

# WCCTA Seventh Annual Conference

April 22-24, 1999

Central Washington University  
Ellensburg, WA

# WCCTA 7<sup>th</sup> Annual Conference Program

## Thursday, April 22

Time	Event	Location
4:00-5:00	Chemistry Department Seminar: <i>Micro- and Nano-Technology in the Chemistry Classroom</i> – Dr. James P. Birk	Science Building Rm. 216
5:00-7:00	Registration	Courson Conference Center
7:00-11:00	Wine and Cheese Social	Elaine Wright Room, Munson Retreat

## Friday, April 23

Time	Event	Location
7:00-8:00	Breakfast	Munson Dining Room
8:00-9:15	Welcome and Keynote Address: <i>Reasoning Skills, Misconceptions, and Other Failings: A Rationale for Change in General Chemistry Instruction</i> – Dr. James P. Birk	Science Building Rm. 147

### Session I

9:15-10:00	<i>Introductory Chemistry on the Web</i> – Robert Johnson	Science Building Rm 216
	<i>Promoting an Understanding of Pressure in General Chemistry Students</i> – Vicky Minderhout and Kristen Skogerboe	Science Building Rm 111
10:00-11:00	Break – Vendors – Building Tours	Science Building Rm. 311

### Session II – Chairs: JoAnn DeLuca (216); Dharshi Bopegedera (111)

11:00-11:30	<i>Pollution Prevention and Green Chemistry</i> – Hossein Divanfard	Science Building Rm. 216
	<i>Exploring the Properties of Waves</i> – Dharshi Bopegedera	Science Building Rm. 111
11:30-12:00	<i>General Chemistry Interface Experiments: Revisions for Windows 95/98</i> – Jack Weyh and Don King	Science Building Rm. 216
	<i>An Inter-disciplinary Program on "Light"</i> – Dharshi Bopegedera and Susan Aurand	Science Building Rm. 111
12:00-1:00	Lunch	Munson Dining Room

### Session III – Chairs: Jack Weyh (216); Carin Thomas (240)

1:00-2:00	<i>Introductory Chemistry Online</i> – Walt Volland	Science Building Rm. 216
	<i>Small Scale Chemistry</i> – Kathy Carrigan and Joan Stover	Science Building Rm. 240
2:00-2:30	<i>WinQual – A simulated Inorganic Qualitative Analysis Program</i> – Kris Bruland, Joe Crook, Don King, and Jack Weyh	Science Building Rm. 216
	<i>Chemistry Outside the Classroom: Chem Club, Summer Camps, Demos, etc.</i> – Nancy Barker, Brian Laubach, and Ralph Morasch	Science Building Rm. 240
2:30-3:15	Break – Vendors – Building Tours	Science Building Rm. 311



<b>Session IV – Chairs: Caleb Arrington (240); John Bullock (203)</b>		
3:15-3:45	<i>New Experiments for the Organic Laboratory</i> – Gary M. Lampman and George S. Kriz	Science Building Rm. 240
	<i>Animating Quantum Mechanics: Helping Students Visualize Atomic, Hybrid, and Molecular Orbitals</i> – John Bullock	Science Building Rm. 203
3:45-4:45	<i>Developing a Web Site and Integrating Technology into your Chemistry Classroom</i> – Marilyn Jacoby	Science Building Rm. 240
	<i>ChemConnections Modules</i> – Karen Harding and Sharon Anthony	Science Building Rm. 203
4:45-5:15	<i>Molecular Modeling Experiments for Organic</i> – Jim Swinehart	Science Building Rm. 240
	<i>Adapt and Adopt in Washington State</i> – Deborah Wiegand and Sara Selfe	Science Building Rm. 203
5:30-6:30	Dinner	Munson Dining Room
7:30-8:30	Chemistry Demo Show – Herb Bryce, Tim Hoyt, and Heather Goodfriend	Science Building Rm. 101
<b>Saturday, April 24</b>		
Time	Event	Location
7:00-8:00	Breakfast	Munson Dining Room
<b>Session V</b>		
8:30-9:00	<i>Organic Mechanisms in Song</i> – Carole Berg	Science Building Rm. 201
	<i>Teaching Buffers Backwards</i> – Dave Reichgott	Science Building Rm. 203
	<i>Sharing Lab Results Using an Internet Database</i> – Phil Hunter	Science Building Rm. 240
9:15-10:15	<i>Open Discussion: General Chemistry</i> – Facilitator: Richard Logan	Science Building Rm. 240
	<i>Open Discussion: Organic Chemistry</i> – Facilitator: Gary Lampman	Science Building Rm. 203
	<i>Open Discussion: Introductory &amp; Allied Health Chemistry</i> – Facilitator: Martha Kurtz	Science Building Rm. 201
10:15-10:45	Break	Science Building Rm. 311
10:30-12:00	Morning Session – ACS Puget Sound Undergraduate Research Symposium	Science Building Rm. 147
10:45-11:45	<i>Open Discussion: Four Year College Issues</i> – Facilitator: George Kriz	Science Building Rm. 203
	<i>Open Discussion: Two Year College Issues</i> – Facilitator: Kathy Ashworth	Science Building Rm. 240
12:00-1:30	Lunch and Business Meeting	Munson Dining Room
1:00-2:00	Poster Session – ACS Puget Sound Undergraduate Research Symposium	Science Building First Floor Foyer
2:00-5:00	Afternoon Session – ACS Puget Sound Undergraduate Research Symposium	Science Building Rm. 147

