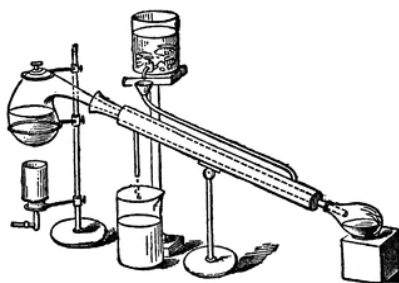




SOUTHWEST RETORT



SIXTY-SIXTH YEAR

DECEMBER 2013

*Published for the advancement of
Chemists, Chemical Engineers
and Chemistry in this area*

published by

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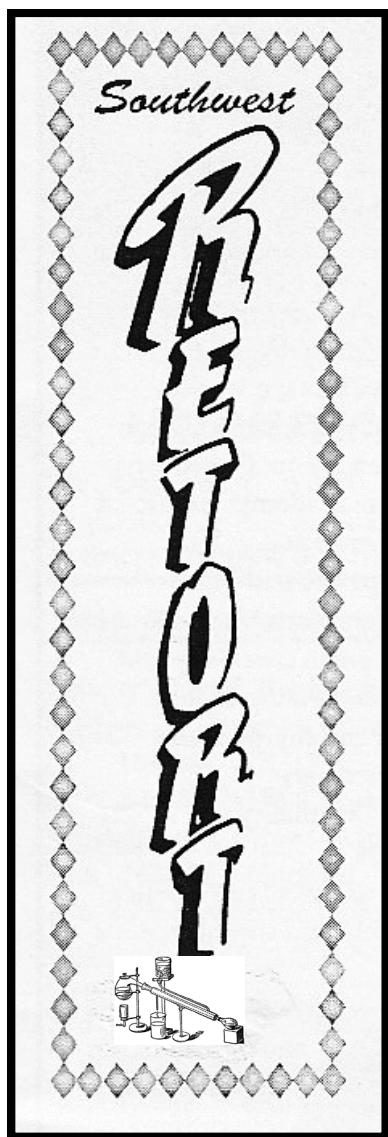


TABLE OF CONTENTS

Fifty Years Ago.....4
 Employment Listings.....3

ARTICLES and COLUMNS

Cost of prescription drugs.....6
 And Another Thing.....9
 Five Questions.....18
 From the Editor.....19

NEWS SHORTS

Dissolving semiconductors.....10
 Tearless onions.....14
 Better tests for cocaine.....15
 Hydrogels for joint pain.....17

AROUND-THE-AREA....none this month

DFW SECTION NEWS

Volunteers needed, SWRM 2014.....13
 Science Fair judges needed.....12
 Letter from the Chair-Elect.....16

MEETINGS and EVENTS

DFW January Meeting.....11

Young Investigators Symposium

ASMD@D March 1-4.....8

INDEX OF ADVERTISERS

ANA-LAB.....5
 Huffman Laboratories.....3
 Sponsor Members.....2

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Job applicants should send name, email, and phone, along with type of position and geographical area desired; employers may contact job applicants directly. If you have an opening, send your listing, including contact info for your company, to retort@acsdfw.org. Deadlines are the 7th of each month.



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FIFTY YEARS AGO IN THE SOUTHWEST RETORT

The January ACS tour speakers will be **Dr. Bernard S. Wilde** from Monsanto, whose topics are “Organic Semi-Conductors” and “Propiolic Acid Chemistry” and **Dr. Max Blumer** from Woods Hole whose topic is “Hydrocarbon Cycles in Nature.”

The ACS Southwest Regional Meeting is being held in Houston Dec. 5-7 at the Shamrock-Hilton Hotel.


