

Computers in Chemical Education Newsletter

Fall 1999

Beginning with the fall, 2000 issue, the hardcopy version of the CCCE Newsletter will be terminated and replaced with an on-line version. Further details about the new format will be provided in the Spring 2000 issue. Any current subscriptions will be continued until that date and no further subscriptions will be accepted for the print version.

Many thanks to all of our readers for their support. We hope that you will find the new format to be just as informative as the Newsletter which had served us so well for so long.

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Submissions: Articles, announcements, etc., should be setup on your own website and the website address of the article sent to editor Brian Pankuch at pankuch@eclipse.net or pankuch@hawk.ucc.edu for review and acceptance. Authors are requested to keep material available for at least a year after publication, longer would be preferred since the Newsletter will be searchable from the Internet. We anticipate increased communication between authors and readers and plan to make these discussions available to all subscribers. A listserv will be provided and managed for these discussions.

Suggestions are welcome!

Submission deadlines: Fall issue - Sept. 25; Spring issue - March 15.

Clarification: In a few places the text of this issue needs clarification. The bottom of page 11 and top of page 12 should have indicated that Donald Rosenthal is at Clarkson University and Brian Tissue is at VPI & State University. The top of page 13 should indicate that Tim Champion is at John C. Smith University and Willis Weigand is at Penn State University - Altoona College. On page 20 Cathy Middlecamp's affiliation is Department of Chemistry, University of Wisconsin, Madison, WI 53706. Our apologies to our authors and readers for these and any additional errors.
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THRIVING ON COMPLEXITY?

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After many years, technology finally seems to be on the threshold of becoming a standard teaching method on many college campuses. Surveys indicate various instructional technologies are used by many, though less than a majority, of college faculty. Perhaps more important, many college administrators seem to have become enthusiastic supporters, who are encouraging the use of technology in the classroom. This may seem like good news for a committee that is dedicated to exactly this goal, but it represents a new set of challenges.

There are several indications that much work remains to be done. A national survey recently reported that 67% of faculty feel stressed by keeping up with technology, more than feel stress due to teaching loads or demands to do research and publish. Some faculty who have chosen not to use technology feel threatened, and it appears that some faculty are adopting presentation software or other technology because they are afraid that if they don't they will look out of date. In some cases, individuals feel so frustrated by the changes that they have become self-proclaimed Luddites, opposing all instructional technology.

Even the professors who are adopting teaching seem to be feeling some discomfort. One faculty member who responded to the survey mentioned previously said, "I just don't have the time. I don't have the time to use everything they come up with." This is not an unusual sentiment. Within a decade, college teaching has changed from a profession where change was slow or nonexistent into a hectic race, where technologies that were implemented last year have already begun to seem passe. One might well say, "It will be great, if only we can survive."

The first few faculty who used technology in their classes were an unusual group. These early adopters found the technology to be exciting. They recognized the possibility that sometimes the technology wouldn't work but were willing to accept that risk. Sometimes there was an almost evangelical belief that technology was not just a new teaching tool, but a catalyst that could dramatically change the educational process. Now, new technology users are more likely to expect technology to be both dependable and efficient. This new attitude is making the job more difficult for technical

support staff.

Campus technology has become crucial within a very short time. Five years ago, an announcement that e-mail would not be available on a campus for two weeks would probably have been viewed as an inconvenience to a small number of individuals; today it would be seen as a disaster by many. Most college faculty have become dependent on technology to do their daily work. How many faculty who use technology have a backup plan in case the computer fails to work? Some college administrators are talking about a 7/24 campus, that is providing services to the students seven days a week, twenty-four hours a day.

The term 7/24 is a clue to where colleges are going. It originated in the electric power industry and represented a commitment to provide essential services without interruption. Like electricity, gas, and water, campus technology is becoming a utility. More and more college personnel expect technology to always be conveniently available. Even though few campuses make this commitment explicitly, it is being implicitly accepted as a basis for operation. Many campuses are just beginning to understand what this commitment means.

These changes in the view of technology represent new challenges for the CCCE. There is still a need for the committee to take a leadership role in the development of instructional technology. In addition, there is still much to be learned about the educational use of "older" technologies, like electronic mail and presentation software. Finally, the committee must be ready to help colleagues who have been slow to change when they are ready to explore new methods. This committee must find ways to cope with a broader spectrum of faculty interests than ever before in an environment where technology is increasingly taken for granted. The good news is that there is still plenty of work for this committee; the bad news is that the job has become much more complex.

Continuing adventure:

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The results of using the techniques, interactive PowerPoint lectures, I've previously described, are promising. I've had a second class in a year in

which the lowest grade was a C. Students still transfer out of our majors courses' into one of our review Chemistry courses, and some just withdraw. Still this kind of performance has been quite rare, in my sections or in sections of my colleagues. See Karen Timberlakes' article in this Newsletter for more detail and ideas.

Action has switched to one of our new remodeled classrooms with multimedia equipment. We have a 1200 lumen Sharp projector mounted from the ceiling, a high quality screen which pulls down, and has a lock down feature which makes it very rigid. A large wheel based table has connections for my portable PowerBook, an Elmo projector, VCR, and both phone and T1 connections for the Internet.

My procedure at the moment, after some experimentation, is to connect the power cord, projector cable and remote mouse accessory then start my PowerBook in my office. I boot the system, a PowerBook 292, bring up PowerPoint, Director and Netscape if I'm going to show animation or Internet material. I open the PowerPoint lecture I'm currently using and go to the slide we left off on. I generally check the slides I'm using for the next lecture to make sure all is well, especially if links to movies, etc., are still good. If I need material from a CD I put the CD in now. I put the PowerBook into sleep mode, disconnect the power cord, move the cart (which has three shelves, with the PowerBook on the top; spare wires, remotes, batteries, handouts on the next; and my briefcase on the bottom) to the classroom. I also have about 1.5 inch foam rubber strips under the PowerBook to cushion bumps, and still let air circulate for cooling.

In the classroom I turn on the projector (ours must be turned on before you connect to the PowerBook or they can't talk to each other), plug in the PowerBook, and connect it to the projector. Touch any key and the PowerBook is up and running within seconds with the application programs I'm going use already running. When I'm finished I put the PowerBook back to sleep, disconnect, wheel the cart back to my office, reconnect to my T1 line and at a click of the mouse I'm up and running, checking material for my next lecture. My Mac reconnects to the Internet without any action on my part..

This cuts down substantially on the time and stress of completely shutting down and rebooting my system. We are having some problems with the very impressive remote for the projector. It doesn't work in the present configuration, which means I can't zoom in on movies, programs, etc. You can zoom in movies, stop, start, loop, etc. in QuickTime 4. To do this requires opening a movie in QuickTime and saving it in QuickTime format. If you just link to a movie that you last played in

Simpletext or some other program it will reopen in the same application.

Working on the PowerBook, even with its 14.2 inch screen, is still less efficient for me, so I prefer to use my desktop machine with a 20" screen. Unfortunately for some reason when the files are transferred to the PowerBook many links to movies, etc., are broken. Transferring with everything (440 MB and growing) lessens the problem, but some links still break. I've been having better luck connecting the PowerBook to my desktop machine with a special cable from Apple, the PowerBook then appears as a hard drive on the desktop. All files being changed are saved to the PowerBook as a hard drive. This method works well but there are still some intricacies and inconsistencies which have eluded me. For that matter I can move shapes on a slide in my office in PowerPoint, leave the machine on as described above and have it change by the time I use it in lecture? Technology is fun, but it is more fun when it works consistently.

