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District Science Teachers – Communities of Practice

Drs. Paul Beardsley and Jodye Selco have been working with local middle school and high school science teachers through the Communities of Practice supported by Riverside County Office of Education and San Bernardino Superintendent of Schools. Science teachers from the two counties get together twice a year to collaborate with those teaching the same content to “talk shop” and plan engaging and challenging science lessons aligned with the Next Generation Science Standards.

Paul Beardsley worked with close to 100 middle and high school biology teachers to plan, implement, and visualize coherent lesson sequences, or storylines, driven by students' questions about phenomena. Teachers learned to use a free, online tool from Howard Hughes Medical Institute's BioInteractive team called “Storyline Viewer” (<https://www.biointeractive.org/>



[planning-tools/storyline-viewer](#)). The development of this tool was led by Paul Beardsley when he was on sabbatical with HHMI.

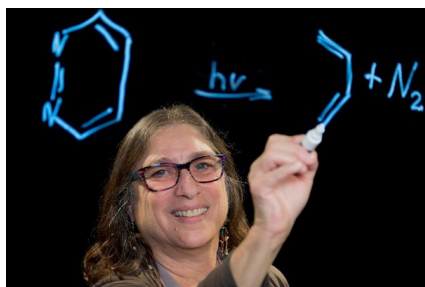
Prete Fellows Program Expands!

Thanks to a generous gift from the Earnest Prete Jr. Foundation, the Prete Fellows Program has expanded to include three Pomona elementary schools. This partnership between CEMaST and the Pomona Unified School District includes twenty-six Cal Poly Pomona (CPP) students who will receive an annual stipend of \$5,100, attend work-



shops and dedicate 10 hours a week to the program, with six hours working directly with the children in their respective classroom. The Prete Fellowship program is an opportunity for CPP students to engage with students from an elementary school in our community, support the sustainability of urban gardening, gain an understanding of the expectations of teachers in a modern society, and explore if the teaching profession may match their career aspirations. Workshops, and three Mentor Fellows (CPP students who participated last year) will support new Prete Fellows in their understanding of the elementary classroom, math and science content standards and resources for lesson planning.

Wall of Cool Winners Announced



Jodye Selco's course "Modeling the Fundamentals of Physical Chemistry" has been recognized as one of the 2019 winners of the Wall of COOL. "The Wall of COOL (<https://elearning.cpp.edu/cool/>)

is an eLearning award which recognizes excellent courses that effectively use technology to enhance student learning and success."

The criteria for Wall of COOL courses include solid course design apart from technology, good faith effort to make the

course accessible to all students (including those with disabilities), and innovative and/or practical use of technology to support learning.

Beginning in Fall 2018 (coinciding with semester implementation) Modeling the Fundamentals of Physical Chemistry has been taught wholly online, and is now an upper division, synthesis General Education course. The course was cited for "excellent use of multiple campus technologies to create effective and accessible instructional content for a fully online course. Blackboard's collaborative tools are leveraged to promote engagement and collaboration. The eLearning Quality Matters (QM) Blackboard Course Template is also used to provide a clear course structure."

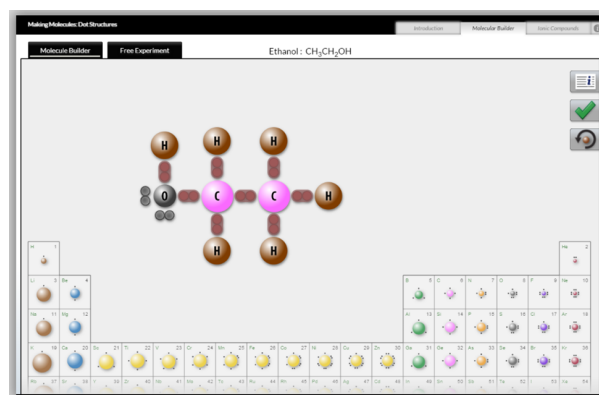
Crystal Award Recognition!



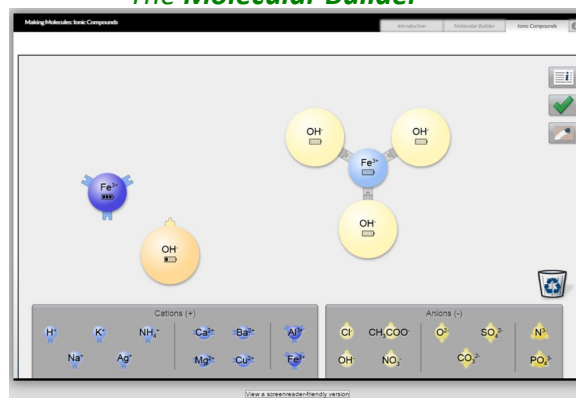
Jodye Selco along with colleagues in CPP's eLearning: Pauline Salim Muljana, (now at Old Dominion University), Richard Feldman, Thomas Gaston, and Bo Choi (now at University of California, Irvine) collaborated to produce "Making Molecules: Dot Structures and Ionic Compounds" (<https://elearning.cpp.edu/learning-objects/making-molecules>) which was highlighted in Volume 3, Issue 1 on page 6 of the CEMaST newsletter .