There will be 219 technical presentations. The winner of this year’s ACS Regional Award is Dr. Jacob Sacks of the University of Arkansas, whose award address will be given on Dec. 6. There will be a large array of invited speakers. They are: in Biochemistry, **Dr. J. F. Foster** of Purdue and **Dr. G. Gorin** of Oklahoma State; Ozone Chemistry, **Dr. E. Bermatek**, University of Oslo, **Dr. O. S. Privert**, University of Minnesota, **Dr. F. L. Greenwood**, Tufts University, **Dr. F. Ramirez**, SUNY Stony Brook; Physical Chemistry, **Dr. W. A. Zisman**, US Naval Research Lab, **Dr. J. R. Platt**, University of Chicago; Organic Geochemistry, **Dr. T. C. Hoering**, Carnegie Inst.; Inorganic Chemistry, **Dr. W. L. Jolly**, UC-Berkeley; Polymer Chemistry, **Dr.**

H. F. Mark, Brooklyn Polytechnic Inst., **Dr. M. Goodman**, Brooklyn Polytechnic Inst, **Dr. T. G. Fox**, Mellon Inst.; and Organic Chemistry, **Dr. W. H. Urry**, University of Chicago. There will also be sessions in the areas of analytical chemistry, industrial & Engineering Chemistry, and Chemical Education. One of the special events will be a boat tour of the Houston Ship Channel.

The 1964 ACS Southwest Regional meeting will beheld Dec. 3-5 in Shreveport, LA. at the Captain Shreve and Washington-Youree Hotels. It is expected that there will be over 200 scientific and technical presentations.

Contributed by E. Thomas Strom



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72 Hf 178.49	73 Ta 180.95												84 Po (209)	85 At (210)
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T104704201

Why Are Prescription Drugs So Expensive?

by
John E. Spessard, PhD, PE



All of us who buy prescription drugs know that the drugs are expensive and that costs are escalating. Pharmaceutical companies have been significant employers of chemists. In recent years employment opportunities for chemists have decreased due to (1) mergers of pharmaceutical companies accompanied by closure of research labs and (2) an increasing proportion of initial evaluation candidates from biology at the expense of chemical development (This was covered in C&EN.) A 2001 study estimated that 42% of preapproval costs were biology and 18% chemistry.

The steps in drug approval are:

Animal and laboratory studies. This involves synthesizing the drug and testing it on animals. Only a fraction of the potential drugs so evaluated will be subjected to clinical evaluations. The time period involved has so much scatter that an estimate would be unreliable. One study found that the standard deviation was very close to the average.

Phase I studies involve 15 to 100 healthy volunteers. This testing determines only that the drug candidate is safe.

Phase II testing involves about 100 people who potentially could benefit from the drug. Phase II testing determines whether or not the drug is safe and effective and the required dosage level.

Phase III testing involves thousands of people (80,000 people participated in the clinical studies of Lipitor. Lipitor was evaluated for several potential applications. Each evaluation re-

quired separate Phase III evaluation.) These tests are double blind with some people receiving the drug and some receiving a placebo. Neither the people receiving the drug nor the people dispensing the drug know who is getting the drug and who is getting the placebo. Phase III testing is the major expense in developing a new drug. The test groups' reaction to the drug is carefully evaluated as well as reported side effects. The people receiving the placebo report an interesting array of side effects.

The testing results are then submitted to the FDA. To approve the drug, FDA must determine (1) that the drug is effective and (2) that it is safe. The usual criteria are 95% confidence by statistical evaluation. About 60% of the drugs submitted to FDA receive approval.

FDA can approve the new drug but still require additional testing.

Then the drug manufacturer must educate physicians to prescribe the new medicine. There are seminars with golf and other recreational activities to teach physicians of the benefits of the new drug. Also, while waiting in the doctor's office, you will see attractive young people calling on the doctor with samples of the new drug and inducing the doctor to prescribe the drug to his or her patients. All in all, the approval process for a new drug can take about 12 years. Drug patents have a 20 year life and typically have about 11 years of patent

protection. After then generic drug manufacturers can provide their version of the drug at a much lower cost.