Great Expectations for Computer Usage by Undergraduate Chemistry Students

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Over forty years ago at MIT I started using computers for calculations in chemistry. I have moved from a mainframe computer fed by punch cards for each run to teletype terminals connected to mainframe computers by slow telephone lines to the early microcomputers with 8K of memory (Commodore PETS and Apples) to the Pentium III machine I am writing this article on. I have served my time on computer committees and even was offered the position to manage our network. I continue to help friends with their computer problems and amazed that I can hold my own with most professional computer staff personnel. For the past twenty five years I have been a consultant/evaluator for the North Central Association (NCA), the

national accreditation agency for the Midwestern states, doing one to two accreditation visits per year to colleges similar to Ripon College. Usually I look at the Sciences, the Library, academic and administrative computing. On these visits computer usage is a frequent discussion topic with members of the accrediting team and members of the institution being examined. Budgets for computer services as a percentage of institutional budgets have been going up each year. Cost of computer facilities and services are about the same for colleges as for the library. There is a realization that college computer costs must level off and be controlled.

Initially, I had great expectations for the power of the computers and how they could be a great boon to instruction of Chemistry for the undergraduates at institutions such as Ripon College. Ripon College is a Liberal Arts College of about 800 students and is a member of the Associated College of the Midwest. Our department has four Ph.D. chemists and is ACS approved. We graduate 5-12 majors a year and are currently coming out of an enrollment decline. About 80 % of our students have their own personal computers in their dormitory rooms. They have more computer power than they need. Fast hookups to Email and the Net are available to all. Below I will recount some of our failures, successes, and what I think we as educators can do to improve the quality of computer usage.

We have tried computer assisted instruction (CAI) for several courses. Very early I wrote a series of programs to teach fundamental chemical chemistry principles and calculations and found that this was not worth the effort. Students must learn by hard work and effort. The problem is getting them to think and study. A good text book and classroom lecture-discussion are helpful. Last year my students used the new edition of Atkin's **Physical Chemistry** with what I thought was a very excellent CD to get an overview and review of the chapter. They did not use it, but decided very early that Physical Chemistry was too hard and nothing would help. The class was small and I felt that I did not have a critical mass of students to have serious discussion and competition.

We have not used computer simulation of experimental equipment for we have a rich array of instruments from FTIR's, gas and liquid chromatographs, uv-visible spectrometers to a 300 megahertz superconducting FT-NMR. We have preferred a hands on instrument approach. Most of the instruments operate from Windows based computers of various vintages. We are finding that strip chart recorders are becoming a thing of the past. Students, with our encouragement, frequently paste chromatograms and spectrograms into their reports

Students currently use STN to search Chem Abstracts in our junior-senior courses for research papers and senior thesis research. We are just getting into online journal usage, and students use the Web to obtain information for their seminars and presentations. Some of the web information used is poor to outright incorrect and very opinionated. Usage in this area exceeds our expectations. Students are eager to obtain and believe information from the Web.

We are currently using Spartan Pro and Gaussian 98 on PC for molecular modeling and quantum chemistry calculations. We use Spartan in all our organic courses and physical chemistry courses. We have a projection system for classroom use and are applying for funds for Spartan systems for Organic I, our first semester freshmen course. We hope our students will consider these quantum chemistry programs as tools on the par with instruments.

One area that I note on my NCA visits, on campus, and reading Wisconsin newspapers is that administrative computing, namely change overs to more powerful data base programs are costly and create serious pain for users including students and faculty. Our registrar and finance office for over six months has been entering data in the old and new data base. Department budget records are not being issued. Student transcripts have been issued on time, but some administrative offices have serious delays in using the new data system. One of our Midwestern universities could not issue transcripts for months and now the ones they issue have an accuracy disclaimer. Because of these changeovers student registration has regressed. These changes are not trivial and have proved to be much more costly and time consuming than many expected. On some of my recent NCA visits, recent data I requested was unavailable because the old system out and the new system could not retrieve data from the new common data base.

Most students who selected the programmable calculator option for calculus use their calculators for numerical integrations, solving transcendental equations, and repetitive calculations. Spreadsheets are routinely used for linear regression calculations and graphing. Most will not put in the effort to develop their own spreadsheets for repetitive problems that occur in our physical chemistry course. They do not see the advantages one obtains when you must redo an incorrect calculation correctly using a spreadsheet. Little use is made of software such as MathCad or Maple. I am still using Scientific Workplace and Scientific Word for Physical Chemistry laboratory reports (See an earlier edition of this journal) which has Maple and T_EX incorporated into it. Students appreciate its power, but resist the effort needed to write in it, and do not like some of

its constraints. They resist using help menus and the manuals. I believe it is important for them to see the power of this type of program for future reference.

The overall quality of student formal reports has improved due the use of word processing programs. We have a writing program at the College and a junior laboratory course emphasizing research report writing. Most students will not use the full power of word processing unless you demand it. They prefer to write in equations, drawings, reference numbers etc. even when they know that they will have a number of drafts. Suggestions to use the word processing program to do this early falls on deaf ears in most cases. This was brought home painfully for students and instructors alike when the students were writing their senior theses.

In conclusion, computers have brought improvements to the quality of instruction of undergraduate chemists and their work. Our expectations in the computer area have as in other areas fallen short. This is the nature of education, teaching and learning.

September 22, 1999

Using Student Centered Learning Strategies in the Chemistry Classroom

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If we consider that learning is enhanced when students are engaged in the processing of information, then our challenge as teachers is to find creative ways to design dynamic learning environments that involve students in doing and thinking about chemistry.

Over the past few years, I have developed a teaching strategy, which I call LecturePLUS that converts the traditional lecture into a student-centered format. The LecturePLUS environment integrates mini-lectures, formative assessments, and activity worksheets for team learning in the classroom.

Background

Most of us who teach chemistry grew up learning chemistry from the lecture method. For many years, I never doubted that it was the way to teach chemistry. Today the lecture system is the preferred teaching style used by 89% of science professors. Indeed, lecture is a comfortable format for many instructors and a non-threatening one for students. It is low cost, easy to control, and an excellent method for organizing course content. However, many of us are becoming more aware that during lecture students are not actively engaged with the topic, they don't seem to listen for very long, and their retention of concepts is minimal. Studies show that students are not attentive 40% of the time they are in class and that although attention is high for the first 15 minutes, it declines rapidly until the final 10 minutes of class. About 10 years ago, I began to hear about student-centered teaching strategies, but I saw little of it at the college level. Now that is beginning to change. Don Paulson, Chemistry, California State University, reports that the use of active-learning strategies from 1994-1998 provided an average retention rate of 75% for one year of organic chemistry compared to 38% when he used the lecture method. In addition, he reports that students who learned with the intense active-learning approach in lecture did significantly better in both retention and GPA in the laboratory class.

Student Centered Strategies

In a student-centered classroom, students are encouraged to participate actively in learning the material as it is presented rather than being passive and perhaps taking notes quietly. Students are involved throughout the class time in activities that help them construct their understanding of the material that is presented. The instructor no longer delivers a vast amount of information, but uses a variety of hands-on activities to promote learning.

As I learned more about student-centered learning environments, I began to alter the way I taught my chemistry classes. I have now developed a group of learning strategies that I call LecturePLUS to promote Participation, Learning, Understanding, and Success. My LecturePLUS system includes mini-lectures using PowerPoint presentations, in-class collaborative learning, peer presentations, ongoing assessment tech-

niques, and "ChemWorks", which are group homework projects.

