts to making a modern video (except sound.) I am now changing my company's direction to make video games, and I am a full time instructor at Hagerstown Community College ([Maruszews-](#)

[kiD@hagerstowncc.edu](mailto:kiD@hagerstowncc.edu), feel free to e-mail me) in Maryland teaching other students how to make video games, from development to coding to art.

It is a great experience that only took me 37 years of my life to figure out. It's odd to look back and know how much time I spent worrying about my future (mostly because I didn't know what I wanted to do with my life) only to have it fall in my lap in mere months. Moreover, I'm betting all physicists would love to at least take part in making a video game even if they are not fond of them. To have your ideas and physics principles put into a virtual environment where you visualize them and enhance them is rewarding.

Even though I am removed from direct physics now, I am very happy to have achieved my physics degree and to have learned from many challenging teachers at Marquette. That experience was invaluable to me and wouldn't have wanted to do my life over without them. I'm indebted to both, and I wouldn't be able to do the job(s) I do now without them. I could go on how physics helps me do my job, but that would take about 10-30 pages. There really is no substitute for that type of knowledge and understanding.

## Ted J. Andresen St. Petersburg, FL

I'm a retired aerospace engineer. My training was in applied physics. Now I work on a math/physics model of the human runner. It represents the human runner as a single mass bounding along on a pair of spring-like legs. It is all Newtonian mechanics. The problem is VERY complicated, so it is solved numerically with Runge-Kutta and Newton-Ralpson algorithms.

It's a interesting topic because it helps one to understand how much power a human runner is expending and how someone can run and use less power.

Presently, I am working on the marriage between the spring

mass model and a two-segment leg. That will explain the energy considerations and why runners select a particular step rate at each speed.

The physics is pretty direct and the results agree with reality so

the model is pretty good.

You can see the model in action at the website below.

<http://members.aol.com/Math-PhysicsModel/SM/SM.html>

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## Letters

I would like to strengthen the justification of science found in the Spring 2008 *Radiations* article "Fermilab: Scientific Citizenship by Example." To the question "Why should society care about such questions not directly related to survival, or activities not directly linked to the production of immediate wealth?" you answer "Similar questions could be put to those who build art galleries, concert halls, racetracks, or cathedrals. We are insatiably curious. We like to push the limits of what we can know and do. Such quests are guided by values that transcend sheer survival or the quarterly financial report." Robert Wilson's explanation then elaborates on these ideas. I believe that a stronger response can be made.

For a primitive society, one with only enough energy perhaps to support the activities of building shelter, acquiring food, defending itself, and reproducing, then science and art would of course be luxuries. But when a society becomes a technological civilization, as ours is, which means that its protection of its health, its production of food, and its warfighting are studied methods involving tools, then science ceases to be a luxury and instead becomes the method of refined reasoning by which the civilization understands its environment and sustains its studied methods of survival. In a similar sense as an individual human in the wilderness uses its reasoning abilities to understand its environment and to build tools, so must a civilization refine its reasoning in order to survive in its environment. For us, science is this refinement of reasoning, a method



with which to check for error, resist bias, dig for difficult answers, and share information. This is a relatively new method for us, and we are a nascent technological and global civilization.

It is irrelevant that high-energy particle physics does not appear to study health, defense, or food. Indeed, on our macroscopic scale of perception, it hardly seems to contribute to our understanding of our

environment—that is, the environment in which we live, our niche. But a civilization concerned with survival and success (which includes cultural or artistic success) has as its concern an environment characterized by much grander domains and subtler qualities, ones we exploit in the studied methods we use to refine our food supply, our health, or our warfighting (hopefully the latter activity passes into obsolescence as our state of civilization develops). So it is this broader conception of nature that we study through science. I hope we all begin to see science as the refinement a society's collective reasoning, and not only as an activity that enriches our culture, which of course it is as well.

Answers like the one I give here must be immediately on hand by scientists, or defenders of science, when asked that inevitable question, "What is the use of science?" Appeals to our culture and spirituality, while true and sincere, are not the complete justification of science, and the stringent, sometimes cynical, competition for the attention of the state and its treasury requires stronger claims.

Sincerely,

Daniel E. Richman

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## Spotlight on Hidden Physicists cont.

### Amanda Joy McDonald, Actuary, American Fidelity, Oklahoma City, OK



Amanda Joy McDonald, an insurance actuary in Strategic Development for American Fidelity Insurance, recently passed the rigorous program of professional certification tests to be designated a Fellow of the Society of Actuaries. Only about 11,000 actuaries have earned the Fellow designation in the United States.