# WCCTA Seventh Annual Conference

## Abstracts

Keynote Address:

***Reasoning Skills, Misconceptions, and Other Failings: A Rationale for Change in General Chemistry***

James P. Birk

Arizona State University

8:00-9:15 Room 147

Reforms are being introduced into large introductory chemistry courses. These reforms include the use of multimedia, emphasis on a molecular approach to chemistry, an active learning environment in large classrooms, an inquiry approach to laboratory, and the use of technology throughout the course, including the laboratory. A rationale for making these changes, based on numerous studies of student difficulties in learning chemistry, deficiencies in course structure, and inherent difficulties in chemistry course content, will be described. Results from nearly three years of experience with this modified program will be summarized.

About James P. Birk:

After a time at the University of Pennsylvania Dr. Birk went to Arizona State University as an Associate Professor in 1973 and was promoted to full professor in 1979. His areas of specialization are inorganic chemistry, chemical education and computers in education. Dr. Birk is the author of "Chemistry," a well respected text for general chemistry used by many colleges and universities. He is the editor of the Journal of Chemical Education Feature "Teaching with Technology," and has won teaching awards at ASU in 1980, 1996 and 1998, the latter two for his innovations in teaching, as well as a national Catalyst Award in 1990. Dr. Birk has published over 70 manuscripts describing his science education and traditional research. He is also the author of several monographs and laboratory manuals. In addition, he has developed and published over 40 software modules to accompany his books. His chemical education research is centered on understanding how students learn science and how modern technology can help them do it better.

c/classroom, Blackboard, net/course/chem100/

**Friday, April 23**

***Introductory Chemistry on the Web***

Robert Johnson

Clark College

9:15-10:00 Room 216

I am willing to lead a discussion about and demonstrate my Chem100 course website. This Introductory course was taught Fall 98 and again Spring 99.

***Promoting an Understanding of Pressure in General Chemistry Students***

Vicky Minderhout

Seattle University

Kristen Skogerboe

Seattle University

9:15-10:00 Room 111

Poor performance on a general chemistry exam question involving pressure and molecular speed highlighted student misconceptions about pressure. Two out of 36 students (comprising one section of general chemistry) were able to accurately analyze a graphical problem involving partial pressure of gases and molecular speed. We addressed this deficiency by developing a series of questions that examined the separate factors that affect the pressure, including molecular speed, impact, number of molecules and temperature and a final question which explored a combination of factors. The assignment was given to the original section and to a second equivalent general chemistry section. Students were encouraged to complete the assignment by working together outside of class. Over 85% of the students turned in completed worksheets and received feedback. We evaluated the effectiveness of this assignment by challenging both sections with a similar version of the original test question on the next exam. In both sections, approximately 50% of the students were able to correctly answer the problem and 25% could provide valid reasons. The results indicate that the worksheet was somewhat helpful in promoting understanding of pressure. However some students retained misconceptions.

