Get To Know...
Professor Paul Karol

Professor Paul Karol has been at Carnegie Mellon for three-dozen years. Raised in Eastchester, NY, Dr. Karol attended Johns Hopkins and Columbia University. After first meeting him in a freshman chemistry course, I had the opportunity to get to know Dr. Karol a little more informally.

CM: What do you like most about Carnegie Mellon?
PK: The diverse student body

CM: Describe your research focus.
PK: High-energy nuclear reactions

CM: What class do you teach this semester?
PK: I teach Physical Chemistry for Biological Sciences.

CM: Which class is your favorite to teach?
PK: Whichever I’m presently teaching.

CM: Fill in the blank: If I were not a chemist, I would be a _________.
PK: A National Football League Referee because the NFL is in desperate need of talent.

CM: What do you do for fun?
Any hobbies?
PK: Watching Steelers Football and Duke Basketball, Butcher Classical Piano, following Johns Hopkins Lacrosse, and visiting beaches!

CM: Any Pets?
PK: Nah. They all run away.

CM: Where did you go on your favorite vacation and why was it so memorable?
PK: I went to Venice for New Years 2000. The food, environs and local sights are tops and made the trip so memorable.

CM: Favorite Musician?
PK: S. Rachmaninoff

CM: Favorite Movie:
PK: “My Cousin Vinni”

Parent’s Weekend

Slime, bouncy balls, never-ending strings, and bags that just won’t bust: Saturday, November 5th, was Parents’ Weekend here at CMU, and for many it was a chance to see what their sons and daughters had been doing all this time in the Chem Lab. After listening to Dr. Grotzinger speak about the Mellon College of Science, the parents and siblings of Chemistry students were able to experience some hands-on lab time of their own.

Letter from the Editor

For those of you who do not know, this is the chemistry department newsletter, “Reactions.” This is our only issue for the 2005-2006 year, but in the past, we have issued two per semester. We would like to have more participation and ideas from the department. You may email the newsletter at anytime if you would like to join the staff. A meeting will be announced at the beginning of the fall semester. Also, if you have any other questions or suggestions, you may email the newsletter at chem-newsletter@andrew.cmu.edu. Good luck with finals and have a wonderful summer!
Bespoken Medicinal Chemistry

Medication that can be created exclusively for the patient. Interested? Well, personalized medicine is closer to realization than one might think. The knowledge and identification of the 30,000-40,000 genes in the human body and the sequence of over 3.5 billion nucleotides that make up human DNA that was completed in Human Genome Project in 2003 is making this possible. These data will be used to understand the proteins for which each of the human genes code.

Currently, pharmaceuticals are created to treat a disease, virus or germ by being more toxic to the culprit than the human host. This vague treatment method is where side effects arise. Variations in genetics can cause different responses to the same drug. For example, Vancomycin, an antibiotic which is administered via an intravenous infusion causes a severe reaction in some patients which they refer to as the red man syndrome. Patients commonly begin to experience itching and warmth over their head and chest, with or without the development of a rash which can be quite uncomfortable. This varies in patients because of the release of a histamine which causes red man syndrome in only some patients, where as the rest given this antibiotic do not display these symptoms.

These genetic differences, called single nucleotide polymorphisms (SNPs), are estimated to occur once per every 100 base pairs of nucleotides in specific genes. Scientists are using several methods to identify SNPs. One examines populations of individuals with and without a given disease or other trait in order to identify genetic differences that might account for the variations in phenotype.

The use of genomic information would allow drugs that are abandoned in the early stages of development (because they are helpful to some people, but harmful to others) to be revived and prescribed selectively. Finding the right drug for a patient and the possibility of drug overdoses, would be drastically reduced. Further, people could be genetically screened for their potential to develop particular diseases. Children with leukemia can now be tested for a rare, but fatal, effect of a common anti-cancer drug and steered to another therapy.

Although research is only in the early stages, there is a growing consensus among researchers that effective medical treatments for a myriad of diseases, conditions, and disabilities including Parkinson’s and Alzheimer’s diseases and heart diseases can be realized through cloning stem cells. This is because stem cells can be made to replicate specific human tissues, offering a renewable source of replacement cells. The impact of this on research, development and production could be outstanding.

Bespoken medicine will make its commercial debut in the doctor’s office where screening is done. This novel approach will likely expand clinical trials, cause delays between production runs, and possibly result in multiple product launches. Capsules, liquids and suspensions will replace tablets as the form of product because of their increased formulation flexibility; patients will be steered towards injectable drugs. Pharmaceutical companies will need to tailor their drugs to patients’ individual needs in order to remain viable. However, the genomic approach to customized medicine will have the greatest impact on pharmaceutical and biopharmaceutical companies, particularly on their manufacturing and engineering processes and product validation procedures.