Mini-Lectures

When I learned in a workshop that student attention span in lecture wanes after about 15 minutes, I began to repackage my lecture material. Eventually I had a series of PowerPoint® slides or CheModules that I utilize as mini-lectures. Many of these are on my web site at <http://www.karentimberlake.com> or <http://www.lectureplus.com>. In the classroom, I use a simple media cart with the presentation system on the top level along with my laptop. A VCR on the middle level allows me to show videos full screen through the presentation projector.

In class, the students work out of a syllabus in which I include the Power Point notes. I don't include the solution slides in the notes, but show them after students have given their answers. The same modules are available on my web site for review and do include the solutions. Here are some slides from the CheModule on ionic compounds and their formulas.

Ionic Compounds

Metals lose electrons and nonmetal gain electrons
Ionic bonds are attractions between + ions and - ions

electron transfer

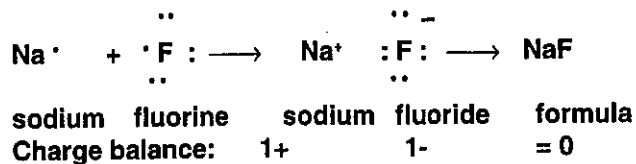
metal \longrightarrow nonmetal \longrightarrow ion⁺ ion⁻

Electrons lost = Electrons gain

Formulas of Ionic Compounds

Formulas of ionic compounds are determined from the charges on the ions

atoms ions



Writing a Formula

Write the formula for the ionic compound that will form between Ba²⁺ and Cl⁻.

Solution:

1. Balance charge with + and - ions
2. Write the positive ion of metal first, and the negative ion
Ba²⁺ Cl⁻
Cl⁻
3. Write the number of ions needed as sub-

scripts BaCl₂

Learning Check IC1

Write the correct formula for the compounds containing the following ions:

A. Na⁺, S²⁻

1) NaS 2) Na₂S 3) NaS₂

B. Al³⁺, Cl⁻

1) AlCl₃ 2) AlCl 3) Al₃Cl

C. Mg²⁺, N³⁻

1) MgN 2) Mg₂N₃ 3) Mg₃N₂

Solution IC1

Write the correct formula for the compounds containing the following ions:

A. Na⁺, S²⁻

2) Na₂S

B. Al³⁺, Cl⁻

1) AlCl₃

C. Mg²⁺, N³⁻

3) Mg₃N₂

Naming Binary Ionic Compounds

Contain 2 different elements

Name the metal first, then the nonmetal as -ide.

Use name of a metal with a fixed charge Groups 1A, 2A, 3A and Ag, Zn, and Cd

Examples:

NaCl	sodium chloride
ZnI ₂	zinc iodide
Al ₂ O ₃	aluminum oxide

Learning Check IC2

Complete the names of the following binary compounds:

Na₃N sodium _____

KBr potassium _____

Al₂O₃ aluminum _____

MgS _____

Solution IC2

Complete the names of the following binary compounds:

Na₃N sodium nitride

KBr potassium bromide

Al₂O₃ aluminum oxide

MgS magnesium sulfide

Formative Assessment

In many of our classrooms, we often have a large gap before we test students on the material we discuss in our classes. After the first exam, we are surprised and

disappointed by what they students did not learn by this time. It is often too late to make up for the material that was missed. I realized that I wanted to know what students were thinking and learning each day while we were in class. To do this, I integrated learning checks within the PowerPoint slides of my CheModules. In the sample slides, there are learning checks IC1 and IC2. These learning checks are a type of formative assessment techniques, which is a non-graded assessment that occurs throughout the class time.

When a learning check appears in a module, I give students time to work out the answers, individually at first, and then in groups. Many of the learning checks involve short multiple-choice or fill in questions. For the multiple-choice questions, every student has a set of three cards with large numbers 1, 2 and 3 on them. I made these from card stock. When I call for answer cards, everyone raises the card(s) that indicate their answers. The results in class serve as a discussion of the concepts. Students get a quick assessment of their own learning and what they need to work on. The learning checks are a way for students to continually adjust their understanding. They also encourage questions. At the same time, I can determine what is working in my mini-lectures and what needs more attention. The ability to adapt to particular needs has resulted in some of the most productive teaching I have ever done. There are a variety of other types of formative assessments that can be used in a chemistry class to assess what students are thinking and learning each day. Several are described below:

Clarification Pause A quick way to add some active learning to a classroom is to take a lecture break every 15-20 minutes. This means that I stop talking for about 2 minutes while students discuss the ideas with each other, check and clarify their notes, and ask questions. I circulate about the room and help them review the ideas. This is a quick way to add student-centered learning that does not require prepared worksheets or other materials.

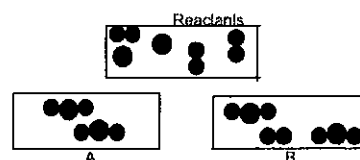
Shared Paragraph During class or at the end of class, students are given a few minutes to write a short paragraph in their own words that explains that major ideas discussed that day. They share their paragraphs with other students, and give feedback to each other. They may turn the paragraphs in as they leave class. I return them the next day and discuss any topics that were not clear. I obtain instant feedback in their thinking and students learn to summarize information.

Fish Bowl At the beginning of class, each student writes a question pertaining to class content on a 3" x 5" card and places the card in a container. I draw out some cards and read the questions to the class. Students are

expected to provide answers. The discussion reviews topics that were unclear and gives students who would not ask a question in front of their peers a chance to present a question to the instructor. Students learn to assess and articulate what they don't know. And I obtain feedback on the level of difficulty of various topics I present.

The One-Minute Paper Students are asked to write a short paper or paragraph for one minute. This might be about a section in the chapter or about a concept we just worked on. They are turned in and I quickly look them over. Students learn to clarify the ideas in the reading or lecture material. The paper provides feedback to the instructor on student's ability to understand the concepts in the text. Here is an example of a one-minute paper:

Carbon and oxygen react according to the following equation: $C + O_2 \rightarrow CO_2$



Select the container (A or B) that represents the molecules after C and O_2 react. Write a one-minute paper to explain your choice. „

When I collected the papers, I discovered that although students could do a mechanical calculation of a limiting reactant problem, they did not understand the concept. This result prompted more discussion and analogies concerning limiting reactant concepts.

Results

“B is the correct answer because it contains an equal number of atoms in the products and reactants as well as forming a new compound with an excess of oxygen.” (120/180 students)

“A is correct. No oxygen atoms are left over, because the equation states the product is CO_2 and not $CO_2 + O_2$. There is extra oxygen reactant floating around which is not stated in the given equation.” (60/180 students) „



The benefit of using formative assessments is that instructors and students have an ongoing evaluation of what students understand and what needs more attention. The instructor adapts to the needs of the class by adding another example, challenging thinking, or moving on to the next topic.

Worksheets for Group Work in Class

Within each set of PowerPoint® notes in the syllabus, I integrate worksheets for collaborative learning during class. Students work in study teams applying the concepts immediately and problem-solving together. Learning is enhanced when students become engaged in the processing of information.

Here is an example of one page of a team worksheet done by groups of students in class.