We will present the problem from the exam, the worksheet and student misconceptions and organize participants to improve the worksheet as a group activity. All participants will receive a revised worksheet and a list of the misconceptions.

***Pollution Prevention and Green Chemistry***

Dr. Hossein Divanfard

Heritage College

11:00-11:30 Room 216

The author has written a module on "Internet Resources for Pollution Prevention Research." This has been published as an EPA document through National Partnership for Environmental Technology Education (PETE). Pollution Prevention resources on the internet, Hotlines and Training Centers will be introduced. Microscale Chemistry will be introduced as pollution prevention, waste minimization tool. Inexpensive techniques of making micro scale glassware such as microburet, micropipnometer and micro stir bar will be discussed. Training opportunities and scholarships for further training will be announced.

***Exploring the Properties of Waves***

Dharshi Bopegedera  
11:00-11:30 Room 111

The Evergreen State College

It is hard for students to grasp the relationship between frequency, wavelength and the speed of light, particularly because it is hard to demonstrate this relationship in a laboratory setting for light waves. Therefore, I designed a lab to explore the relationship between wavelength and frequency of water waves – waves that students have some personal experience with. Using a water table and a stroboscope for a wave generator, students generated water waves at different frequencies. They measured the wavelength of these water waves and input their data into a class spreadsheet using Microsoft Excel. This data was then analyzed to explore the relationship between frequency and wavelength for water waves. Their conclusions were compared with those for light waves.

I will discuss the experiment in detail, present a sample of typical students' data and the conclusions that were made. I will provide information of the equipment and software used for this experiment and discuss the success of the experiment as a teaching tool.

***General Chemistry Interface Experiments - Revisions for Windows 95/98***

Jack Weyh  
Don King (presenter)  
11:30-12:00 Room 216

Western Washington University  
Western Washington University

We are currently using twelve computer interface experiments in our general chemistry series. These experiments were originally developed for the DOS version of LabWorks. We have completed revisions of all twelve experiments for LabWork's Windows version. A review of these revised experiments will be given, including a look at sample data as treated with the Windows spreadsheet program. Our experiences in working with the LabWork's Windows version will be reviewed.

***An Inter-disciplinary Program on "Light"***

Dharshi Bopegedera  
Susan Aurand  
11:30-12:00 Room 111

The Evergreen State College  
The Evergreen State College

We taught a two-quarter long inter-disciplinary program titled "Light." In this program we explored how artists and scientists use and study light. In our presentation we will discuss how the theme of "light" was used to teach students important concepts in chemistry and physics. We will also share several students' projects that required them to explore some aspect of light in an inter-disciplinary manner.

### ***Introductory Chemistry Online***

Walt Volland

1:00-2:00 Room 216

Bellevue Community College

The growth of the web has reached into the classroom. Course syllabi, lecture notes, and some experiment procedures are online. This natural evolution has led to the development of complete courses and degree programs on the web. An introductory chemistry course is part of an online Associate of Arts degree program offered through Washington Online.

Introductory chemistry is a reasonable starting point for a complete web delivered chemistry course. The class was offered for the first time this January. Course content is the same as a traditional introductory course. Web activities that relate to course topics are a new feature. Chat rooms and virtual office hours are integral parts of the class.

The students are not required to come to campus. This requires a novel approach to experiments. A set of safe "green" environmentally friendly experiments have been developed. These labs are similar to the ones done in a traditional lab. Problems faced when developing online labs will be described. A typical experiment will be introduced as part of the presentation.

Advantages and disadvantages of the new mode of instruction will be discussed.

### ***Small Scale Chemistry***

Kathy Carrigan

Joan Stover

1:00-2:00 Room 240

Portland Community College

South Seattle Community College

Joan and I would like to provide a "hands on" activity to demonstrate the utility of and fun with small scale chemistry experiments. After participating in a two week class in Colorado with Dr. Steve Thompson, I have implemented these labs into my courses with considerable success. We are planning two short experiments that people could begin during the seminar but complete in a second session and/or on their own. We considered a "competition" to see who could make the best small scale balance. We will provide all materials necessary, as well a information on further workshops and trainings in small scale chemistry for those interested in learning more.

