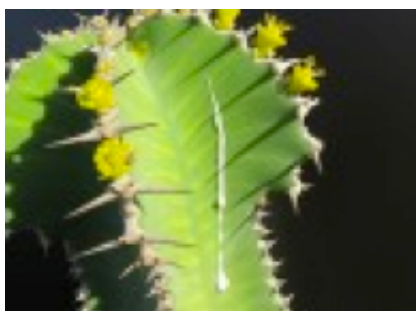


tackling today's world of environmental and medical challenges

## Friend or Foe? Microbes Living in Euphorbia Plant Latex



Things are not always as they seem - especially in the enigmatic and microscopic world of microbes living in extreme environments.

Scientists from the Oak Crest Institute of Science discovered that first-hand during their recent study of *Euphorbia*, a highly diverse plant family, which includes over 2,000

different annuals, biennials, perennials, as well as trees and shrubs. The plants share the feature of having a poisonous, milky, white latex-like sap, along with unusual and unique kind of floral structures.

Results of their study appear in the December 2015 issue of the prestigious [American Journal of Botany](#), the flagship journal of the [Botanical Society of America](#). Findings in the article, "Euphorbia Plant Latex Is Inhabited by Diverse Microbial Communities," are so significant, that Editor-in-Chief, Dr. Pamela Diggle, selected the article for special recognition in the [Highlights](#) section of the journal.

Discoveries published by Oak Crest, in collaboration with researchers from The Huntington Library, Art Collections and Botanical Gardens and University of California, San Diego, dispel the premise that the antimicrobial properties and toxicity of *Euphorbia* plant latex make it a hostile environment to microbes.

According to Dr. Marc Baum, Oak Crest Senior Faculty, when specimens from *Euphorbia* spp. were propagated in tissue culture, microbial growth was observed routinely, raising the question whether the latex of this diverse plant genus can be a niche for polymicrobial communities. "Based on these observations, we suspected that the latex would contain a low diversity of microbes, but what we discovered was totally unexpected. *Euphorbia* latex was found to contain complex bacterial and fungal communities using culture-independent methods," says Dr. Baum. "Many of the identified taxa are known plant endophytes, but

## News & Events

### Construction Update

It's been 12 months since our initial meeting with the Building Division of the City of Monrovia to discuss the plans for our new facilities. It seems like only yesterday! During this time there have been successes and setbacks but we are now nearing the end of construction and are beginning to prepare for our move to Monrovia.

While work on the Monrovia facility continues, staff at our Pasadena site is beginning the arduous task of sorting through years of paperwork, research projects and files to archive and pack. Due to the fragile nature of much of our lab equipment, the move will take place in stages, allowing experts to carefully pack, transport and reassemble the equipment in a painstaking manner. It is estimated that all equipment, supplies and personnel will be moved into the new facility by mid-April.

This is a very exciting time for all of us at Oak Crest. Our move to Monrovia will begin a new chapter for our organization. We want all of our friends, partners and supporters to be part of this amazing journey. We invite you to share in our excitement by following our progress via the weekly New Facility [Blog](#).

have not been previously found in latex. The most commonly observed bacteria in the studied samples were from a family that is not typically associated with plants, let alone latex.”

These results suggest that *Euphorbia* plant latex, a putatively hostile antimicrobial environment, unexpectedly supports diverse bacterial and fungal communities. Dr. Baum explains that the ecological roles of these microorganisms and potential interactions with their host plants are unknown. “Further research is warranted and will give us a better idea of the significance of these findings,” he adds.

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## Vehicle Emission Study Helps Identify Unknown Pollutants



Emissions testing station located near the 110 freeway.

The air we breathe can be as soft and caressing as an ocean breeze or as harsh and irritating as a desert windstorm. If you live or work in the greater Los Angeles basin you are more familiar with the latter.

According to the 2015 State of the Air City Rankings compiled by the American Lung Association, the air in the Los Angeles-Long Beach, CA area is the worst

in the nation when it comes to ozone levels. Los Angeles also ranks fifth in the country for year-round particulates, the tiny microscopic solid or liquid matter suspended in the Earth's atmosphere. These tiny particles can have an impact on climate and precipitation that adversely affect human health. Lots of people, cars, factories, and shipping ports, as well as sunny, stagnant weather and a "bowl-like" topography, all contribute to local air pollution in Southern California.