A 1975 cost for the development of a new drug was \$100 million. Two cost estimates for the development of a new drug were \$802 million in 2000 dollars by DiMasi et. al. and \$880 million in 2000 dollars by the Boston Consulting Group. DiMasi studied samples from, 1970 to 1983 using much the same methodology and found a cost of \$231 million in 1987 dollars. Forbes reported that between 1997 and 2011, 12 leading pharmaceutical companies spent \$802 billion to gain approval for 139 new drugs, a cost of \$5.8 billion per drug.

The increased cost of Phase III testing is the reason. The Tufts group (DiMasi) reported that between 1999 and 2005:

Median procedures such as blood work increased 65%. Average clinical staff work load increased 67%. Average length of clinical trials increased from 460 to 780 days or 67%.

Finding and keeping the thousands of subjects for the entire clinical trials who have the needed ailments is no easy task. There was also a 30% decrease in the number of subjects who completed the trials.

The DiMasi paper was savagely and unjustly criticized. The charges were (1) the data was voluntarily provided by pharmaceutical companies, (2) the Tufts group had received funding from the pharmaceutical industry, (3) the Tufts group included an 11% charge for cost of capital which was both unjustified and excessive, (4) the Tufts group did not consider the favorable tax treatment of R&D expenditures and (5) profits of 17% of sales are unjustified.

Regarding points (1) and (2), The Federal Office of Technology Assessment in 1993 found that DiMasi's estimates were "reasonably accurate." A 2006 Congressional Budget Office report on drug development largely supported the DiMasi estimates. Recent cost estimates for the cost of developing a new drug are now in excess of a billion dollars. As for cost of capital charges, I took a course in Managerial Accounting as part of a MBA program. Cost of capital is a standard charge in that (1) you must raise capital by selling stock or bonds or reinvesting earnings. Every internal cost estimate that I made for my employers had a cost of capital item. As for 11% being outrageous, I did cost estimates for environmental controls on EPA contracts. EPA allowed a 10% cost of capital and depreciated the expenditure over 10 years. As for (4), R&D tax credits apply to any industry and not just pharmaceuticals. A better indication of profitability is return on assets, A CNN Fortune and Money study found that the pharmaceutical industry's return ranked 3rd. out of 25 industries at 11.4% in 2008. SEC reports were probably the source of information.

Finally, these critics in a 2011 publication estimated that the REAL cost of developing a new drug was \$43.4 million. If you consider the costs of recruiting thousands of volunteer subjects, (2) keeping them for 780 days, (3) discovering the subject's outcomes and side effects, (4) doing the necessary laboratory work on the subjects, (5) statistically evaluating the data and (6) submitting the data to FDA with the inevitable back and forth, it is obvious that a \$43.4 million figure was absurd. The referees were amiss in allowing this paper to be published.

Welcome To ASMD@D

The Somewhat Different Conference

<http://smu.edu/austinsymposium/>

The **25th Austin Symposium on Molecular Structure and Dynamics at Dallas (ASMD@D)**, will take place at the Double Tree Hotel, Campbell Center, Dallas, from **March 1-4, 2014**. The conference will be held in memoriam of Professor James E. Boggs, who organized the first 23 Austin Symposia in the time from 1966 to 2010 before the conference moved to Dallas. The ASMD@D 2014 will be organized in the spirit of previous symposia:

Listen and discuss

Meet international experts

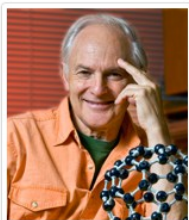
No parallel sessions

A place where important interdisciplinary work can start

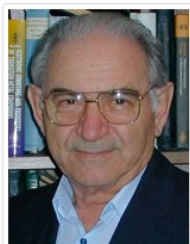
A place where new positions can be found

Featured speakers

Sir Harold Kroto



Professor Issac
Bersuker



Professor Louis
Echegoyen



Professor Anne
McCoy



Professor Martin
Quack



Professor Martin
Suhm



For the list of confirmed speakers, check the web site.