Joy earned a BS in physics from Southern Nazarene University, Bethany, OK, in 1989, where she published a paper in the *Journal of Undergraduate Research in Physics*. She was elected into Sigma Pi Sigma in the SNU chapter when it was chartered in 1994. Joy began her career as an actuary before graduation by taking the first actuarial exam in November 1988. Then life intervened. She took several years off from Fellowship studies to raise children while still working as an actuary for American Fidelity. In 2006, realizing she was approaching the twentieth anniversary of starting the Fellows program, Joy set a goal to achieve the FSA before that anniversary. That goal was realized a few months early when Joy completed the final requirement in July 2008. Joy concentrated her actuarial studies in Group and Health Insurance.

Joy has remained a highly visible "hidden physicist" throughout her actuarial career. She presents talks to university math clubs and chapters of the Society of Physics Students, describing how a background in physics prepares one well for actuarial studies. An article on that subject, co-authored (with fellow AF actuary Gene Shepherd) by Joy for the March 1996 issue of the *SPS Newsletter* (now the quarterly *SPS Observer*) described how an actuary, like a physicist, creates and

develops mathematical models of systems. At the 2000 Sigma Pi Sigma Congress, held at College Park, Maryland, Joy was one of the invited panelists from business and industry who described how their physics education provided a strong background for their careers. Joy said, "Actuaries design algorithms that help companies deal with risk. In the actuarial profession, there's a lot of on-the-job training. The distribution functions we derive don't fit a given set of equations. One has to go back to first principles and derive results from scratch in each new situation—just as we were trained to do in our physics courses and research projects—not to memorize formulas but to think." (*Radiations*, Winter 2000, p. 13)

In a statement to her colleagues at American Fidelity, Joy said, "The support of my department and the camaraderie of the actuarial community here at AFA definitely had an impact on my ability to achieve this designation. Everyone here would regularly ask me how things were going. Whenever anyone passes, we all celebrate, and we share in the setbacks as well. It's been very motivating."

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vicariously through the variety of reports we are planning on the website, [www.sigmapisigma.org](http://www.sigmapisigma.org), and here in future issues of *Radiations*.

And after you have had a chance to let it all sink in, decide for yourself whether we live in truly interesting times or if, in fact, the whole idea that these times are extraordinarily interesting is yet another example of humans (mistakenly!) thinking themselves the center of the universe.

[1] "May you live in interesting times," is often cited as a Chinese curse, such as Robert F. Kennedy did in his Day of Affirmation Address in Cape Town, South Africa, in 1966; but most who have studied it say it has origins in modern literature, via Carl Jung, or perhaps a

1950s science fiction story, U-Turn, by Duncan H. Munro, a pseudonym for Eric Frank Russell. It certainly seems like a modern sentiment to me.

[2] For a refreshingly positive view of the LHC see the stunningly popular CERN Rap video (over 3 million views to date) by Katie MacAlpine on the SPS website, [http://www.spsnational.org/news/2007/geneva\\_gazette.htm](http://www.spsnational.org/news/2007/geneva_gazette.htm); her earlier physics rap, "N3UROCH!P", is at <http://www.katemcalpine.com/webout.html>.

[3] Art Hobson makes the case for a scientifically literate populace in a recent article, describing the adult scientific literacy worldwide as "shockingly low" but rising. Perhaps surprisingly, the U.S. ranks second among the 34 nations tested in one recent measure. For more information, see Hobson's paper in the October 2008, issue of *The Physics Teacher*, "The Surprising Effectiveness of College Scientific Literacy Courses," citing the work of Jon Miller.

*Special thanks to Kendra Rand for valuable suggestions.*

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Congratulations to Sigma Pi Sigma for an excellent Spring 2008 issue. I was particularly impressed with Dr. Victor Alpher's article about his father. I met Ralph Alpher when he was George Gamow's student (and already a mature scientist), and knew Gamow quite well when he was at Colorado. The Alpher, Bethe, and Gamow publication was one of Gamow's favorites, and being the whimsical person he was he always relished the authorship. Ralph Alpher deserves a great deal more credit for his many accomplishments.

Years ago when I was at the University of New Mexico, Gamow was to give a lecture on the age of the earth. He started by asking the audience if anyone knew the age of the earth. The answer he got was 3.6 billion and two years. Gamow asked the responder how he came up with that figure. The answer was "I heard you give this lecture two years ago and the age then was 3.6 billion!"

Edmond Gerald Meyer  
Emeritus Professor and Dean  
University of Wyoming