This learning object has been awarded the 2019 First Place Crystal Award from the Association for Educational Communications and Technology (AECT); this is the top award given by AECT. The selection criteria for this award include design, pedagogy, and usefulness as a learning tool.

Making Molecules Simulation



The Molecular Builder



Ionic Compounds

Photosynthesis Animation



Dr. Paul Beardsley was one of the main writers for a new animation about the process of photosynthesis which is now freely available from [HHMI BioInteractive](https://www.biointeractive.org/classroom-resources/photosynthesis) (<https://www.biointeractive.org/classroom-resources/photosynthesis>) which builds off his experiences teaching this content to CPP undergraduates and Pomona Unified School District teachers. The NGSS-friendly, engaging, multipart animation shows how sunlight is captured to power the process of photosynthesis, which nourishes the vast majority of the living world. The animation viv-

idly shows how and where photosynthesis takes place, detailing both the light reactions and the Calvin cycle, while focusing attention on the flow of energy and the cycling of matter.

The animation was awarded as Best Entry in Motion Media Division (Warren Sturgis Motion Media Award) and given an Award of Excellence by the BioCommunications Association (BCA) in 2019.

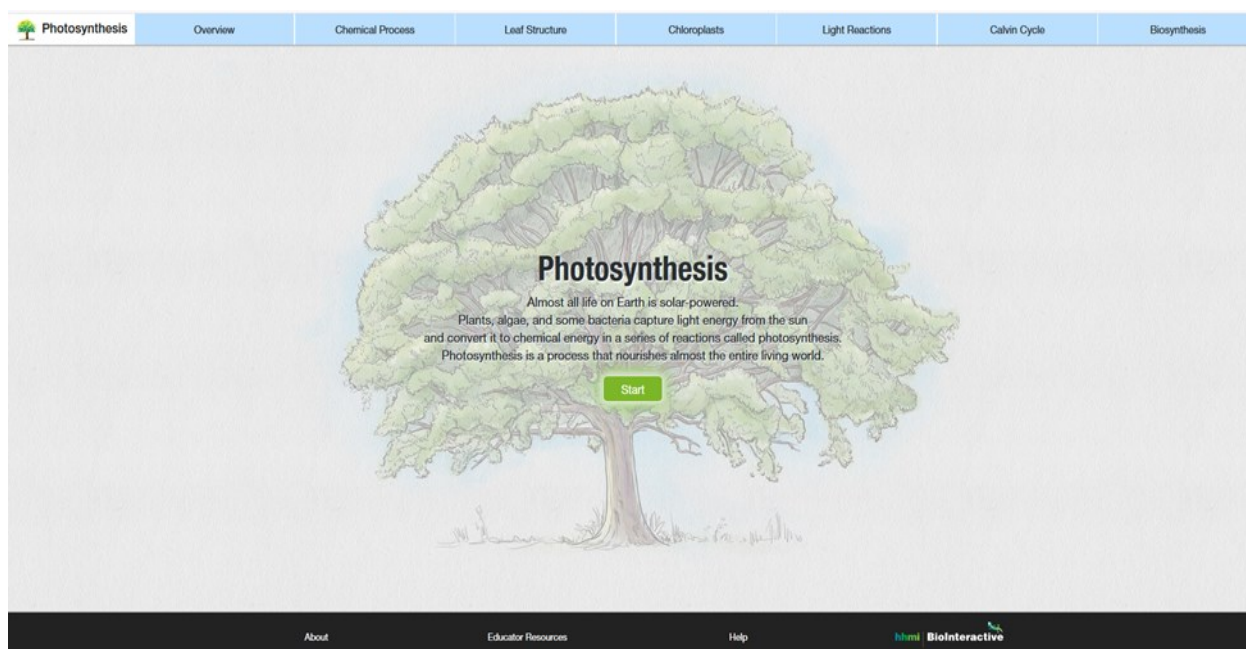


Image from HHMI BioInteractive.

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Paul Beardsley is an Associate Professor in the Center for Excellence in Mathematics and Science Teaching (CEMaST) and the department of Biological Sciences at California State Polytechnic University, Pomona. He is actively involved in biology teaching, education research, curriculum development and professional development with teachers across the biology education spectrum, from kindergarten to post-doctoral researchers.