We hope to see you in March,

Professor Dieter Cremer Professor Elfi Kraka
Chairs of the Organizing Committee of ASMD@D
Department of Chemistry, SMU, Dallas, Texas



Click on the logo to
access the web site.

...And another thing...

By Denise L. Merkle

Contemplation of Another Year

It's already December. Can it be? Oh, yes. In little more than three weeks, the new year will have roared in upon us, ringing whatever bells it can get its hands on. It seems like 2000 just appeared, let alone 2014. Nearly everyone I know has recently asked, "Where did this year go?" This will become a recurring query, but, really, the questions should be, "Where are we going? "Where will we be at the end of the next rapidly advancing—and retreating—year?"

Well, scientists, how do we answer? What Resolutions will be made—and broken? What opportunities will slide by us, never to be grasped or offered again? How often will we say, "I'd do that, if only X would happen or Y not happen or Q would do X or S would not do Y?" And the tiny, fleeting moments that could lead to fulfillment, or overcoming a fear, or removing a burden from one's life, will be gone for good. Will we ever acknowledge that inaction is actually action? Negative results are still results. Hypotheses, however educated, may be supported or might be shown to be bad guesses, but unexpected results still yield information.

What will we conquer in 2014? What will we ignore? Fix? Break? Escape? Contribute? How many inventions,

experiments and projects that flood our brains with the happiness of anticipated creation will remain, sequestered in whatever cells and electrical stimuli protect memories?

Where will we be at the end of 2014 (more than 365 days away from the Retort deadline for the December 2013 issue) if, instead of having a reason or an excuse, we can spur ourselves to action? Would we advance our careers/lives/goals/dreams if, instead of calling on X, Y, R, S, we make a plan and work steadily toward that last, potentially life-altering step? Would we fail? Yes, of course. The world is not perfect. Would we fail all the time? No. The world is not *that* imperfect.

What is the point, you may ask? The point is, we can rue the flying time, and regret data unanalyzed, books unwritten, paintings unpainted, genes unmodified, slopes un-skied, tracks un-driven—or we can compute, write, paint, experiment, ski, drive, hike, invent, whatever—Carpe. Just Carpe.

Life is Short. Time Flies. Fear is Good. Science is Fun. Conquer It All! (Or at least try).

Best Wishes for a fulfilled, successful, rewarding, brave new 2014!

NEW WAY TO DISSOLVE SEMICONDUCTORS HOLDS PROMISE FOR ELECTRONICS INDUSTRY

Alkahest for V_2VI_3 Chalcogenides: Dissolution of Nine Bulk Semiconductors in a Diamine-Dithiol Solvent Mixture

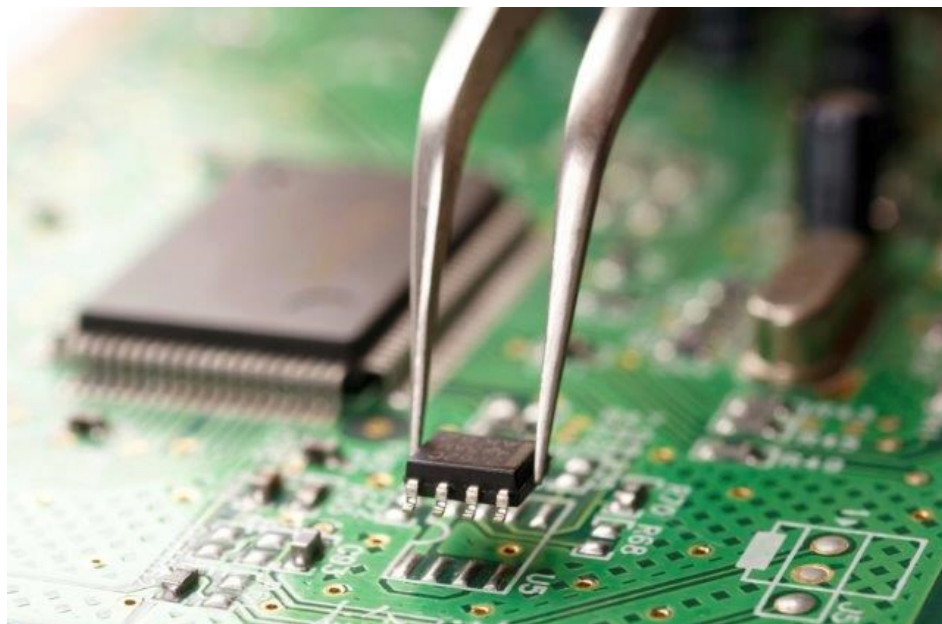
Journal of the American Chemical Society

