The Dilated Times

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AFTER YEARS OF ABSORPTION, DR CARTER REFLECTS

I remember clearly the day I fell in love with physics. During my freshman year at Harvard, a physics major showed me Maxwell's equations, written in a language that was then Greek to me. He said that they described all the phenomena of electricity, magnetism, and light. I said, "You can't be serious," and decided on the spot that I had to understand how that was possible. I'm still thrilled by the fact that you could spend a lifetime exploring the richness of four equations that can be written on the back of a postage stamp.

After graduating and serving some time in the Navy, I worked at the Woods Hole Oceanographic Institution, where I became interested in ocean acoustics. So I began graduate study at Brown, which at that time was probably the strongest school in the country in acoustics. After a brief flirtation with experimental nuclear physics (I investigated deuteron-neutron reactions using MIT's cyclotron), I returned to acoustics and wrote a Ph.D. thesis entitled "Multi-Mode Acoustics Propagation in an Inhomogeneous Medium." I showed that quantum-mechanical methods could be applied to an understanding of underwater sound transmission and derived the conditions under which strong focusing regions could exist. These "convergence zones" were studied extensively by many investigators and led to the realization that very long-range sound propagation in the deep oceans was possible.

After leaving Brown it was natural for me to go to Bell laboratories, where a major Navy-sponsored effort devoted to submarine surveillance was just getting underway. The program included systems research, design, development, installation, and maintenance — all by organizations within the old Bell System. At the peak of the effort, probably 5000 people were involved.

My job was to understand the characteristics of sound transmission, noise, and signal fluctuations in most of the world's oceans. I spent a lot of time at sea making measurements; the occasional seasickness was not as bad as being away from my family.

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There were lots of stories I couldn't tell at the time, because the program was highly classified. But I can mention now that on one occasion, a technician and I had to pose as bird watchers at a place called Mukka Flugga (I am not making this up), the northernmost point of land of the British Isles. We were there to install surreptitiously a sound transmitter in the water off the island. Bird watching was our cover, and it was not without its hazards. On one occasion I got lost in the fog on the moors and was divebombed by an angry skua with a six-foot wingspread!

The surveillance system, whose main element consisted of hydrophone arrays placed on the ocean floor, was remarkably successful in keeping track of submarines and deterring Soviet aggression during the Cold War. You can read about it in Tom Clancy's novel, The Hunt for Red October. The system is still being used — by scientists studying whale migrations, undersea volcanic activity, fishing patterns, and global warming.

There were always many exciting things going on at Bell Labs: transistor research, satellite communications, laser optics, and speech recognition immediately come to mind. I had other assignments in my career, but the work in acoustics was the most fun. As a department head, I recruited or had assigned to me some very competent Ph.D.s

Dr Carter Reflects (continued from page 2)

and technicians. Among the brightest and most productive was none other than Jim Supplee! Jim left Bell Labs in the 1980s to teach but I can say I knew him before anyone else at Drew did.

I, too, wanted to teach, and in 1975 John Ollom, then the chair of the physics department, asked me to become an adjunct professor at Drew. That was the beginning of a long and happy association. I retired from Bell Labs in 1990, and the rest is history, as they say. My greatest satisfaction is seeing students become excited about physics, just as I did many years ago. -Dr Ash Carter

Next in the SPS Film Series: THEM!

On Tuesday, November 19, the 1954 sci-fi classic *Them!* will be shown in HSC 244. *Them! i*s the first and best of the atomic mutation movies: radiation from Los Alamos bomb tests produces giant, man-eating ants. Cop James Whitmore, FBI agent James Arness, and scientists Edmund Gwenn and Joan Weldon must track the ants across the desert and into the sewers of Los Angeles to destroy them. Though the ants are a scientific impossibility (for one thing, they'd collapse under their own weight), they remain a special effects marvel and an apt embodiment of American fears about the bomb and atomic radiation.

Physics for Kids in 1961

Excerpts from Physics: Its Marvels and Mysteries by Dr Daniel Q Posin, published in 1961 and sold for 59¢

"Why? How ? What? and Who?"
When a Geiger counter goes *click! click! click!* as you hold it out in the open, you wonder about it, don't you? And when you get more clicks as you hold the counter over some uranium rocks - or over the glowing dial of your watch - you wonder some more.

And gravity: What is it? How can gravity keep the moon from flying off into space? And X-rays: What are they? And light itself? And what is everything made of? Atoms? Why can't we get less than atoms — smaller pieces, that is? We can? Really? How? Why? When?

If you have wondered about some of these things - about forces, and material, and motion, and energy — you have been wondering about the science called physics. A scientist who studies these things is a physicist. Would you like to be a physicist?