For the past five years researchers at the Oak Crest Institute of Science have been conducting near-roadway field studies in an effort to better understand the effectiveness of emission control systems and their potential to help prevent air pollution. The most recent findings from this ongoing study were presented at the AGU (American Geophysical Union) Fall Conference, held in San Francisco, CA, in December 2015.

“Emission control systems in light-duty motor vehicles have played an important role in improving regional air quality by dramatically reducing the concentration of criteria pollutants (carbon monoxide, hydrocarbons, and nitrogen oxides) in exhaust emissions,” says Dr. John Moss, Senior Faculty at Oak Crest. “Unintended side reactions, however, can occur on the surface of three-way catalysts, leading to emission of unexpected pollutants such as ammonia and nitrous oxide.”

Dr. Moss points out that of particular concern is a class of compounds termed (chemically-) reduced nitrogen compounds that include ammonia, amines, and hydrogen cyanide, as well as aldehydes, ketones, and carboxylic acids. While emissions of these compounds is still poorly understood, their presence in vehicle exhaust, even at low concentrations, may lead to significant adverse health effects, particularly in high exposure scenarios such as freeway communities, vehicle cabins, and enclosed spaces (e.g., residential and parking garages).

To gain a greater understanding of the potential adverse health effects of contaminated air, Dr. Moss and Oak Crest President and faculty member Dr. Marc Baum led a field study conducted over five days (May 18-22, 2015) alongside SR110 in the Highland Park neighborhood of Los Angeles. The research team was comprised of former Oak Crest/Rose

## Rose Hills Fellowships

It appears that word is spreading throughout the San Gabriel Valley regarding the outstanding internship opportunities offered by the Oak Crest Institute of Science. According to Dr. Sherry Tsai, Educational Outreach Director for Oak Crest, a record number of community college students submitted applications for the [2016 Rose Hills Foundation Research Fellowships](#).

A total of 53 students applied for paid internships funded by [The Rose Hills Foundation](#). This outstanding response is an 89% increase in applicants from last year. The selection committee at Oak Crest chose eight applicants to participate in high-impact, independent research in [environmental science](#) at Oak Crest.

Rose Hills Foundation Research Fellows are paid a weekly stipend and are required to commit a minimum of 20 hours per week to their project for the duration of the program. At the end of the program, participants present their research findings during Seminar Day.

The new Research Fellows began their program orientation and lab safety training in December and are currently working with Oak Crest faculty on their research projects.

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## Rose Hills Alumni

If you are a graduate of our past [Rose Hills Research Fellowship Program](#), we want to hear from you! We know many of you may have already completed your undergraduate degrees and have gone on to advanced degree programs or an exciting new career. Because you are an important part of Oak Crest, we want to receive periodic updates from all our Rose Hills alumni. Please take a few minutes today to email [Sherry](#) to let her know what you've been up to since leaving Oak Crest!

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## Seminars at Oak Crest

As part of their ongoing commitment to science education, Oak Crest hosts monthly seminars for their research fellows and

Hills Research Fellows including Amalia Castonguay, Vince Aguirre, Anaïs Pesta, Rob Fanter, Mackenzie Anderson, and Scott Churchman.

Throughout the study, traffic consisted exclusively of light-duty motor vehicles. Air samples were acquired adjacent (1-2 meters) to the northbound lanes and at a background site located 140 meters away on a perpendicular transect to the freeway. Sampling was carried out each day between 2:30 and 6:30 p.m.—peak traffic hours.

Methods used to collect these pollutants using mist chambers, annular denuders, impingers, and solid-phase cartridges and quantify their concentration using GC-MS, LC-MS/MS, IC, and colorimetry were developed and validated in the laboratory and field prior to the freeway study.

Results of the study showed that pollutant concentrations followed a steep decreasing gradient from the freeway to the background site. Emission factors (pollutant mass emitted per mass fuel consumed) were calculated by carbon mass balance using the difference in concentration measured between the freeway and background sites for the emitted pollutant and CO<sub>2</sub> as a measure of carbon mass in the vehicle exhaust. The significance of these results were presented at the AGU conference in terms of emissions inventories in the South Coast Air Basin of California, emission trends at this site over the period of 2009-2015, and for NH<sub>3</sub>, emission measurements conducted by the Oak Crest group and others over the period between 2000 and 2015.