### ***WinQual - A Simulated Inorganic Qualitative Analysis Program***

Kris Bruland

Joe Crook

Don King

Jack Weyh (Presenter)

2:00-2:30 Room 216

Western Washington University

Western Washington University

Western Washington University

Western Washington University

This program focuses on a set of eleven cations and anions and their aqueous chemistry. It culminates in over 1000 unknowns that the user can solve. The program is very visual. Hundreds of pictures of various ion mixtures, compound precipitates, etc. have been

taken and digitized. Every time a user adds a reagent to an unknown (or a known) a full color, digitized picture shows the result of the mixing. If the user is Exploring (that is, the sample is a known), the composition of the solution can be shown with a click of the mouse. If the sample is an unknown, careful reasoning, strategy, and thoughtful mixings lead to successful unknown solution. Unknowns run the gamut from simple to extremely difficult and challenging.

The program is completely open-ended. Sample solutions can be prepared, and then mixed, saved, used, heated, centrifuged and decanted. The user decides what to do and sees the real result of every action. The eleven ions are  $\text{Na}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Ag}^+$ ,  $\text{Ni}^{2+}$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{I}^-$  and  $\text{Cl}^-$ .

WinQual is a completely rewritten, 32 bit Windows 95/98/NT version of the DOS program published in 1990.

***Chemistry Outside the Classroom: Chem Club, Summer Camps, Demos, etc. A talk and open form for discussion on what does and does not work***

Nancy Barker

Pierce College

Brain Laubach

Pierce College

Ralph Morasch

Pierce College

2:00-2:30 Room 240

The staff of Pierce College invites you to join us for a brief talk on our activities outside The classroom, followed by a group discussion. We will discuss our successful creation of an active Chemistry Club. We will include information on various projects and activities our club has organized and conducted. We will discuss our Campus Capers Summer Camp. This is a two week long camp with campus wide participation for 10 to 12 year olds. We will focus on the science portion of the camp. Over the last three years of participation, we have acquired a wealth of knowledge on this subject that may be useful to others interested in a similar project. After our short presentation we would like to invite all participants to share with the group any activities, ideas or input on the topic of science outside the classroom.

***New Experiments for the Organic Laboratory***

Gary M. Lampman

Western Washington University

George S. Kriz

Western Washington University

3:15-3:45 Room 240

Several new experiments will be presented, including the preparation of Naproxen, the preparation of 4-nitrophenyl-1-pentyne using a palladium coupling catalyst, and a project-oriented preparation of chalcones.



***Animating Quantum Mechanics: Helping Students Visualize Atomic, Hybrid, and Molecular Orbitals***

John Bullock

Central Washington University

3:15-3:45 Room 203

The quantum mechanical nature of orbitals presents chemistry students with one of the more abstract concepts that they encounter. Many textbooks give brief descriptions of orbitals as wavefunctions, frequently contrasting them with Bohr orbits. However, emphasis on the wave nature of the electron is usually absent, thereby leaving the student with the impression that orbitals are simply unusually shaped, "fuzzy" orbits. Using Mathematica, I have developed a series of three dimensional computer animations that attempt to illustrate the standing wave functions from which the pictures of orbitals in texts are derived. This has the advantage of allowing students to "see" the waves and helps them develop an appreciation for the manner in which different orbitals can interact. Another advantage to these images is that they help illustrate the physical significance (and arbitrary designation) of the orbital signs. In addition to the three-dimensional plots, I have developed several series of contour plot animations that I have used to illustrate the formation of hybrid orbitals from individual atomic orbitals as well as the formation of molecular orbitals for simple molecules and ions, such as  $\text{FHF}^-$ .

***Developing a Web Site and Integrating Technology into your Chemistry Course***

Marilyn Jacoby

WCB/McGraw-Hill Publishers

3:45-4:45 Room 240

Presentation will include a Demonstration of creating your Course Website using Pageout software from McGraw-Hill. Also presented will be Course Solutions and Online Learning Centers. Course Solutions is the integrated answer to your specific teaching needs. Course Solutions will assist you in integrating your syllabus with new media tools.