"**How Things Move and Fly and Soar"**
One day if we want to avoid the feeling of gravity for a long time, we will take a spaceship trip to another planet, or even to another sun's family. And, incidentally, some scientists think that as we travel at great speed, our time will begin to run slowly and we will not age as much as those we leave behind on earth.

Motion, therefore, is an important part of our lives. How birds move and fly is important because we have wanted to imitate them and have done so. How the planets move is important for the sake of knowledge. We want to learn of motion, and soaring and power and flight, because the universe is large and full of mystery — and beckons to us.

"The Magic of Magnetism"
You can see that the effects of magnetism and electricity can be more startling than the wonderful tricks of a magician. They give promise of great usefulness in the coming development of the Age of Space.

"The Strange Behavior of Liquids and Gases"
This principle of buoyancy was used long ago by the Greek scientist, Archimedes. He was trying to figure out whether or not a crownmaker was cheating the king by making his crowns partly out of silver instead of entirely of gold. Archimedes was lolling in his bathtub when suddenly he was struck by the idea of buoyancy and of how he could use it to test the crowns. He jumped out of the tub and ran down the street yelling, "Eureka!" which means, "I have found it!"

"Sound: Noise or Music?"
For many years I have been hearing people propose this problem: If a bomb goes off in a desert, and there is no living thing to hear it, is there a sound?

"Electricity: Mysterious and Powerful"
The sun and stars generate radio waves as well as light and X rays. And even excited gases generate radio waves which our radio telescopes pick up. This reminds us that projects are under way to see if beings in some other solar system may be trying to send radio messages to us! Do you think messages will come? In what form?

"The Small World of the Atom"
Of course you know that everything is made of bits of matter called atoms. The atoms, in turn, are made up of particles called protons, electrons, and neutrons.

Did you know that some opposite types of particles have been discovered — anti-protons, anti-electrons, anti-neutrons.

If these particles exist together, we will find that we have anti-matter! Do you suppose there could be anti-beings? What would they be like?

So much to know. So much to see. So much to discover. Are you going to be a discoverer, a scientist? It is a wonderful life!

Top 10 Reasons To Be A Physics Major

10. Electrocution available upon request.

9. Social benefits of afternoons in lab.

8. True appreciation of three hours of sleep.

7. Free math lessons in every lecture.

6. Free Greek lessons in every lecture.

5. Admirable lack of grade inflation.

4. Two words: *Physics Today*.

3. Goggles not required.

2. Pocket protectors optional.

1. Mental health highly overrated.

Zone Meeting at SUNY Stony Brook

Junior Matt Diamond on the meeting:

On Saturday, November 2, senior Jon Paley and I represented Drew's SPS at a zone 2 meeting at SUNY Stony Brook, Long Island, Ny. From Jon: "The meeting was small - I had expected more students from more schools like the meeting Drew hosted last year where there were more than eighty students from more than ten schools - but we did meet some students from Adelphi whose small school experience we could identify with. The talks were interesting though a little long."

Dr Dwight Neuenschwander, National Director of SPS, opened the conference with a talk on the long term, growth-oriented goals of SPS. In addition to student talks, the schedule included a lecture by Dr John Milnor, recipient of the Fields Medal, the equivalent of the Nobel Prize in the field of mathematics.

In the afternoon, Dr Thomas Hemmick spoke about "Recreating the Birth of the Universe." His analogies between quantum phenomena and student life kept his lecture understandable and entertaining. Jon "can easily see why [Hemmick] was awarded a distinguished teaching prize by the university - a $500 check he donated to their SPS." Dr Peter van Nieuwenhuizen spoke about the theory he invented in "A Beginner's Guide to Supergravity."

Zone meetings are a great way to learn about opportunities in physics while connecting with other schools. Look for the zone 3 meeting on March 14-15 this spring!

UPCOMING SPS EVENTS...

Friday November 15....Science Day

Tuesday November 19....Sci-Fi Film

Thursday December 12....Taco Party

New Jersey Nightline

If a question comes up after the sun goes down, call New Jersey Nightline at 1-800-922-2233. Hours: Monday thru Thursday from 9 p.m. to midnight and Friday thru Sunday from 5 p.m. to midnight.

SOCCER STAR SARAH

Congratulations to senior physics major and soccer player Sarah Adams, who scored Drew's only goal at the first game of the MAC championship, played at Elizabethtown on Saturday, November 2. Sarah scored a cross from the right side with 12 minutes remaining in the game. It was only her second varsity goal and her first goal of the year, in her last game for Drew.

PLEASE RECYCLE ME!

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