“Degraded air quality is a serious health and environmental concern and is caused by direct emissions as well as secondary products formed in the atmosphere,” adds Dr. Moss. “Emission sources are often highly diverse, and their air quality impacts are a complex function of transport, mixing, and photochemical processes. Studies such as those conducted by the Oak Crest Institute of Science give us a greater understanding of air pollution and provide us with data that can help us develop cleaner running cars in the future,” he adds.

#### Special Thanks:

This research was supported by The Rose Hills Foundation and by the Health Effects Institute. The Oak Crest Institute of Science gratefully acknowledges the valuable assistance provided by these programs. We also thank the National Science Foundation (CHE-0723265 & 0552713) and the Ralph M. Parsons Foundation for instrumentation funding support for this research project.

## Ask a Scientist... Inquiring Minds Wanted to Know

It was a dinner meeting unlike most. Local entrepreneurs, scientists, researchers and community members joined together to discuss current and relevant scientific topics that many of us rarely consider. Members of this diverse group recently took part in Oak Crest’s inaugural Ask a Scientist forum hosted by [MADIA Tech Launch](#). The event was held Tuesday evening, December 8, during MADIA’s meet-up at Jake’s Roadhouse in Monrovia.

[Dr. Marc Baum](#), Oak Crest President and Senior Faculty, introduced the new quarterly science café, which is designed to bring the scientific, technical and business community together to share ideas and ponder how future advancements in science and technology will affect the world we live in. Oak Crest’s Senior Research Scientist, [Manjula Gunawardana](#), presented an overview on “DNA Sequencing in Our Daily Life,” followed by a question and answer period. The topic sparked lively conversation regarding current DNA research, friendly debates on the origins of life and discussions on ethical considerations relating to genetic cloning and possible prevention of inherited medical conditions caused by DNA abnormalities.

“Our inaugural Ask a Scientist forum was a great success,” says Dr. Baum. “Not only did the group engage in stimulating discussion, we had

volunteers on a variety of environmental and biomedical topics.

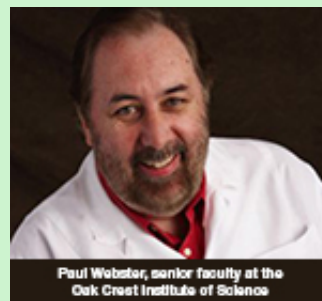
Organized by Dr. Paul Webster, senior faculty at Oak Crest, upcoming seminars include:

**May 4** – Presentation by Elaine Bearer, MD-Ph.D. University of New Mexico

**June 1** – Presentation by David VandeVelde Ph.D. Caltech

All seminars are held at 4 p.m. in the conference room at Oak Crest. Please follow us on [Facebook](#) for additional seminar updates.

### Oak Crest Researcher Coauthors Study on Cancer Therapies



Paul Webster, senior faculty at the Oak Crest Institute of Science

A team of researchers, led by Caltech scientists, has shown that nanoparticles can function to target tumors while avoiding adjacent healthy tissue in human cancer patients.

“Our work shows that this specificity, as previously demonstrated in preclinical animal studies, can in fact occur in humans,” says study leader Mark E. Davis, the Warren and Katharine Schlinger Professor of Chemical Engineering at Caltech. “The ability to target tumors is one of the primary reasons for using nanoparticles as therapeutics to treat solid tumors.”

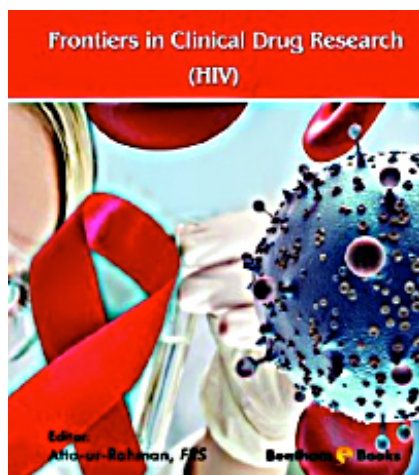
The findings, published online the week of March 21, 2016 in the journal Proceedings of the National Academy of Sciences, demonstrate that nanoparticle-based therapies can act as a “precision medicine” for targeting tumors while leaving healthy tissue intact. In addition to Davis, other coauthors on the study include Devin Wiley and Jonathan Zuckerman, both at Caltech; Paul

the opportunity to network and share our common vision for local scientists, technologists, industrialists, entrepreneurs and professionals in the San Gabriel Valley to unite for mutual support, shared experience and education.”

