

Engineering & Physics Club NEWSLETTER

Spring 2006

"640K ought to be enough for anybody."

- Bill Gates, 1981

"Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world."

- Albert Einstein

See the latest Puzzler on page 3



Meet John Carzoli, Soaring Ph.D.

By Davy Murukurthy

Don't let Dr. Carzoli's calm demeanor fool you. When not acting as Chair of Physics, Earth Science and Chemistry, he does everything from photography to flying. His duties as Chair include hiring adjunct faculty, managing course schedules and selecting text books. This spring he is teaching Physics and Astronomy.



Dr. Carzoli was born in Woodstock, Illinois, the seventh of eight children and has lived in that area all his life. As a child he played the clarinet but had more interest in computers. He worked six years as a paper boy, collected coins, and built models and rockets. When he mistakenly reversed the engine on a three stage rocket, it rapidly took off along the ground rather than high in the sky.

At Beloit College in Wisconsin he simultaneously earned three bachelors degrees in physics, math, and chemistry, all in four years. He received a Masters of Science in Physics at the University of Oklahoma. There he earned a Ph.D. in Atomic Physics. He was helped through college by a combination of work-study programs, grants, scholarships, loans and his parents.

Dr. Carzoli did not always want to be a physicist. He originally wanted to be a heart surgeon. However, in college he was drawn in to physics and science (he realized he was not fond of the sight of blood). As he continued his studies he became fascinated by astronomy and the theoretical side of science. **Continued on page four.**

Photo above: Dr. Carzoli and the plane he'd like to fly next, the North American P-51 Mustang fighter.

2006 SPRING AMATYC MATH COMPETITION

Every Oakton student is welcome to participate in this prestigious national competition which will be held at 1:00-3:00pm, February 28, 2006, in room 1608/1610 (Des Plaines) and in room P103/P104 (Skokie). The level of competition is precalculus.

All entrants will receive a Certificate of Participation. Other certificates, and medallions will be awarded to top scoring participants. The top six annual winners will receive U.S. Savings Bonds of \$100, \$75, and \$50, depending on placement. The annual award ceremony will be held May 4, 2006. Please contact STEM Club officers (below) for contest details.

The STEM Club will hold competition preparation workshops at 1:00 PM – 3:00 PM on Wednesdays, February 15, and 22, in Room 2140. For more info on workshops, contact one of the following STEM Club officers: Ed McGrath (edmcgrath@gmail.com) president, Adrian Emmanuel (aemmanuel86@yahoo.com) vice president, Imran Khatri (throcky1@hotmail.com) secretary, or Aleksander Krichnkov (alex47k7@yahoo.com) treasurer.



Smashing Bridges!

Get ready for the 4th Annual Bridge Building (and Demolition) Contest, slated for July 19, 2006. You supply the pasta, and the Engineering and Physics Club will supply the cement and specifications. Build your best bridge and watch it load tested to the destruction point. More details will be available this summer.

Rose Sadlier, the 2005 champ, with her winning bridge. It took 160 lbs to damage her construction.

“As current storage techniques such as DVD reach the upper limit of possible data density... holographic storage has the potential to become the next generation of storage media.”



“Keep away from people who try to belittle your ambitions. Small people always do that, but the really great make you feel that you, too, can become great.”

- Mark Twain



Holographic Optical Storage in Photorefractive Crystals

By Nouel Kamber, Ph. D.

Photorefractivity was discovered by A. Ashkin *et al* in 1966 and since then much work has been performed to characterize the phenomenon and to apply it. Nevertheless, research in this field remains very active and productive, in both basic and applied directions. The photorefractive effect is a nonlinear optical effect seen in certain crystals and other materials that respond to light by altering their refractive index. The effect can be used to store temporary, erasable holograms and is useful for holographic data storage. Nonlinear optics is the branch of optics that describes the behavior of light in nonlinear media, that is, media in which the polarization P responds nonlinearly to the electric field E of the light. This nonlinearity is typically only observed at very high light intensities such as provided by pulsed lasers. Holography was invented in 1948 by Hungarian physicist Dennis Gabor, for which he received the Nobel Prize in physics in 1971. The discovery was an unexpected result of research when improving electron microscopes at the British Thomson-Houston Company in Rugby, England. The field did not really advance until the invention of the laser in 1960. The first holograms which recorded 3D objects were made by Emmett Leith and Juris Upatnieks in Michigan in 1963, and by Yuri Denisyuk in the Soviet Union. Holography is the science of producing holograms, an advanced form of photography that allows an image to be recorded in three dimensions. The technique of holography can also be used to optically store and retrieve information. To produce a recording of the phase of the light wave at each point in an image, holography uses a reference beam which is combined with the light from the scene or object (the object beam). Optical interference between the reference beam and the object beam, due to the superposition of the light waves, produces a series of intensity fringes that can be recorded on standard photographic film. These fringes form a type of diffraction grating on the film, which is called the hologram.