Semiconductors, the foundation of modern electronics used in flat-screen TVs and fighter jets, could become even more versatile as researchers make headway on a novel, inexpensive way to turn them into thin films. Their report on a new liquid that can quickly dissolve nine types of key semiconductors appears in the *Journal of the American Chemical Society*.

Richard L. Brutchey and David H. Webber note that making low-cost, semiconducting thin films on a large scale holds promise for improving a number of electronic applications, including solar cells. The problem has been finding a liquid that can dissolve semiconductors so that they can be subsequently solution-processed using inexpensive methods. Hydrazine can do the trick for many of these materials, but as a compound that is sometimes used in rocket fuel, it is explosive and highly toxic. It's also a poor option for making semiconducting thin films en masse. Brutchey and

his team decided to search for a safer solution.

They found an answer in a mixture of two compounds that could dissolve a set of important semiconducting materials called chalcogenides at room temperature and normal air pressure. The researchers state, "We believe these initial results indicate that the chemistry can be further extended to other families of chalcogenide materials



and may hold promise for applications that would benefit from solution deposition of semiconductor thin films."

The authors acknowledge funding from the National Science Foundation and the Dornsife College of Letters, Arts and Sciences at the University of Southern California.

DFW Section Meetings

DECEMBER: NO MEETING

JANUARY 2014

Meet DFW's New Young Investigators

Learn about exciting research in the DFW Section

Saturday, January 25, 2014, 8:30 A.M. to 2:00 P.M.

**Room 114, W. A. Baker Chemistry Research Building (CRB),
Arlington, TX**

Updates, a complete program, details on registration, and directions will be posted at

<https://www.uta.edu/chemistry/seminars/dfw-ac-s-meeting>

SYMPOSIUM SPEAKERS (9:00 to Noon)

Kayla Green (TCU)

Nicolay Tsarevsky (SMU)

Benjamin Janesko (TCU)

Brian Zoltowski (SMU)

Junha Jeon (UTA)

Gomika Udugamasooriya (UTSW)

Kayunta Johnson-Winters (UTA)

Schedule:

Coffee and Welcome: 8:30 A.M. to 9:00 A.M.

Speakers: 9:00 A.M. to 12:00 P.M. (includes coffee break)

Lunch and Postdoctoral Posters: 12:00 P.M. to 2 P.M.

Pizza Lunch will be provided

**For questions or concerns, please contact Chair-Elect Katie Walker
at kawalker@austincollege.edu or (903) 813-3159.**

SCIENCE FAIR JUDGES NEEDED

We would like to extend an invitation to participate as a chemistry judge at the 2014 Beal Bank Dallas Regional Science and Engineering Fair. Held annually since 1957, this competition produces some of the best middle and high school research projects in the world, hosting around 1,000 students and 400 judges. Please join us and help support students in our region! Breakfast, lunch, and a small memento of the fair will be provided for all judges. Further details and online registration can be found on the Judge page of drsef.org.