Atomic Electron Configurations Simulation

By Jodye Selco

Remember back in your first (or second or third) chemistry course how confusing it was to remember how the Aufbau Principle was used to determine how electrons filled atomic orbitals? The latest simulation from Jodye Selco and CPP eLearning colleagues April Dawn and Richard Feldman illustrates how the electrons fill in atomic orbitals so the result is the lowest energy. The electrons fill in the lowest energy orbitals first, but which are lowest in energy depends not only on the type of orbital, but also how many other electrons are already in the atom.

This learning object (<https://elearning.cpp.edu/learning-objects/>)

[atomic-electron-configurations/](#)) shows the orbital energies and connects the electrons added to the “Energy Ladder” to the linear electron configuration and the element’s position on the periodic table. Connecting the three different representations enables users to practice completing electron configurations for very easy elements (noble gases are completed first since they are the easiest and can then be used as a set of “core” electrons). The elements presented begin with the easiest and progress to the hardest (those with “exceptions” in filling in the electrons).

This Learning Object comes with a student worksheet and an Instructor’s Guide containing tips for classroom implementation.

Introduction
Energy Ladder

Atomic Electron Configurations

The electron configuration is a listing of which atomic orbitals are occupied by electrons, and how many electrons are in each type of atomic orbital. The “ground state” electron configuration is the lowest energy combination of electrons in the atomic orbitals. Your task is to discover what the ground state electron configurations are – and how these can be predicted from the periodic table.

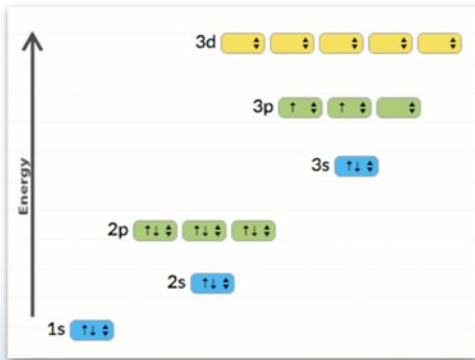
The Energy Ladder is a graphical representation of an atom’s electron configuration in which the orbitals are arranged vertically in the order of their relative energy levels. Each box on the energy ladder represents an atomic orbital that can contain 0, 1, or 2 electrons.

Upon completion of this interactive learning object, students will be able to:

- Arrange the electrons in an atom to obtain the correct electron configuration
- Connect the correct electron configuration with the lowest energy for the atom
- Predict the correct electron configuration from the atom’s position on the periodic table

If you are using this learning object as part of a class your teacher may ask you to complete the companion [Worksheet](#).

Teachers: Please review the [Instructor’s Guide](#) for tips on implementing this simulation in the classroom.





Jodye Selco is a Professor in the Center for Excellence in Mathematics and Science Teaching (CEMaST) at California State Polytechnic University, Pomona. She is actively involved in research in physical chemistry as well as the teaching and learning of chemistry by all students. Professor Selco has been working with the teachers in Rialto USD for many years and has developed many learning experiences in science for teachers and students in the Rialto USD which have been adopted by many other teachers.

CMP@CPP

Cal Poly's Mathematics & Statistics Department along with CEMaST is hosting FREE monthly CMP Workshops on Saturdays from 8:30 am to 12:30 pm. The goal of the CMP@CPP site is to help local teachers, principals, and district leaders to develop their capacity to provide the students they serve with a rich, rigorous, and coherent mathematics curriculum. We do this by working to increase both mathematical content knowledge and pedagogical content knowledge while at the same time promoting equitable teaching practices. Local teachers, principals, and Cal Poly students are invited!

The next CMP Workshop will be held on Saturday, December 7th from 8:30 am to 12:30 pm. Dr. Mark Huber, Mathematics Professor from Claremont McKenna College will be presenting *How to make a point (or several): Using visualization tools to understand large data sets*. In the past few years, some great, free, professional level tools have become available for visualizing data. In this workshop, we will explore one such system, called R and the tidyverse. We will work through how to import data, what it means to have tidy data, and once we are there, how to use visualization tools to understand our data. Along the way we'll see some common data pitfalls, and some graphics pitfalls, and show you how to avoid them. By the end, we will have done a complete data analysis from import to report! Breakfast is provided and parking is free.



Dr. Arlo Caine and local teachers at a CMP workshop

In addition to the CMP Saturday Workshops, the Math Department is also offering Math Teachers' Circle Meetings sponsored by CMP. Math Circles bring together K-12 educators and mathematicians to work on interesting problems and topics in mathematics. Math circle meetings are interactive and lead to exploration of new mathematical concepts that also have deep connections to the things being taught in the K-12 curriculum. The goals of the meetings are for teachers to discover and pass along to students the excitement and richness of problem solving in deep yet accessible mathematical topics.