“This is a project that I have wanted to launch for a long time,” adds Dr. Baum. “I’m grateful to have the opportunity to collaborate with MADIA on this endeavor and feel that the timing is just right in light of Oak Crest’s upcoming move to Monrovia. We look forward to even greater participation in future forums as word spreads throughout San Gabriel Valley,” he adds.

The next Ask a Scientist event will be held in mid-May. Watch for details on our [website](#) and on our [Facebook](#) page.

## Spreading the Word About HIV Research Around the World



Researchers at the Oak Crest Institute of Science continue to distinguish themselves as leaders in the fight against HIV by publishing their groundbreaking research in some of the most prestigious scientific and medical journals available today.

Top scientists from around the world, including those from Oak Crest, shared their most recent research findings in the newly published book – [Frontiers in Clinical Drug Research – HIV](#). The eBook series, published by [Bentham](#)

[Science](#) in December 2015, brings updated reviews to readers interested in learning about advances in the development of pharmaceutical agents for the prevention and treatment of AIDS and other disorders associated with HIV infection.

The scope of the eBook series covers a range of topics including the medicinal chemistry and pharmacology of natural and synthetic drugs employed in the treatment of AIDS (including highly active antiretroviral therapy) and resulting complications, and the virology and immunological study of HIV and related viruses.

Volume two of this five-volume series presents important new developments in the form of cutting edge reviews written by experts in the field from around the world. Chapter 2, entitled “Vaginal Mucosal HIV PrEP: Fundamental Insights and Practical Considerations”, was written by Drs. John Moss and Marc Baum, Department of Chemistry, Oak Crest Institute of Science, and Dr. Richard Pyles, Department of Pediatrics, and Department of Microbiology and Immunology, University of Texas Medical Branch, Galveston, Texas.

[Click here](#) for more on this story.

Webster, senior faculty at the Oak Crest Institute of Science; Joseph Chao and James Lin at City of Hope; and Yun Yen of Taipei Medical University, who was at City of Hope and a visitor in the Davis lab at the initiation of the clinical trial.

In the study, Davis and his colleagues examined gastric tumors from nine human patients both before and after infusion with a drug–camptothecin–that was chemically bound to nanoparticles about 30 nanometers in size.

The team found that 24 to 48 hours after the nanoparticles were administered, they had localized in the tumor tissues, released their drug cargo, and the drug had the intended biological effects of inhibiting two proteins that are involved in the progression of the cancer. Equally important, both the nanoparticles and the drug were absent from healthy tissue adjacent to the tumors.

The nanoparticles are designed to be flexible delivery vehicles. “We can attach different drugs to the nanoparticles, and by changing the chemistry of the bond linking the drug to the nanoparticle, we can alter the release rate of the drug to be faster or slower,” says Andrew Clark, a graduate student in Davis’s lab and the study’s first author.

Davis says his team’s findings are suggestive that a phenomenon known as the enhanced permeability and retention (EPR) effect is at work in humans. In the EPR effect, abnormal blood vessels that are “leakier” than normal blood vessels in healthy tissue allow nanoparticles to preferentially concentrate in tumors. Until now, the existence of the EPR effect has been conclusively proven only in animal models of human cancers.

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**ANNOUNCEMENTS**

**RESEARCH, PUBLICATIONS  
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### Special Event

**Ask a Scientist Forum** – Due to the current move to our new facilities, the Ask a Scientist Forum has been postponed until mid-May. Be sure to watch for more details on our [website](#), in our newsletters and on our [Facebook](#) page.

### Publications

Congratulations to the following Oak Crest faculty and collaborators for the recent publication of their scientific papers:

[Webster, P.](#), Bentley, D., and Kearney, J. The ATUMtome for automated serial sectioning and 3-D imaging. *Microscopy and Analysis* 136:19-23. 2015.

Griffiths, G., Slot, J.W., [Webster, P.](#), and Tokuyasu, Kiyoteru: A pioneer of cryo-ultramicrotomy. *J. Microsc.* 260:235-237. 2015. doi: 10.1111/jmi.12346