Naming and Writing Ionic Formulas Worksheet 4.3

1. Determine the formula and name of the ionic compound containing the following ions:

Ions	Formula	Name	Na ⁺ and O ²⁻
			Al ³⁺ and S ²⁻
			Ba ²⁺ and Cl ⁻
			K ⁺ and P ³⁻

2. Why is Na⁺ named sodium ion, while Fe²⁺ must be named as an iron (II) ion?

3. Complete with formulas and names:

	Cl ⁻	S ²⁻	N ³⁻
Li ⁺			
Mg ²⁺			
Fe ³⁺			

4. How do you determine the charge of the positive ion in CuO and Cu₂O?

As students work together in the classroom, they think and use the language of chemistry. They use peer instruction to fill in gaps in math and chemistry for each other by providing immediate feedback and correction to each other's ideas. I've found that peer instruction helps students begin to formulate questions about what they don't understand and begin to model successful problem solving for their peers. A former student comments, "The best part of working in groups is that students who are too shy to ask the professor for help can ask a member in the group". The importance of establishing a learning community that supports all the students in the class cannot be overrated. Another student said, "The group methods helped me to understand the material for the first time. It made chemistry enjoyable." One may argue that learning chemistry may not always be so enjoyable, but if too much of it is not, the student will often leave the class.

Peer Presentations

When we are ready to review several chapters for an exam, I hand out a review worksheet or assign a different questions from the text to each study team in the classroom. I have done this with classes up to 200 students. Students manage to find a way to work together regardless of the shape of the classroom or lecture hall. They discuss the problem and write up a solution on a transparency. After 15 minutes, one or two students describe their solution to the class using an overhead projector. I am always impressed with the ability of students to articulate their work and to teach a class. I interject a thought or clarification as needed, but most of the time it is a student who asks a question or makes a suggestion. As long as students are given the time to prepare their solution, the peer presentation is a positive experience that strengthens the self-confidence of many students.

Group Homework Projects "ChemWorks"

In the process of changing to a more student-centered classroom, I found that I said less but taught more. For example, I no longer work problem after problem in class as students snooze. Now students work out problems together using group problem solving homework worksheets I call "ChemWorks". They must get together outside of class with their study teams and work on these homework sets. They have different ways to do this. Some do all the work together. Others assign problems to work on their own and then get together to go over the work. Others email back and forth on their computers. Because I don't cover all the material in class, they must learn from their textbooks

and other resources. At the beginning of each exam (I give 5), one ChemWorks paper is turned in for each study team and each member receives the same grade. An example is shown below:

CHEMWORKS 2

Names and Signatures of Study Team

1. Write the formulas or names of the following ions.

_____ S^{2-} _____ magnesium ion _____
 _____ SO_3^{2-} _____ carbonate ion _____

2. Give the correct formula for the following covalent compounds:

nitrogen trichloride _____ iodine _____
 silicon tetrabromide _____ carbon dioxide _____

Give the correct name for the following covalent compounds.

PCl_3 _____ O_2 _____

4. Draw the electron dot formula of silicon tetrabromide.

5. Complete the following for ionic compounds:

IONS

CORRECT

	positive	negative	FORMULA
aluminum bromide	_____	_____	_____
iron(III) oxide	_____	_____	_____
calcium phosphate	_____	_____	_____
lead(IV) chloride	_____	_____	_____

6. Write a correct name for the following compounds:

NaI _____ $Ca(NO_3)_2$ _____
 $BaCl_2$ _____ Fe_2O_3 _____

SHOW WORK AND CORRECT SETUPS ON ALL PROBLEMS.

7. Betahistine, $C_8H_{12}N_2$, is a vasodilator used in the treatment of hypertension by acting directly on the vascular smooth muscle to cause relaxation.

- What is the molar mass of betahistine?
- How many grams of betahistine are in 0.255 moles of betahistine?

Small-group learning has the benefit of engaging students, sharing teaching and learning, connecting more learning styles, developing higher-order thinking skills, helping students to reflect and increasing success and retention. By working in groups, students learn to take

more responsibility for their own learning, which is a process that is important in today's Internet world. A student comments, "As each student brings knowledge or insight to the group, the pieces begin to fit together like a puzzle so that basic learn concepts can be applied to a wide variety of situation. You take a more active and responsible role in your learning."

Tips for Adding Student-Centered Learning in the Classroom

If an instructor wants to move toward a student-centered classroom, I have some tips on getting started. Begin using active strategies the first day and start small. Students will know that your course will be different from the traditional lecture format. Clarify procedures and provide a non-threatening environment. Discuss the appropriate behavior for students when they work in groups. Experiment with various activity to find those that are most comfortable and workable within ones own teaching style. Adapt the various activities to fit your class. Be prepared to find out what students do to learn.

There will be mixed reactions from students but I have seen students start a semester thinking this was a ridiculous way to teach and end the semester begging me to teach their next class. Since I started using more interactive techniques, I have become keenly aware that students do not learn the same ways; in fact, they have vastly different ways of processing information and learning how to think.

Conclusions

Student collaboration and peer instruction using non-graded classroom assessments and team worksheets in a student-centered classroom provides continuous feedback to both students and instructor throughout the class time. Students interact with each other as well as the instructor, which means they are processing ideas and learning. They are using new vocabulary in a non-intimidating setting and participating in problem solving as they work and explain concepts to other students. For me, the move to more student-centered teaching has been a most exciting way to put learning back into teaching while providing students with the tools for lifelong learning and success. Now I say less and enjoy teaching more!

Acknowledgments

Several of my colleagues have been influential in guide my ideas towards student-centered learning. They include Kenneth Anderson, Department of Biology and Microbiology, Joan Clemons, Department of Geography, Los Angeles Valley College, California State University, Los Angeles, Donald R. Paulson, Department of Chemistry and Biochemistry, California State Univer-

sity, Los Angeles, Diana C. Shakarian, Department of Kinesiology and Health Promotion, California State University, Fullerton, William D. Timberlake, Los Angeles Harbor College, Wilmington., and Jamie Webb, California State University, Los Angeles. This work was supported in part by The Title III Grant, Los Angeles Valley College, Strengthening Institutions Program for Hispanic Serving Institutions, U.S. Department of Education and The Los Angeles Collaborative for Teacher Excellence (LACTE) National Science Foundation, grant DUE-9453608.

Suggested Readings

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Students are working together on a problem in a lecture setting.

SOME GENERAL AND CHEMISTRY WEBSITES

by Donald Rosenthal

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In June 1999 I offered two workshops at the Northeast Regional Meeting (NERM) of the American Chemical Society. One workshop was intended for High School Teachers and the other workshop was for College Teachers. The purpose of the workshops was to provide an opportunity for these teachers to explore chemistry and other resources available on the World Wide Web. Rather than providing a list of URLs, I decided it would be easier and more efficient to establish a website containing links to websites I considered useful. About 50 sites were selected. These selections reflect my personal likes and interests.

In a two or three hour workshop this provides only enough time to spend a few minutes examining each site. Each participant did not examine every site. The workshop website has been left available so that workshop participants can continue to explore some of the sites. Some of the sites have been described in previous issues of this Newsletter. Some of the original sites have moved or are no longer available. I have removed the NERM related sites, added a few additional sites and updated some URLs. The present sites are divided into nine categories:

- I. General
- II. American Chemical Society
- III. Chemistry Websites With Many Links
- IV. On-Line Chemistry Conferences
- V. On-Line Chemistry Courses
- VI. High School Chemistry
- VII. Careers and Employment Opportunities
- VIII. Professional Societies
- IX. Miscellaneous

There is some redundancy in these sites. The websites in category III contain links to many of the other sites. The URL for SOME GENERAL AND CHEMISTRY WEBSITES is: <http://www.clarkson.edu/~rosen2/webwork.htm>

If you have comments or suggestions, please contact me at ROSEN@CLVM.CLARKSON.EDU.