What: Beal Bank Dallas Regional Science & Engineering Fair

When: 8:00 am - 1:00 pm approx.,
Saturday, February 15, 2014

Where: Fair Park, Dallas

Contact: scifair@physics.smu.edu
Website drsef.org



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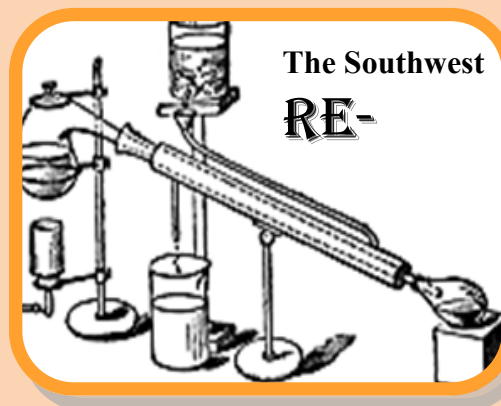
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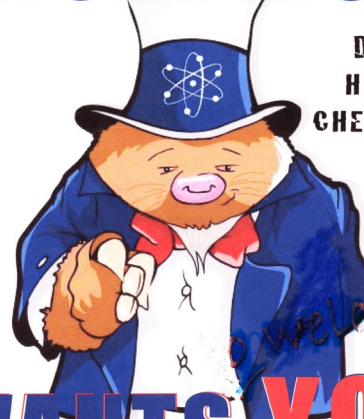
VOLUNTEERS NEEDED!

The 247th National ACS Meeting will be here in Dallas on March 16-20, 2014. We need a **local section coordinator** to work with national ACS to help identify a venue for the Saturday outreach activity prior to the meeting. We also need a **coordinator to organize volunteers for the hospitality booth** for the duration of the meeting. If you are interested in either of these positions, please send an e-mail to kawalker@austincollege.edu.

Kirby Drake is planning the 70th Southwest Regional Meeting to be held in Fort Worth in 2014. Please email Kirby (kirby.drake@kk-llp.com) if you are interested in serving as the **sponsorship/exhibitors chair, undergrad programming chair, or a symposium chair.**

UNCLE MOLE

DUTY!
HONOR!
CHEMISTRY!



WANTS YOU

To volunteer for the 2014 Southwest Regional ACS Meeting! SWRM 2014 will be held at the Fort Worth Renaissance Worthington Hotel, November 19-22, 2014. If anyone would like to suggest a topic or organize a symposium, please contact Kirby Drake kirby.drake@kk-llp.com

or Danny Dunn
dannydunn@sbcglobal.net

'TEARLESS' ONIONS COULD HELP IN THE FIGHT AGAINST CARDIOVASCULAR DISEASE, WEIGHT

Inhibition of Platelet Activation by Lachrymatory Factor Synthase (LFS)-Silenced (Tearless) Onion Juice

Journal of Agricultural and Food Chemistry

Onions, a key ingredient in recipes around the globe, come in a tearless version that scientists are now reporting could pack health benefits like its close relative, garlic, which is renowned for protecting against heart disease. They published their laboratory analysis, which suggests a similar heart-friendly role for the tearless onions, as well as a possible role in managing weight gain, in ACS' *Journal of Agricultural and Food Chemistry*.

Colin C. Eady and colleagues note that the onion has a unique chemistry that leads to its tear-inducing effects when cut. Its pungency has driven cooks to don goggles, clench wooden spoons in their mouths and try other usually futile techniques to prevent crying at the cutting board. An answer could arrive in the form of a new type of onion that makes less of the protein blamed for making eyes burn and tear up. Eady's team has developed such a version, which instead makes a sulfur compound similar to

one found in cut garlic that may be the key to its cardiovascular benefits. Many people eat garlic cloves or take it as a nutritional

supplement in pill form to reduce the clumping of platelets in the blood, which can lead to blood clots and clogged arteries. Garlic also has been shown to reduce weight gain. They wanted to know whether the new onion might also have similar positive effects on health.