Personalized medicine without the dreaded side effects, now that seems like a hearty ideal.

- Ryan Faught
The Chemistry of Love

Although Valentine’s Day has come and gone, CMU remained largely unaware of the holiday. However, the mention of science brings a glint to the eyes of any MCS student, including our very own Chemistry department. So, since it is near the holiday of love, why not delve into some of the naturally produced chemicals that are responsible for the mysterious and unusual condition that is “love.” You may even learn something!

There are the chemicals that everyone know about. Anyone who took high school health classes should know plenty about testosterone and estrogen, the hormones linked to puberty in men and women.

There are dopamines, which produce a sense of bliss, and a lack of which is associated with the onset of Parkinson’s disease. In the same vein as dopamine are serotonin and norepinephrine, which are all released during the stage of infatuation – they are responsible for the shortness of breath, racing heart and increased energy that it often brings.

Next on our list of love chemicals is oxytocin.

Oxytocin is a very important chemical in relation to sex and love. It is released in the body during orgasm, it stimulates milk ejection during lactation and uterine contraction during birth, and levels present in the body have been informally linked to the success of interpersonal relationships.

Oxytocin release and production by the body has been connected to a variety of emotional and physical triggers, even things as simple as looking at your partner.

Endorphins are another type of chemicals involved in love. If the above are the chemicals of lust and hookups, then endorphins are the long term relationship chemicals. As you probably know, endorphins are the body’s “natural painkiller.” The interesting thing is that, during periods of long-term commitment, endorphins are being released in the bodies of both men and women. If the relationship ends, the flow of endorphins stops abruptly, and this can cause some minor symptoms of

---

ChemSAC Update!

The Chemistry Student Advisory Committee elected new officers for the 2005-2006 year. Last year’s president Greg Bascug served to advise the new officers. The new President is junior Elizabeth Wiltrout. The Vice President is sophomore Jenny Kim, and the Faculty Relations Officer is senior Suzanne McAnanama.

ChemSAC held several events for the spring 2006 semester. The chemistry department met at Forward Lanes to bowl on February 10. We held a murder mystery dinner on February 27, where Sage Bowser was found to be the murderer at the prom.

ChemSAC held the annual senior banquet on April 7, where awards were given to graduating seniors and other undergraduates. ChemSAC looks forward to another year starting in the fall and would like any suggestions on events we could do. Monthly meetings will start at the beginning of the fall semester.
Get To Know... Professor Paul Karol
continued from page 1

CM: What advice (career-wise) do you have for CMU undergrads and grad students involved in chemistry.
PK: Don’t follow my decision-making process. I chose chemistry because, for college applications, I had to choose something to major in and it was the high school course I had recently finished and enjoyed. I chose nuclear chemistry as a graduate field because, in freshman chemistry, the Professor apologized for not having time to get to Chapter 33 on nuclear chemistry, and it just sounded cool! So that’s where I went. These are not how you make life path determinations! When I grow up, I’ll probably be in a different career. ☺

- Christina Maksymiuk

Parent’s Weekend
continued from page 1

Four chemistry stations had been set up in one of the labs, among stations dedicated to the other departments in MCS. A number of Chemistry majors had volunteered to work this event and show parents around the lab. At these different stations family members could make their very own bouncy balls, long strings of rubber, multi-colored slime, and even test their ability to stick as many pencils as they could into a plastic bag before busting it open. One parent remarked, “I don’t know why you think lab is so hard! This is fun!”

In the end, the event could be seen as a success because many scientifically minded parents jumped at the chance to discuss the mechanisms involved in the reactions that the demonstrations were based upon. After about an hour in the lab, parents and children left, bouncy balls and slime in hand to spend time with their kids.

- Kathleen Burke

The Chemistry of Love
continued from page 3

withdrawal. So, when Robert Palmer said that you were “addicted to love,” he might have been serious.

Some people say that passionate love doesn’t last for long or that true love ends at marriage. Chemistry might be able to explain that. The norepinephrine and other chemicals, that cause the feelings so often associated with love, may be suppressed by the production of endorphins and vasopressin as the relationship gets older. These chemicals, as we have discussed, don’t create the excitement that the earlier chemicals did, but instead they can cause a sort of dependency. This probably explains why some people can be so sick and tired of their partner of so many years but still feel pretty terrible when they split.

Now that you know so much about the physical realities of love, go fall in love and feel chemistry at work!

- Christopher Mancini
Chemistry in China

Do you ever wonder what chemistry is like on the other side of the world? Do the Chinese college students, like us poor CMU students, stay up all night trying to finish a lab report? How is chemistry research organized under China’s communist government? What contribution do Chinese chemists make to the world? Well, I thought since we all are well-educated Chemistry majors in CMU, it wouldn’t hurt us to know a few facts about Chemistry in China.