FUTURE ON-LINE CONFERENCE SESSIONS

"Teaching Spectroscopy"

October 31 to December 3, 1999

Organizer:

Scott Van Bramer

Department of Chemistry

Widener University

Chester PA 19013

svanbram@science.widener.edu

"The Role and Nature of Research by Undergraduates in Chemistry" Spring 2000

Organizers:

Tim Champion and Willis Weigand
Department of Chemistry Department of
Chemistry Johnson C. Smith University Penn
State University - Altoona College Charlotte NC
28216 Altoona PA 16601-3760
tchampion@jcsu.edu waw6@psu.edu

papers being solicited

"The Use of Computer Simulations in General Chemistry" May and June 2000

Organizer:

Denis Bussieres

Dept. des Sciences Fondamentales

Universite du Quebec a Chicoutimi

Chicoutimi, PQ

CANADA G7H2B1

dbussier@uqac.quebec.ca

papers being solicited

"Assessment of Model Creation and Use by Chemistry Students" Fall 2000

Organizer:

John Oversby

School of Education
Reading RG6 1HY UK
J.P.Oversby@reading.ac.uk

papers being solicited

"Lecture Demonstrations in Chemistry on the World Wide Web" Spring 2001

Organizers:

Oliver Seely and Dr. George Wiger
Department of Chemistry
California State University at Dominguez Hills
Carson CA 90747
oliver@dhvx20.csudh.edu and
gwiger@dhvx20.csudh.edu
demonstrations being solicited

"Environmental Issues and Risk/Benefit Analysis in the K to 12 Curriculum". Summer 2001 (July and August)

Organizer:

Elizabeth W. Kleppinger
Department of Chemistry
University of Kentucky
Lexington KY 40506-0055
ursa@zeus.chapel1.com

papers being solicited

"On-Line Teaching Methods"
Fall 2001

Organizer:

John H. Penn
Chemistry Department
West Virginia University
Morgantown WV 26506-6045
JPenn2@wvu.edu

papers being solicited

Where it is indicated "papers being solicited", please contact the conference organizer if you wish to submit a paper.

Also, consult the CONFCHEM Website <http://www.ched-ccce.org/confchem/> for additional details.

May-June 2000 CONFCHEM

THE USE OF COMPUTER SIMULATIONS IN
GENERAL CHEMISTRY

Call for papers

This on-line conference will deal with different uses of computer simulations for teaching General Chemistry. Examples of simulations can include -
symbolic diagrams : like visualization of chemical or
physical processes/reactions -
graphics and equations : like chemical reactions,
physical or analytical processes/
instruments - molecular structure : like molecular
vibrations, intramolecular distances,
bond angles, symmetry properties, crystals

You are invited to submit a brief description with the title of your paper by January 15, 2000 to the organizer :

Dr. Denis Bussieres
Dept. Sciences Fondamentales
Universite du Quebec a Chicoutimi
555 Boul. Universite
Chicoutimi, QC G7S 2L9 (Canada)
e-mail : dbussier@uqac.quebec.ca
Tel: 418-545-5011 ext 5074
Fax: 418-545-5012

Full papers are expected to be about ten typewritten pages and be received by April 15, 2000.

This on-line conference is free to all Internet users.

Anyone interested in obtaining more information may subscribe to the CONFCHEM Majordomo or visit the CONFCHEM World Wide Web site: <http://www.ched-ccce.org/confchem/>

To subscribe send the message:
SUBSCRIBE CONFCHEM your-name <your e-mail address>
To: MAJORDOMO@CLARKSON.EDU

Also, additional information may be obtained by contacting either Donald Rosenthal or
Brian Tissue
Department of Chemistry Department
of Chemistry of Chemistry

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Fax + 44 1189 318650

SOME INFORMATION FOR PROSPECTIVE AU- THORS

April 1, 2000 - DEADLINE for receipt of titles and
abstracts

July 1, 2000 - DEADLINE for receipt of final papers
in HTML or ASCII format.

The conference is free to all Internet users.

Those who are interested in obtaining more informa-
tion should consult the CONFICHEM website ([http://
www.ched-ccce.org/confchem/](http://www.ched-ccce.org/confchem/))

FALL 2000

ASSESSMENT OF MODEL CREATION AND USE BY CHEMISTRY STUDENTS

The conference will deal with the following issues in
chemical education:

1. Teaching about model-making in chemistry
2. Learning about the role of models in explaining
chemistry
3. Teaching students the essentials of model
creation and use
4. Assessing progress in understanding and using
chemical models

Chemical modelling includes all forms of representa-
tions used by chemists in order to explain chemical
reactions and related chemical properties. In addition
to computer based molecular modelling programs,
other forms of modelling such as diagrams, draw-
ings, pictures, mathematical functions, physical
objects, chemical equations and animations are
significant in chemistry. The theme is an attempt to
focus on essential methods of communication
specific to chemistry in explaining chemistry.

Papers on assessment of student understanding of
chemical models will be very welcome, especially if
there is some discussion of how this assessment
has been carried out. Papers related to the teaching
of the process of chemical modelling will also be
welcome. As this is a relatively new area, it is
expected that small scale work will predominate so
contributors may offer shorter papers than normal.

Proposals should be sent before March 1, 2000 to:
Dr John Oversby
School of Education

THE ROLE AND NATURE THE ROLE AND NATURE OF RESEARCH BY UNDERGRADUATES IN CHEMISTRY

SPRING 2000 ON-LINE CONFERENCE

SPONSORED BY THE DIVISION OF CHEMI-
CAL EDUCATION - CCCE

Papers describing the nature and role of research
by undergraduates in chemistry are invited for an
on-line conference to be held during the Spring of
2000. Information about starting and managing a
successful undergraduate research program might be
included.

In addition to these papers, all participants are
invited to submit brief descriptions of their under-
graduate research projects to an electronic poster
session. Those who are interested in submitting a
paper or poster should contact:

Organizers:
Tim Champion and Willis Weigand
Department of Chemistry Department of
Chemistry
John C. Smith University Penn State Univer-
sity - Altoona College sity - Altoona College
Charlotte NC 28216 Altoona PA 16601-
3760
tchampion@jcsu.edu waw6@psu.edu

SOME INFORMATION FOR AUTHORS

Papers are expected to be the equivalent to at least ten typewritten pages in length. Posters may be as short as a single page.

December 1, 1999 - DEADLINE for receipt of titles and abstracts

February 14, 2000 - DEADLINE for receipt of final papers in HTML or ASCII format.

The conference is free to all Internet users.

Those who are interested in obtaining more information should consult the CONFCHEM website (<http://www.ched-ccce.org/confchem/>)

to the activities of the Committee and they were omitted from the expressions of thanks only due to an oversight on my part. I apologize for the mistake and express our appreciation to Professors Chipman and Gettys for their hard work.

Using Multimedia III -

Font and Color Selection

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Membership Changes: Addenda and Apologies

Harry E. Pence
Chemistry Department

In the Spring, 1999 issue of the Newsletter, I recognized the contributions of three members of the CCCE who were retiring at the end of their terms. At that time, I inadvertently omitted two other committee members who were also retiring, Wilmon B. Chipman (Bridgewater State College) and Nancy Gettys (Univ. Of Wisconsin - Madison). Both of these individuals have made excellent contributions

Although modern presentation software allows a lecturer to use a variety of fonts and color schemes, using more than a few of these many options in a given presentation can make it almost impossible to indicate emphasis to the audience. Emphasis is extremely important when communicating, especially when giving a classroom presentation. Doing something different calls attention to what the students need most to know. To have this option, some standard pattern must have been established. If there is no normal pattern, it is impossible to show an

emphasis.