The scientists found that in lab tests, extract from the tearless onion significantly reduced platelet clumping, compared to regular onions or even garlic. Other results

showed that the new onion had about the same anti-inflammatory properties as the original. Also, preliminary testing in rats showed that the tearless onion could help control weight gain — more so than regular onions or garlic.

The authors cite funding support from the New Zealand Ministry of Business, Innovation and Employment.



Peeling Onions

by Lily Martin Spencer, 1852

CLUES TO COCAINE'S TOXICITY COULD LEAD TO BETTER TESTS FOR ITS DETECTION

Covalent Thiol Adducts Arising from Reactive Intermediates of Cocaine Biotransformation"

Chemical Research in Toxicology

A new study on cocaine, the notorious white powder illegally snorted, injected or smoked by nearly 2 million Americans, details how it may permanently damage proteins in the body. That information, gleaned from laboratory tests,



could be used to potentially detect the drug in biofluids for weeks or months — instead of days — after use, say scientists.

The findings, which appear in the ACS journal *Chemical Research in Toxicology*, could also help explain cocaine's long-term health effects.

Anthony P. DeCaprio and colleagues explain that prescription and over-the-counter drugs intended for legal medical use undergo rigorous studies to determine how they work and how they might cause side effects. But there are very few similar studies on illicit drugs. Long-term use of the so-called rich man's drug is linked to depression, breathing problems, kidney diseases and sudden death. Researchers already knew

that cocaine abuse can alter proteins in the body, but the exact details of how it makes these changes were not known. DeCaprio's team stepped in to investigate this mystery.

In laboratory tests, they discovered a brand-new way that cocaine breaks down and alters proteins. They speculate that these proteins could appear in users' biofluids for weeks or months after the drug is first taken. This finding could dramatically expand the window for determining past cocaine use, which currently is only detectable for up to several days. Also, the new details on cocaine metabolism contribute to a more comprehensive picture of the drug's toxic effects.



The authors acknowledge funding from a Florida International University Presidential Enhanced Assistantship.



Letter from the Chair-Elect

Dear colleagues,

The semester and year are drawing to a close!

Save the date for our DFW Young Investigator's Meeting on Saturday, January 25, at UT Arlington. The meeting will include research presentations from recent faculty (2009-2011) in the local section, postdoc poster presentations, and lunch!

<https://www.uta.edu/chemistry/seminars/dfw-acs-meeting>

The 247th National Meeting will be here in Dallas on March 16-20. Keep an eye out for a call for volunteers for the outreach event on Saturday, March 15, at the Perot Museum. Also, we'll need volunteers for the hospitality booth for the duration of the meeting. Help us show off our local section and DFW to chemists from across the nation!

Our own Kirby Drake is working on planning the 70th Southwest Regional Meeting to be held in Fort Worth in 2014. Please email Kirby (kirby.drake@kk-llp.com) if you are interested in serving as the sponsorship/exhibitors chair, undergrad programming chair, or a symposium chair. I encourage you to take advantage of these opportunities to get involved at the regional and national level!

See you all in January!
Katie Walker
2013 Chair-Elect



OSTEOARTHRITIS MEDICINE DELIVERED ON DEMAND *IN SITU*

Hyaluronic Acid-Based Hydrogels Containing Covalently Integrated Drug Depots: Implication for Controlling Inflammation in Mechanically Stressed Tissues

Biomacromolecules

Scientists are reporting development of a squishy gel that when compressed — like at a painful knee joint — releases anti-inflammatory medicine. The new material could someday deliver medications when and where osteoarthritis patients need it most. Their study appears in the ACS journal *Biomacromolecules*.

Xinqiao Jia, Chandran R. Sabanayagam and colleagues note that in the past few decades, researchers have been developing a variety of “smart” hydrogels that can release medications over several days rather than in a single burst. Most of these gels release medicine all the time or in response to changes in temperature, light or other factors. Very few respond to physical pressure, which is what causes pain in the 27 million osteoarthritis patients in the U.S. Osteoarthritis is called the “wear-and-tear” type of arthritis. The cartilage between the bones becomes damaged and wears away, making everyday movements

of the knees, hands, backs and hips severely painful. Jia and Sabanayagam set out to develop an on-demand, drug-delivery system for pain management and tissue repair in a way that makes more sense for osteoarthritis patients.