***ChemConnections Modules***

Karen Harding

Pierce College

Sharon Anthony

The Evergreen State College

3:45-4:45 Room 203

The ChemLinks Coalition and ModularCHEM Consortium, two of the National Science Foundation "systemic change initiative" projects in chemistry, are developing and testing modules for teaching chemistry that combine interesting real-world questions and guided inquiry with active and collaborative learning strategies. John Wiley & Sons are publishing these modules as the *Wiley Chem Connections* series. This session is designed to provide faculty with an opportunity to evaluate this new approach.

**Examples of Chem Connections Modules:**

Build A Better CD Player: How Can You Get Blue Light From A Solid?

Computer Chip Chemistry: How Do We Drive The Reactions Of Integrated Circuit Design?  
Earth, Fire, And Air: What Is Needed To Make An Effective Air-Bag System?  
Water Treatment: How Can We Make Our Water Safe To Drink?  
What Should We Do About Global Warming?  
Why Does The Ozone Hole Form in the Antarctic Spring?  
Would You Like Fries With That? The Fuss About Fats In your Diet

***Molecular Modeling Experiments for Organic Chemistry***

Jim Swinehart

Pierce College

4:45-5:15 Room 240

The use of low cost or public domain software for the study of the structure and stereochemistry of both simple and complex molecules will be described. The author hopes that during the discussion period others will describe their experiences with molecular modeling in organic chemistry courses.

***Adapt and Adopt in Washington State***

Deborah Wiegand

University of Washington

Sara Selfe

University of Washington

4:45-5:15 Room 203

An Adapt and Adopt proposal for Washington State has been submitted to the National Science Foundation. The purpose of NSF's Adapt and Adopt Initiative is to support chemistry departments in the incorporation of the new curricula developed through the Systemic Chemistry Initiative. The Washington State program will involve faculty from a variety of institutions throughout the state in the adaptation of modular curricula into the first two years of college chemistry. Faculty will participate in summer institutes to learn about modular teaching and to develop implementation plans with emphasis on assessment of student learning from the modules. Join us to hear more about the planned program and how you can participate.

**Saturday, April 24**

***Organic Mechanisms in Song: A fast and unusual way to teach Organic***

Carole Berg

Bellevue Community College

8:30-9:00 Room 201

Mechanisms so that the students never forget them.

### ***Teaching Buffers Backwards***

Dave Reichgott

8:30-9:00 Room 203

Edmonds Community College

Are students baffled by buffers? Do they balk at Henderson-Hasselbalch? Is that titration section tacked on at the end of the chapter a little tacky? Come and hear about an experimental approach to teaching and learning about buffers that is based on titration curves.

A two-lab module starts with the definition and measurement of pH, compares the resistance to pH change by various solutions, and then moves to pH titration curves. The shape of titration curves is related to the resistance to pH change. Students participate in a spreadsheet exercise calculating ratios of acid and conjugate base from their titration curve, and then an acid dissociation constant is calculated from concentrations. In the second laboratory session students make buffers to specific pH values by partial titration, using their previous week's curve. Buffer parameters (buffer capacity, acid and base neutralizing capacity) are introduced and related both to stoichiometry and titration. Sequel labs could include water quality determinations, clinical applications, or industrial process control tests.

### ***Sharing Lab Results Using an Internet Database***

Philip Hunter

8:30-9:00 Room 240

Tacoma Community College

General Chemistry students at Tacoma Community College often must pool their lab results to perform meaningful analyses. We have created a database application on the World Wide Web (<http://www.tacoma.ctc.edu/home/phunter/labdata>) that allows students to record their results. The application provides immediate feedback to students when mistakes are detected in the submitted data. Students may view tables of the class results and download the tables into Excel for further analysis.

The presentation will include a demonstration of the application, benefits to the students, and an overview of the development process.

## SEVENTH ANNUAL WCCTA CONFERENCE PARTICIPANTS

APRIL 22 – 24, 1999

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**SEVENTH ANNUAL WCCTA CONFERENCE VENDORS**

APRIL 22 – 24, 1999

Central Washington University

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**See the Vendor Displays in Room 311!!**