In speaking, we can create emphasis by speaking slower, or louder, or with particular stress. Similarly, print media use different types sizes and sometimes even different colors to catch our eyes. A speech or publication that constantly varies is just as frustrating as a talk given in a monotone. To make emphasis possible, a presentation should be based on a limited set of fonts, type sizes, and colors that are chosen most of the time. The basic format should be repeated so often that the eye is no longer aware of it. Then a different font or color will have a real impact on the viewer when emphasis is required.

One of the most common mistakes for new users of presentation software is poor font selection. When slides were widely used, it was common to talk about the 6x6x6 rule. That is, no more than six words in a line; no more than six lines on a frame; and the text should be legible from six feet away. This still works on the computer. Do not clutter up the screen with every word in the lecture. Remember that what is perfectly legible on the computer screen may be difficult or impossible to read when projected into a large classroom. This is particularly important in classes that include students with vision problems.

Unfortunately, there are no firm general rules for selecting fonts. Room size and projector brightness can make large differences. It is important to use a font with strong descenders and ascenders (the vertical and horizontal lines). The advice not to use serif fonts, that is, the fonts with the extra decorations at the end of some vertical and horizontal lines, has a sound basis, but it is not just because of the extra decorations.

Many serif fonts, like Times Roman, have thin vertical lines. This makes them hard to read in a large classroom, with a poor projector, or in a lighted room. Despite this problem, Times Roman is a standard selection in many presentation packages. A heavier font, like Bookman Old Style (serif), Ariel (sans serif), or Helvetica (sans serif) will often give better readability. One way to give a font extra weight, is to use the boldface version. In general, avoid font sizes smaller than 24 point. If a smaller font is needed to include everything, it may mean that there is too much on the frame.

To produce a readable presentation, the other main requirement is a good color scheme. The important factor here is obtaining a strong contrast between the background color and the text color. Deep, strong background colors, like dark blue, dark green, or dark red, are typical choices, because the text will stand out sharply. White or yellow are good text color choices in

these cases. Many other combinations are possible, and sometimes even suggested by the presentation software, but there are few combinations that match these for readability.

Sales presentations are commonly done with a dark blue or green background because these colors are considered to put the viewer in a receptive frame of mind. Bright red, the color of blood, is considered to be very aggressive, and so is rarely used by salespeople. On the other hand, an eight a.m. class will need all the energy possible, so bright red may be a good choice.

Be sure to avoid the color combinations that are difficult to read. Bright red text on dark blue background is usually a poor choice, since the human eye has difficulty focusing on these colors at the same time. Pastel backgrounds were once a common choice, because the available projectors were not very bright. There is little reason to use a pastel background today, particularly since it is hard to find a strongly contrasting color for the text. Another factor that decreases readability is to place the text over a picture or diagram. This may be done for a title section, but if the text is important, it is essential to make sure that the text stands out strongly against whatever background is provided by the image.

Never lose track of the fact that the primary consideration when selecting colors and fonts is readability. No matter how pretty the presentation may be, if the audience cannot read the text, the resulting lecture is a waste of time.

A Simple Strategy for Creating Web-based, Interactive, Multiple-Choice, Practice Examinations.

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INTRODUCTION

This article describes a simple, text-based HTML technique for creating multiple-choice Web examinations that allow students to review course materials interactively. Clicking on any of the answers to each examination question reveals whether that answer is right or wrong. The technique is particularly useful in converting class examinations into Web-

based practice examinations.(1)

(1) Examples of examinations created through this approach are available at www.miami.edu/chm/chm201a2 (organic) and www.miami.edu/chm/chm101h (nonmajors). Look for File Examinations on the home page. These should be available through 15 December 1998.

The principal advantage of this strategy is simplicity. It requires only the ability to write HTML coding, or access to a fully featured Web page-creation program. Except for graphic, audio, or other binary files that might be included within the examination- or response-files, all files are text (ASCII) based. Other than competence with HTML, no programming skills are required.(2)

(2) Among many books available for introductions to and compendia of HTML coding, I have found Laura Lemay's HTML books especially useful, e.g. "Teach Yourself Web Publishing With HTML 4 In A Week", 4th Edition, Laura Lemay, Sams.net Publishing, 1997. See also <http://www.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimerAll.html>

In practice, an HTML-coded file is created for the multiple-choice examination and is placed in a server directory along with a set of five HTML files (for 5-choice questions) that respond to wrong answers and a set of HTML files, one for each question in the examination, that respond to right answers.

In order of increasing complexity, the following illustrate 1) a typical wrong-response file, 2) a typical right-response file, and 3) a typical question taken from a quiz-file.

WRONG-RESPONSE FILE

Sorry, but that is the `wrong` answer. Please use your browser to move back to the quiz and try again.

That's the entire text for the wrong-response file. Except for HTML emphasis on the word "wrong" it contains nothing fancy. It seems desirable to keep the wrong-responses low key. The student now uses the browser's own capabilities to return to the the same location on the previous page, the examination page, and try the question again. There is no return-to-test link in the wrong- response file to carry the student back to the test question just attempted. The browser itself performs this function. This method of operation allows one set of five wrong-response files to be used for the

entire examination.

The wrong-response files are named no1.htm through no5.htm. Alternatively they might be no_a.htm through no_e.htm, or some other variation. The file no1.htm is linked to each *wrong* choice *a)* in every question within the examination; file no2.htm is linked to each *wrong* choice *b)* in every examination question, etc. For *right* choices *a)*, *b)*, etc., there is a set of right-response files.

RIGHT-RESPONSE FILE

```
<font color=#6b8e23>Yes! That is the</font> <font  
size=+3 color=#9400d3><blink>RIGHT</blink></  
font></em> <font color=#6b8e23>answer. Now move  
to the</font> <a href="quiz.htm#03">next question</  
a>.
```

Here HTML coding is used for font color, font size, and to produce blinking of the word "right". Effects can easily move up or down the scale, depending on the complexity desired for right- response files, HTML competence, and/or the sophistication of a Web page-creation program.

The coding `` carries the student back to the examination, which is in a file named quiz.htm, and to the next question. This implies that the right-response file shown above must be the file for the right answer to question #2, and is used *only* for that particular answer of that particular question. Thus each right-response file must contain a `` where #nn refers to the next question in the examination. (The right-response file for the final question carries the student to links that permit return to question #1 for repeating the examination or back to the home page, as described below.)

Each right-response statement is the sole occupant of a unique html file, named no01.htm, no02.htm, etc., or an appropriate variation. Notice that for the first five questions, the wrong- and right-response HTML files are distinguished from each other by a single digit (1, 2, etc.) for the wrong- and two digits (01 02, etc.) for the right-response. All additional questions continue to use two-digit right-response files, no06.htm, no07.htm, etc.

QUIZ FILE

Questions

```
<a name="06">06.</a> The energy of the sun comes  
from:
```

```

</ul>
<li><a href="no06.htm">a</a> fusion of H nuclei to
form He nuclei
<li><a href="no2.htm">b</a> fission of He nuclei to
form H nuclei
<li><a href="no3.htm">c</a> fission of U-238 nuclei
<li><a href="no4.htm">d</a> fission of U-235 nuclei
<li><a href="no5.htm">e</a> fusion of deuterium and
tritium nuclei
</ul>

```

The question starts with an HTML name. In this question, Question 06, the `` is the target of the right- response file for question #05. This is what brings the browser back to question 06 of the quiz.htm file when the student clicks at the return-to-quiz link of the right-response file for Question 05.