They created a special type of hydrogel that responds to compression — such as the pressure between joints that occurs in everyday movement — and loaded it with an anti-inflammatory drug called dexamethasone, which is sometimes used to treat arthritis. When they compressed the hydrogel in the laboratory, it boosted the release of the drug. The researchers are currently testing their smart pain medications in laboratory animals.



The authors acknowledge funding from the National Science Foundation, the National Institutes of Health, and the State of Delaware.

FIVE QUESTIONS FOR...

This month's '5Q' participant is **Howard M. Cole**, ACS member and President and owner of Porous Metal Products.* Mr. Cole holds a BS in Industrial Management from Lawrence Institute of Technology, Detroit, MI, and has a comprehensive background including - but not limited to- Industrial automation test stands, machining, electronic and electrical wiring, contract management, and Industrial and chemical filtration, separation and treatment. He has experience as a Sales Engineer, and was a Product Manager for Bendix Corporation's Porous Metals Product Line.

Porous Metals are used in a surprising number of applications: chemical plants, refineries, waste water solids recovery, water purification, catalysis retention, reactor beds, heat transfer systems for solar energy; membrane support, biological cell scaffolds, bone implants and repair, balloon screens to trap blood clots, flotation webs for hot sheets of auto glass during shaping, IR burners and filter screens for hot molten plastic sheet at 650 °F, in 15,000 psi extruders, and a few others.

1) How old were you when you realized you wanted to be a scientist?

About 12 - 14 years old - Greatly influenced by my father who loved science.

2) What aspects of your education best prepared you for your career?

Physics, chemistry, biology, math, English, and drafting.

3) Is there a part of your career or business that was/is unexpectedly challenging?

working with others in a cohesive manner and building trust and teamwork to solve problems and recognize all who contributed to the success. Mastering "paperwork flow" in today's computer world requires fast manipulation and rapid off-load, while maintaining focus.

4) Which material or application do you think will be most important in the future? Has it been invented yet?

A material that will easily harness and store 3,500 °F sun energy. It is free energy. The world wide demand for energy is growing almost exponentially as world wide education grows. Young people whose heritage is life on the deserts of the world now see people of their age on TV, driving new Ford Mustang Convertibles- or even Bentley autos- and wonder: "Why don't I do that". An amazing force.

5) Who is your Science Hero, and why?
Albert Einstein. He got us all really thinking about relativity.

* <http://www.porousmetalproducts.com>

Thank you, Mr. Cole, for participating in '5Q'! 2014 interviewees e-: retort@acsdw.org.

Interesting Scientists Wanted! To volunteer to be interviewed for 5 Questions, contact retort@acsdw.org.

From the editor

It's a short issue; the combination of December, the end of the semester, and an ice storm got in the way of a lot of things. We have several meetings coming up (not to mention the March ACS meeting here in Dallas). The DFW Section meeting in January is our second annual Young Investigators Meeting; it will take place at UTA on January 25. The 25th Austin Symposium on Molecular Structure and Dynamics at Dallas (ASMD@D) is scheduled for March.

One of the most important announcements in this issue—maybe the most important—is the need for judges for the Dallas Regional Science & Engineering Fair, on February 15 in Fair Park in Dallas. I know that I am prejudiced on the issue: as a kid, there was nothing that I loved more than the science fair. Each year, I started my annual project during the summer and worked on it until January (okay, granted, nerd alert). When my kids were in school, our house was the neighborhood nexus for science projects. But more than that, science fairs are where our future scientists get their start. All too many local school science fairs have suffered under cutbacks. Support all your local science fairs and consider volunteering for this one;



*Best regards,
Connie*