We all know that China is ruled by a central Communist government. Chemistry, like most of other things in China, is under intense government regulation. The government policy both offers opportunities and imposes constraints on chemical research and development (R&D). Lately, the Chinese government has increasingly acted to update China’s relative backward Chemistry research and technology, and is eager to cooperate with western nations, in particular with the United States. In 2000, Beijing appropriated just over $7 Billion for scientific research; in 2002 that number rose to $10 Billion*. The government is expected to focus on the kind of research that leads to economic opportunities. However, there are still several daunting obstacles, such as inefficiency caused by government bureaucracy, lack of expertise in international R&D and educational cooperation, and shortage of senior officials with broad and deep expertise in more than one type of scientific and technological institution.

China’s pursuit of chemistry related research over the last two decades has contributed to a large and growing industry which has attracted significant attention around the world. The chemical industry is the third largest in China, after textile and machinery, and accounts for 10% of China’s GDP*. China’s chemistry industry is the second largest consumer of chemical raw materials in the world, right after the United States. Trade of chemistry related products and services between the United States and China is vital to both nations. The most traded products between the two nations include crude petroleum oil, iron ores, coke & semi-coke and terephthalic acid, among others. The large scale trade leads to more cooperation that benefits both nations.

The primary research institutions that fuel the enormous Chinese chemical industry are the government funded laboratories at the Chinese Academy of Science and at public universities; research from private companies and institutions contributes to a smaller extent. In addition, the Chinese Chemistry Society is an academic organization formed by Chinese chemists to promote a wide range of chemistry related activities, such as organization of local meetings and lectures that promote public interest in chemistry. The production of Chinese chemistry related publications has also increased rapidly. China produces about 22,000 publications on chemistry per year, according to ISI. There are also a lot of foreign government and private organizations, such as the American Chemistry Society and The China Foundation, which support chemical research in China.

The Chinese educational system provides talented chemists to China and other nations. Students in China generally have 9 years of compulsory education, and then the majority enroll to senior secondary school and universities through two separate national exams. The national university admission system is characterized by fierce competition and intense pressure. After college, students may pursue a Master’s degree and a Ph.D. degree, or can pursue higher education in foreign countries. Chinese students typically take

continued on page 6
Chemistry in China

continued from page 5

Chemistry as one of their major courses (others are Chinese, Math, English, and Physics) in 9th grade, and the education is intense: Chinese chemistry students generally have a strong conceptual background. However, a major concern with chemistry education in China is it doesn’t provide adequate lab time for students to develop practical skills. So the college chemistry majors, unlike us, are less likely to spend a lot of time in labs.

Chinese chemistry researchers and post-docs contribute to the science not only in China, but in America and other foreign countries as well. According to a recent study by the National Science Foundation, “China is among the top six countries of origin of foreign-born scientists and engineers employed in the United States”. According to this study, 85% of Chinese science and engineering doctoral recipients in America from 1988-1996 prefer to stay in the United States.

Hopefully I haven’t bored you out of your mind yet. I hope that you have gotten something out of this article and appreciate the hard work that chemists in China and other parts of the world put into for a better understanding of Chemistry.

On behalf of the ChemSAC and the “Reactions” newsletter, we would like to congratulate all of the 2006 graduating seniors. We wish them luck on all of their future endeavors!

Cara J. Abbondandolo
Gregory Bascug
Jennifer J. Bentley
Deborah A. Brashear
Samuel J. Brooks
Warun S. Bubna
Michael J. Chow
Alexander M. Clemmens
Kaitlin Fague
Natalia D. Ivanova
James G. Kennard
Adina P. Klein
Kimberly P. Kicielinski
Jung-Heon Kim
Adam J. Krukas
Robert Y. Lee
Alison A. Liu
Monisha V. Mandalaywala
Suzanne R. McAnanama
Jessie E. McQuiston
Brian C. Morelli
Ben Naman
Irene N. Ojini
Grisel Perez
Evan Powell
Linda M. Prengaman
Kathryn E. Smith
Joshua E. Tischuk
Margot C. Wilson

On February 10, 2006, ChemSAC sponsored a bowling night with faculty at Forward Lanes in Squirrel Hill. Many students and professors took advantage of this opportunity to have fun outside of classes. We had about ten faculty, their guests, and about fifteen students attend.

Contributors

Editor in Chief:
Elizabeth Wiltrout
Editor:
Christopher Mancini
Layout:
Warun Bubna
Staff:
Christina Maksymiuk
Kathleen Burke
Ryan Faught
Guangzu Gao
Diana Bacal
Faculty Advisor:
Karen Stump

-Guangzu Gao