The five choices are coded as an unnumbered list. Response *a)*, the correct response in this case, is coded to take the student to the right-response file for this question, no06.htm; all others are coded for one of the five wrong-response files.

A typical quiz footer:

```

<hr>
<a name="51">= THE END =</a><br> You now have
the choice of:
<ul>
<li>returning to <a href="quiz.htm#01">Question #01</
a> to repeat the quiz, or
<li>returning to the <a href=" ../101hfile.htm">file exami-
nation menu</a><br>
</ul>
</body>
</html>

```

Following a hard rule `<hr>`, a section named "51" (for a 50- question examination) gives students the options of returning to Question 01 of the examination or returning to a menu of file examinations. This footer must be coded `` where nn is the number of the last question on the examination.

Every quiz file is named quiz.htm. Multiple quizzes are distinguished from each other by the names of their storage directories.

Link colors:

Placing the code `<body link="#228B22" vlink="#228B22">` early in the quiz file prevents the browser from changing the colors of the links as they are clicked. Thus good choices made by the first

student to take the quiz don't reveal the right answers to subsequent students (using the same computer) through color changes in links.

OTHER CONSIDERATIONS

The simplicity of HTML coding requires that every examination file, together with all its right- and wrong-response files, be placed in a unique directory on a server. The entire set of both right- and wrong-response files must be placed in every directory containing a quiz. This approach is demanding of server space, but that is a cost of its simplicity.

As with any other html document, graphics such as .gif or .jpg files can be inserted into the right- and wrong-response and quiz files. For rapid downloading via modems, I avoid graphic and other binary files except where graphics are integral parts of the questions.

Although beyond the scope of this discussion, the use of word- processor macros facilitates immensely the conversion of classroom examinations into these HTML quizzes. Anyone interested in copies of the macros I have written for use with my DOS-based, WordPerfect 5.1+ word processor may contact me. With these or other macros, the only time-consuming activity, other than proofreading, is identifying correct answers and entering the appropriate right-answer code by hand.

Finally, the HTML coding described here is effective with the currently available Netscape Communicator. While other browsers, or later versions of this browser, may require (or benefit from) different coding, the strategy described here should be generally and consistently useful.

Searching for Images on the World Wide Web
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pencehe@oneonta.edu

An important part of the success of presentation software is the use of appropriate images to reinforce and clarify the lecture. Many commercial textbooks now include CD-ROMs that provide images that may be used for lectures, but these are not

always appropriate. The web is an excellent alternative, since many web pages include images. Unfortunately, it can be a discouraging job to find the desired needle in the midst of the 800 million pages of the WWW haystack. There are, however, several resources that can make this searching easier and more likely to be successful.

When selecting images from the WWW, be sure to take copyright into consideration. Many sites include a statement of copyright policies. Be sure to read these notices before using any images. Some sites copyright all images (even if their right to do so may be questionable); other site owners explicitly state that none of the images are copyrighted and invite educational use.

Sites for General Purpose Images

Often it is possible to use general purpose images from the Web to illustrate chemical principles and to make the lecture more realistic. The Mugar Memorial Library, one of the Boston University Libraries (<http://www.bu.edu/library/instruction/webimages-x.htm>), has an excellent set of links to sites dealing with general purpose images. Paula Berinstein's directory of image sites is also very good. (<http://www.berinsteinresearch.com/fiolinks.htm>). Berinstein says that her directory of image sites is "not exhaustive," but it certainly comes close. Another extensive resource is the Digital Librarian site (<http://www.servtech.com/~mvail/images.html>) maintained by Margaret Vail Anderson, a librarian in Cortland, NY. Finally, the Berkeley Public Library supports the Librarians Index to the Internet (<http://sunsite.berkeley.edu/cgi-bin/searchindex>), another searchable listing of image-rich sites.

Special Sites for History of Science Images

The most efficient strategy is to look at sites devoted to science. For example, several web sites are dedicated to pictures of individual scientists. John L. Park, of ChemTeam, runs an on-line gallery of famous chemists at (<http://dbhs.wvusd.k12.ca.us/Gallery/GalleryMenu.html>). Harry Nelson's site (<http://charm.physics.ucsb.edu/people/hnn/physicists.html>) also has pictures of famous scientists (mainly physicists). In addition, Nelson includes excellent links to more image-rich sites. Another good source of pictures of famous scientists is the Niels Bohr Library of the Center for History of Physics at the American Institute of Physics (<http://www.aip.org/history/esva/>). The main focus here is twentieth century American physicists and astronomers, but many other images are also included. The Edgar Fahs Smith Memorial Collection at The University of Pennsylvania consists of

over 3,000 pictures of scientists, laboratories, and scientific apparatus, and a selection of these images is at (<http://www.library.upenn.edu/etext/smith/>). Search Engines

Search engines offer general search capabilities for information of interest on the Internet. Several search engines are dedicated only to finding images. These engines are usually for general purpose pictures, but often there are images that are appropriate for a chemistry lecture. A good first stop for any search is the web site maintained by Debbie Abilock of the Nueva Library. Debbie attempts to match the type of search with the best web resources and does a fine job. (<http://www.nueva.pvt.k12.ca.us/~debbie/library/research/adviceengine.html>).

Image Search Engines

Ditto.com (www.ditto.com) is an excellent search engine devoted only to images. This site, formerly called Arribavista, may be searched by key words, and returns thumbnail versions of each image. It currently lists approximately 1.5 million images and is expanding to over 2.5 million images. This search engine can be very effective when looking for general purpose images.

Proteus (<http://www.thrall.org/proimage.html>) is a meta search engine for images. The sites that are searchable include AltaVista Photo Finder, The Amazing Picture Machine, The Lycos Image Gallery, and Columbia University's WebSEEK. Besides giving the option of searching eight different on-line collections of images, there is also a good list of links to further image sites that must be searched individually.

The major photo collections searchable by Proteus, can also be searched individually. AltaVista Photo Finder (<http://image.altavista.com/cgi-bin/avncgi>) searches 17 million images, audio clips and video files from the web and private collections. The Amazing Picture Machine (<http://www.ncrtec.org/picture.htm>) is operated by The North Central Regional Technology in Education Consortium. The list of the types of pictures available does not include many specific science categories, but this site is sometimes useful. The Lycos Image Gallery (<http://www.lycos.com/picturethis/>), provides two options; search through more than 80,000 free images, current pictures and vintage illustrations on the Lycos Image Collection or search the entire web.

Columbia University's Webseek (<http://disney.ctr.columbia.edu/WebSEEK/>) does not appear to have many scientific images. The American Memory site (<http://memory.loc.gov/ammem/amhome.html>) is

a good place to look for historical U.S. Images. This web site allows a search of the Library of Congress Historical Collections, which includes a technology and applied sciences section.

General Search Engines

Most of the popular search engines allow the basic search to be modified by requiring that an image be present. Unfortunately, this is not always adequate. Some engines, like AltaVista, list only images and even give a thumbnail copy, but some other engines will list any page that has the keyword requested and any type of image, including banners, logos, etc. Often the latter approach does not limit the search sufficiently. Searching for the word for chemistry with the image option on, the result may be pages about chemistry that have images, but the images may not be very chemical. This is why the search engines that have gathered a searchable list of specific images are often a better bet for finding something useful.