The monthly CMP Workshops and Math Teachers' Circle Meetings will continue in Spring 2020. In addition, a one-week CMP Summer Institute will be offered at the end of this academic year. Robin Wilson is the Director of CMP at Cal Poly Pomona. Stacy Brown is the Co-Director and Cristina Runnalls is the Faculty Advisor. Come join us to explore fun math topics, network with other math teachers, enrich your problem-solving skills and math content knowledge! Everyone is welcome! Contact CEMaST@cpp.edu for more information.



Interested in a Career in Teaching?



The CSU is committed to increasing the number of highly qualified math and science teachers.

To become a math or science teacher in California you must obtain a Single Subject Teaching Credential. This credential authorizes public school teaching in a departmentalized classroom such as those in most middle schools or high schools.

To obtain a Preliminary Credential the following requirements must be met:

- Bachelor's Degree or higher

from an accredited university.

- Completion of a teacher preparation program (credential program, including student teaching)
- Meet the Basic Skills Requirement (CBEST exam)
- Demonstrate subject matter competency by passing the California Subject Examinations for Teachers (CSET) or completion of approved single subject program.

Cal Poly has an approved single subject program for mathematics and science as well as a credential program. The deadline to apply to start the credential in summer 2020 is February 17, 2020.

For more information or for an advising appointment please contact CEMaST at cemast@cpp.edu.

New MSTI Scholars Selected

CEMaST has selected eight new MSTI Scholars for spring. They are:

- Luis Ortiz
- Damary Ayala
- Jazzeyla Castillo
- Olivia Tougas
- Jocelyn Haro
- Rita Leger
- Diana Alba
- Ashley Garcia

These scholars will join the current MSTI scholars who are preparing to become single subject teachers in mathematics and science. In addition to receiving a \$5,000 scholarship the MSTI scholars will have access to seminars, travel funds, and mentor/peer support.

Funding for the MSTI scholarship program comes from the California State University (CSU) system. The Math and Science Teacher

Initiative (MSTI) was established by the CSU Chancellor's Office to address the critical shortage of credentialed teachers in California. The California State University system is the state's largest producer of mathematics and science teachers, and had made a commitment to increase its annual production of credentialed teachers in science, technology, engineering, and mathematics (STEM) fields. The California legislature has provided long-term support to the CSU's Mathematics and Science Teacher Initiative, creating a foundation for sustained effectiveness by increasing the number of highly-trained teachers and educators.



Dr. Riggs with 2019 MSTI scholars

MSTI Seminars Support Future Teachers



MSTI seeks to encourage talented Science and Mathematics majors who are considering secondary teaching.

The MSTI Scholarship comes with more than just financial support for future math and science teachers. It also comes with advising, travel funds, and monthly seminars. The seminars provide the opportunity for MSTI scholars to interact with professionals, mentors and peers. The October seminar was especially popular with two former MSTI scholars coming back to talk about their journey and encourage current scholars. Nicole Tronske (science) and Evan Scheerer (math) are in their second year of teaching and provided key insights on navigating their first year and what to expect as a new teacher.



The November seminar featured a school district assistant superintendent who spoke with the scholars about curriculum mapping.

Scholarship Funds Available



Scholarship funds are available for the 2020-21 academic year through the Math and Science Teacher Initiative (MSTI) Scholarship Program. The program's objective is to support talented Science and Mathematics majors who might not have considered the teaching profession. Each MSTI Scholar can receive up to two years of scholarships, up to \$5,000 per year. Scholarships are competitive and MSTI Scholars are selected on the basis of academic achievement, under-representation and financial need. MSTI Scholarships are available to undergrads seeking a single subject credential in Biology, Chemistry, Geology, Mathematics, and Physics.

Requirements include:

- A declared Cal Poly major in a Mathematics or Science discipline.
- At most two years remaining to complete a bachelor's degree.
- An overall GPA of 3.0 with a preference given to those who have a GPA no lower than 3.0 in their major.
- Be a US citizen, national or permanent resident alien.

For Credential Candidates –

- Be enrolled in, or have applied to enroll in, one of Cal Poly Pomona's single subject credential programs in Mathematics or Science.
- Have subject matter competency through prescribed coursework or passing the appropriate CSET.
- Have an overall GPA of 3.0 with a preference given to those who have a GPA no lower than 3.0 in their major.
- Have an overall GPA of 3.4 in credential coursework.
- Be a US citizen, national, or permanent resident alien.

The deadline for Summer is February 17, 2020.

The deadline for Fall is May 22, 2020.

For more information and to apply please visit the website

<https://www.cpp.edu/~msti/index.shtml>

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The CEMaST Newsletter Committee welcomes news from faculty, students and teachers. Please contact Dr. Laurie Riggs, lriggs@cpp.edu, for information on how to be included in upcoming issues!