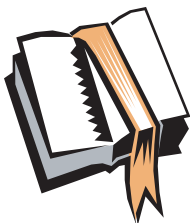
Holography can be applied to a variety of uses other than recording images. Holographic data storage is a technique that can store information at high density inside photorefractive crystals such as lithium niobate (LiNbO_3). Holographic memory is a technique that can store information at high density inside photorefractive crystals. As current storage techniques such as DVD reach the upper limit of possible data density (due to the diffraction limited size of the writing beams), holographic storage has the potential to become the next generation of storage media. The advantage of this type of data storage is that the volume of the recording media is used instead of just the surface. This can be achieved by a number of methods, e.g. rotation of the media with respect to the recording object and reference beams or changing the wavelength or phase of the recording laser beams for each hologram. Like other media, holographic media is divided into write once (where the storage medium undergoes some irreversible change), and rewritable media (where the change is reversible). Rewritable holographic storage can be achieved via the photorefractive effect in crystals.

Dr. Kamber has published several articles on holographic storage and crystals. He is an adjunct faculty member at Oakton and a Physics and Math tutor at the Learning Center. He is often available for students at the Instructional Support Services, Room 2400.

Book Corner

Blink: The Power of Thinking Without Thinking

by Malcolm Gladwell



Little, Brown and Company (January 2005), 288 pages,
ISBN: 0316172324

The author of “The Tipping Point,” and staff writer at *The New Yorker*, explores the importance that “the hunch” and instinct play on the workings of the mind. This book is a thought-provoking, enjoyable, easy read. The basic idea is that we make snap judgments, in a blink, and that these quick thoughts often lead to long-term insights. The author encourages his readers to rely on their adaptive unconscious to allow them to quickly react to new ideas, understand new encounters, and to be alerted to danger.

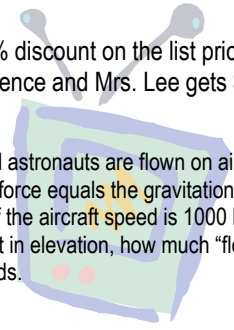


The NEW Puzzler:

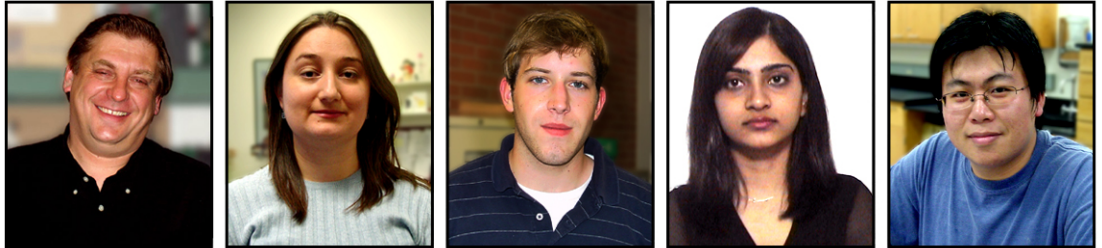
Mrs. Lee buys a TV in Oregon (where there is no sales tax) and receives a 13% discount on the list price. Later she sees an ad offering a 19% discount. If the store agrees to refund the difference and Mrs. Lee gets \$21 back, what is the TV's list price?

Solution to the last Puzzler: Recap: In order to train for weightlessness, potential astronauts are flown on air force transports. The pilot flies the aircraft over an arc at high altitude, so that the centripetal force equals the gravitational pull. The astronauts can then release their seatbelts and "float" in the cabin for some time. If the aircraft speed is 1000 km per hour what is the radius of the flight path? If the pilot cannot deviate more than 2000 feet in elevation, how much "floating" time do the astronauts have? Solution: $R = 7974.8$ m and float time is 12.46 seconds.

Congratulations to Ji Hoon Jeong for supplying the correct answer.
For detailed solution, contact George Tootelian, gtoot1@comcast.net.



The Engineering and Physics Club Officers



From left: John Kalinowski; President, Milja Pekic; Vice President; Todd Nudelman; Treasurer, Pratiksha Patel; Secretary; Ji Hoon Jeong; Technical Advisor

New in 2006: Milja Pekic, formerly Club Secretary, now holds the office of Vice President. Pratiksha Patel is our new Secretary and is currently attending classes at both Oakton and North Park University, with a double major in Biology and Psychology. She wants to see more people involved with the club, and in a geothermal project that would help improve our heating systems, the environment, and money. Ji Hoon Jeong holds a new position as Technical Advisor to the club. He is an international student advisor and has been a valuable member of the club for the past year.

STICKER SHOCK!

Have you seen your January heating bill? Here's how geothermal heating can offer a viable solution!

By Ji Hoon Jeong, Todd Nudelman, and Pratiksha Patel

Oil, gas and coal have fueled our nation's industrial and economic growth since the 1800s. Continuing America's dependency on costly and polluting fossil fuels will continue to indebt our nation's people and destroy the environment. Technology for the development and application of more efficient energy sources are already here, and it is time that we take advantage of it.