Field Searching

Another way to find chemical images on web pages is to use field searching. Every Web page includes field information, which specifies date, title, type of page (i.e., image, video, audio, etc) etc. Limiting the search to a specific field can narrow the focus and eliminate many useless pages. For example, to search for images of robins, enter the following: Image: robin. i.e. (field type): keyword Of course, many robin images may have names like bird and so may not be found in this way. Field searching is usually the last recourse, but sometimes it is the only way to get the image that is needed.

Field searching can help to avoid copyright problems if the web images are found on U.S. Government sites. GovBot (<http://ciir2.cs.umass.edu/Govbot/>) will search only these sites. This engine, supported by The Center for Intelligent Information Retrieval (NSF sponsored), searches a database of over one million U.S. Government and military pages. Field searching is a little more complicated here (Be Sure to Read the Hints Link!), but it is possible to select images from this impressive collection. Unfortunately, this site does not provide thumbnail images for previewing.

Other Potentially Helpful Sites

As the name implies, Free Graphics (<http://www.freegraphics.com/>) offers links to "the top 508 graphic links on the Internet!" that may be used without charge. There is not much chemistry here, but the site is a good source of buttons, bullets, etc. It is another way to avoid copyright problems. The links to Create

Your Own Graphics (http://www.freegraphics.com/11_Online_Create_Your_Own/) can be helpful when designing banners, buttons, etc. for a web page.

The TechSmith site (<http://www.techsmith.com/>) lists several types of shareware software that may be of interest, including a program called Snagit. According to the description, Snagit "captures anything on the Windows desktop quickly and easily." A screen capture tool like this can be very helpful in some situations. An on-line version of this article with clickable links will be found at <http://snyoneab.oneonta.edu/~pencehe/imagesearch.html>.

ON-LINE CONFERENCE ON "TEACHING SPECTROSCOPY"

OCTOBER 31 TO DECEMBER 3, 1999

Scott Van Bramer

Department of Chemistry

Widener University, Chester, PA 19013

svanbram@science.widener.edu

<http://science.widener.edu/~svanbram>

The focus of the conference will be: Developments in spectroscopy and innovative strategies for teaching spectroscopy in the undergraduate curriculum.

Spectroscopy is used throughout the undergraduate chemistry curriculum and spectroscopic techniques are undergoing continual innovation. As a result, it is a challenge to decide what topics to teach and when to teach them. This conference will highlight recent developments in spectroscopy and introduce innovative teaching techniques. An additional goal of this conference is to generate discussion about teaching spectroscopy at all levels of the undergraduate curriculum.

This on-line conference will be held utilizing the World Wide Web for distribution of abstracts and papers.

The home page for the conference is: <http://www.ched-ccce.org/confchem/1999/d/>

Questions and discussion will occur using Majordomo. The final version of the material for discussion will be available three weeks before the start of the conference. There is no registration fee for this online conference. OnLine discussion will occur on the CONFCHEM Majordomo. To register, subscribe by sending the following text in the body of an email message to majordomo@CLARKSON.EDU.

SUBSCRIBE CONFCHEM your-name <your e-mail address>

An acknowledgment message will ask you to confirm your subscription. The acknowledgment message will contain more details as does the CONFCHEM instructions page.

The Conference schedule, list of speakers and titles of papers are presented below. Abstracts for each of the papers are presently available via the World Wide Web.

For additional information, contact
Session Chair:

Scott Van Bramer
Department of Chemistry
Widener University
Chester, PA 19013
svanbram@science.widener.edu
610/499-4516

For CONFCHEM Listserv problems contact
Donald Rosenthal
(rosen@clvm.clarkson.edu).
For problems with the CONFCHEM webpages
contact Brian Tissue (tissue@vt.edu).

SCHEDULE FOR FALL 1999 CONFCHEM "TEACHING SPECTROSCOPY"

October 1, 1999. Papers available online.

Week 1, October 31, 1999
Opening discussion.

Week 2, November 7

Sunday, Monday, Tuesday: Paper 1
"Teaching Infrared Spectroscopy in General
Chemistry Using Interactive
Animation" by Charles Abrams, Beloit College.

Wednesday, Thursday, Friday: Paper 2:
"Making Connections Between Spectroscopy
and General Chemistry. A Series of
Practical Exercises" by Walt Volland, Bellevue
Community College.

Week 3, November 14

Sunday, Monday, Tuesday: Paper 3
"Development and Student Use of Web-Based
Prelabs in Analytical Chemistry
Courses" by Mark R. Anderson and Brian M.

Tissue, Virginia Polytechnic
Institute and State University.

Wednesday, Thursday, Friday: Paper 4:
"Interactive Visualization of Infrared Spectral Data:
Synergy of Computation,
Visualization and Experiment for Learning Spectros-
copy" by Robert J. Lancashire, University of the
West Indies and Paul M. Lahti, University of
Massachusetts.

Week 4, November 21

Sunday, Monday, Tuesday: Paper 5
"The Spectroscopic Workstation: A Modular Approach
to Teaching Optical
Spectroscopy" by George R. Long and John C. Ford, I
Indiana University of Pennsylvania.

Wednesday, Thursday, Friday: Thanksgiving
Break

Week 5, November 28

Sunday, Monday, Tuesday: Paper 6
"Teaching Advanced Spectroscopy to Undergradu-
ates" Anton S. Wallner, Missouri Western State
College.

FALL 2001 CONFCHEM

ON-LINE TEACHING METHODS

Technological capabilities have advanced rapidly in recent years, enabling many new possibilities for teacher/student interactions. This conference will explore the latest in new internet methodologies to enhance the teaching of chemistry. Among the topics to be included in this conference are:

The latest in new techniques and methodologies for

transmittal of information between teacher and student, Peer learning techniques, Distance teaching methodologies, Differences between traditional teaching methodologies and on-line methods, and, Any other relevant topics

Proposals for paper presentations should be sent before

March 1, 2001 to:

Professor John H. Penn
Department of Chemistry
West Virginia University
Morgantown, WV 26506-6045
Email: Jpenn2@wvu.edu
Phone: 304-293-3435x4452
Fax: 304-293-4904
Home Page:
<http://www.chem.wvu.edu/jpenn>

SOME INFORMATION FOR PROSPECTIVE AUTHORS

Papers are expected to be the equivalent to at least ten typewritten pages in length.

April 1, 2001 - DEADLINE for receipt of titles and abstracts

July 1, 2001 - DEADLINE for receipt of final papers in HTML ASCII format.

Cathy Middlecamp <chmiddle@facstaff.wisc.edu>

Controversies, Courtesy of Nature

Starting in 1998, Nature, an international weekly journal of science, began offering "fully moderated, web-based discussions" that run for six weeks. This feature is called "Nature Debates" and utilizes the following guidelines:

- The debates target areas of current scientific controversy and aim for "broad intellectual appeal"
- The discussion is international, with contributors selected from around the globe.
- The essays are open to all, but only current subscribers to Nature may contribute to the discussion
- The organizers cite the value of "brevity". The contributed essays are short and the moderators publish only a representative set of reader responses and counter-responses.

The current debate began on September 9, 1999 with the topic of "Why are there so few women in science?" Previous topics have included: "Is the reliable prediction of individual earthquakes a realistic scientific goal?", "Is the fossil record adequate?" and "The benefits and risks of genetic modification in agriculture". If you haven't already seen the feature at Nature's web site (www.nature.com), you might want to check it out. Wherever possible, journals and articles are cited with a direct web link.

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