Geothermal heat is a renewable energy source which has been in use since the 1940s and has dramatically lowered heating and cooling bills throughout the Chicagoland area. This is done by utilizing the constant temperature of the earth, just meters below the surface (45-75 F depending on latitude). In the cold winter months of Chicago, the ground retains its heat of about 45° F, even when the air temperature above ground falls below 0° F. This heat can be harnessed by installing a Geothermal Heat Pump system in your backyard.

There are three kinds of GHP systems; those that can obtain heat from groundwater, surface water, or soil. Groundwater and surface water heat pump systems require a certain amount of water to operate. In Illinois, ground coupled heat pumps, utilizing heat from soil is most often used. Water is pumped through polyethylene tubing laid underground, forming a vertical/horizontal loop system. In the winter, the water passing through the system is a constant 45° F, and is pumped into a quiet running control unit in your house. The warmed water passes over coils containing refrigerants, which absorb the warmth. Using electrically operated compressors, this heat is concentrated and transferred to inside air ducts or radiant floor systems which heat the entire house. In summer this process is simply reversed, thereby cooling the house.

The cost of a Geothermal Heat System in this area, including installation, for a 2000 sq. ft. home, is approximately \$18,000. The cost would be less if you're building a new home, and could be cut further depending on available tax credits, and state and federal incentives. Annual operating cost would be around \$1000, with less maintenance, noise, and harm to the environment than conventional gas or electric heating and cooling systems. This could save \$2,500 a year in future energy costs. Currently there are more than 150 geothermal systems in the Chicagoland area, and this number is continually growing. The payback on investment could happen in as few as four years.

"I have not failed. I've just found 10,000 ways that won't work."

- Thomas Alva Edison

"Education is what survives when what has been learned has been forgotten."

- B. F. Skinner

**Oakton
Community
College
Engineering &
Physics Club**

**Room 1433
Des Plaines
Campus**

Contact:
gtoot1@comcast.net

The views and opinions expressed on these pages are strictly those of the authors. The contents of these pages and the links therein have not been reviewed, approved or endorsed by Oakton Community College.

Dr. Carzoli, continued from page one: It was at Beloit that he decided to go into teaching. He liked the teachers' style at Beloit and started tutoring while working on his Ph.D. He taught physics at Beloit for one year, then received a full time position at Oakton.

Away from school, the professor enjoys writing, astro-photography, video editing, and compiling his aurora borealis photos. You can see his images on his website: <http://www.oakton.edu/user/~jcarzoli>. He also enjoys skydiving and the "pure freedom" of flying. A favorite flying destination is Door County for lunch. Now his busy schedule usually only permits flying out of Lake in the Hills, where his brother and friend run a flying business. It was his brother who first got him started with sky diving and flying. Dr. Carzoli is looking forward to his instrument rating.

The professor's siblings are as driven and independent as he is, with careers ranging from owning a flight school, to teaching, banking, and CAD design. His father, who recently received his pilot's license, was stationed at the Glenview Naval Airbase and is currently self-employed selling electrical equipment. Dr. Carzoli's mother works as part time secretary.

Dr. Carzoli and his wife Tricia, a high school English teacher, have been married for two years. His wife has been very supportive of his hobbies and even goes camping for one week every year during the air show. She also does some acting and directs the fall play at her school.

The professor is currently working with another grad student on a project dealing with black holes and is also working on the basement of his new house, the construction of which was completed last May. Next on the agenda is acquiring a master's in aeronautical engineering and building his own kit plane.

Davy is the former V.P. of the Physics and Engineering Club and now a full time student at U.I.C..

Upcoming Events



The Engineering and Physics Club tour of Argonne National Laboratory on Wednesday, February 22.

2006 Spring AMATYC Math Competition

Tuesday, February 28, 2006

1:00 to 3:00 PM, Room 1608/1610 (Des Plaines) and room P103/104 (Skokie)

Every Oakton student is welcome to participate. Contact STEM Club officers for more info: Ed McGrath (edmcrath@gmail.com) president, Adrian Emmanuel (aemmanuel86@yahoo.com) vice president, Imran Khatri (throcky1@hotmail.com) secretary, or Aleksander Krichnkov (alex47k7@yahoo.com) treasurer.

Student-Industry-Teacher Simulations (SIT SIMS)

Saturday, March 11, 2006

8:00am-1:00pm

Business Conference Center, Oakton Community College, Des Plaines Campus

High school students may participate in a half day offering work-related simulations in Science, Technology, Engineering and Mathematics. For details, contact Joe Kotowski, Chair of Engineering (koto@oakton.edu)

The Engineering and Physics Club's Annual Pizza Night

"Meet the Engineers of the Illinois Society of Professional Engineers"

Wednesday, March 29, 2006

7:00 – 8:30 PM, TenHoeve Center, Room 1606, Oakton Campus

Representatives will speak about the benefits of becoming a registered, professional engineer, and the many opportunities in the field of engineering.

The 4th Annual Bridge Building Contest

Wednesday, July 19, 2006

You supply the pasta, we'll supply the instructions and cement.

More information will be available in the summer semester.