

The Coroner's Brunch: Discoveries Beyond the Originals

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WHAT THE UNIT SEEKS TO TEACH

The objective of my unit is to teach young boys and girls in America that science and technology is an important part of America's future.

Getting boys interested in reading and involved in the sciences is an additional goal of the chemistry research unit. However, the main focus is getting young girls interested in the sciences and, in particular, chemistry and biochemistry.

This unit is designed to teach the students, specifically girls, about the extent that women have played and can play in science and scientifically-related fields and, thereby, become, at least minimally, information literate about women and the role they play in science. The United States has been falling behind in the number of students choosing advanced sciences and choosing science as their field of specialization in our colleges and graduate schools.

The students and teachers will hopefully be sparked with curiosity that will turn into a burning passion for more science information that helps students develop into future scientists. Additionally, they might even do something worthwhile for mankind in the field of science, in particular chemistry and the subset of biochemistry. "The future belongs to those who believe in the beauty of their dreams," encouraged Eleanor Roosevelt. The unit will demonstrate that the science of chemistry and biochemistry is an integral part of our daily lives. They will find that discovery work is fun, exciting, and rewarding for our present and future. The students will become information literate, curious and, hopefully, capable young men and women in science for the benefit of all present and future generations.

WHY THIS UNIT IS IMPORTANT TO TEACH

A passion for the promotion of females in science and math with the teaching of research skills is the reason for developing this Chemistry Unit. Additionally, developing reading skills has also been a dominant factor and attraction in my teaching and parenting. According to the National Science Foundation, approximately sixteen percent fewer girls than boys reported talking to their parents about science and technology issues (*Women, Minorities, and People with Disabilities in Science and Engineering*).

As a middle school Librarian and a seasoned teacher with a strong interest in reading at all levels, it has always fascinated me how easily our children will engage themselves in something new. Both my graduate and career work takes me into school, university, and public libraries where our youth are searching for answers from the past, and, I hope, sparking a curiosity for the future. With these passionate interests, developing a unit that includes original research in the field of chemistry and other sciences will expand my aspirations as a woman, librarian, and teacher. The obvious impact on our future American scientists (specifically females) is a great concern for us all. Eighth-graders in five Asian countries that outperformed U.S. eighth-graders in mathematics in 2003 -- Chinese Taipei, Hong Kong SAR, Japan, Korea, and Singapore -- also

outperformed U.S. eighth-graders in science in 2003. Eighth-graders in Estonia and Hungary also performed better than U.S. students in mathematics and science.

Michael Kinsman quoted Newt Gingrich in the *San Diego Union-Tribune* on April 28, 2005, with Gingrich stating:

Every American should understand what a crisis this is. I don't understand why the failure of our country to educate its young people in math and science gets so little attention. This is a crucial issue for America, but we're just not responding with the urgency it deserves.

Kinsman reported that it is not often that a conservative like Newt Gingrich and a liberal like Robert Reich find themselves on the same side of an issue, but they do when it comes to the nation's commitment to science and math education. Gingrich also stated:

The Hart-Rudman Commission said that the greatest threat to America by 2025 was the detonation of a weapon of mass destruction. It said the second greatest threat was our country's failure to remain competitive in math and science.

The necessity to remain competitive must focus not just on the male student but also on the female:

For thousands of years the achievements of women, if not actively erased from human history, have been largely ignored. History was written almost exclusively by men about men – men's wars, men's accomplishments, and men's discoveries. But today, as women around the world are forging ahead in industry, politics, and the arts and sciences, it is more important than ever to look back at those who laid the groundwork for our current achievements. (Ashby and Ohrn, inside front jacket)

Craig Barrett, CEO of Intel Corporation, recently was quoted in *Business Week* that despite the calls for action spanning decades, "We still do a very, very poor job of educating our kids" in science and math. Compare high school graduates in the world's top 25 countries, he says, and "an American kid is, on average, near the bottom 10%" ("Meet the Best and Brightest").

David Bauer, recipient of the first place award from Intel Corporation, the Intel Science Talent Search (STS was sponsored by Westinghouse before 1998), stated in *Business Week*, that the United States should get females started early in their science education. He is sure that "female students would respond to the opportunity now so often hidden to them." He further states that:

During my four years of high school, a new set of young women has emerged. They stand on their own as equals to their male peers. They're just as bright and just as aggressive in class. Yet far fewer of them are interested in a scientific career. Why?

David Bauer sees three things that will help women get into the scientific arena. First, start teaching science to three and four year olds during their formative years; second, teach the scientific method of discovery in lower grade school classes when girls are more interested in science and math; and finally, show young women that science is a real option for them by using outreach programs for middle and high school girls.

Allowing students the time to investigate an area of interest with specific goals, a required amount of resources from designated areas under the general topic of science empowers them. For too long we have remained stagnant, taking the excitement and fun out of learning. It has become almost a forced 'chore'. We are losing some of our best teachers with boring, rote curriculum. Each year our parents are less involved, and they too almost have to be dressed in battle fatigues to accomplish the short, required homework battle.

Using library research creates a whole new beginning and meaning to the curriculum for everyone involved. Often it can be more time consuming and more involved, but the results are innovative, stimulating, and significant. Initially the research could be a daunting assignment without working with a partner, having specific directions, and collaborative planning. Involving the Science, Social Studies, and English teachers will provide a much more in-depth, meaningful, and relevant project.



This unit is focusing on Library Science Research. It is limited to one topic, but a collaboratively planned enriching subject with many topics. For example, the research could be in anthropology on early African American, Eslanda Robeson, who studied chemistry to find her heritage.

(Photo: Robeson, Eslanda. Discovering Collection.)



Or the research could be directed toward health issues like Sara Baker who saved thousands of babies with her health discoveries of sanitation and milk.

(Photo: Baker, Sara Josephine. Discovering Collection.)

Or the research could be on the environment investigating such famous environmentalists as Rachael Carson.

This is the exciting part of teaching. You are able to witness the discovery and development of new information while it is analyzed and used to question further pertinent information from the past to implement discoveries for the future. This provides a cross curriculum enrichment simultaneously supporting state standards while making it an exciting and authentic learning experience. It is reinventing the meaning of discovery and learning.

Attracting young females in the scientific fields during the middle school years will significantly make a difference in our American society. The unit will be initiated with an introduction of fascinating chemical discoveries of the nineteenth and twentieth century with colored overheads or via a power point presentation accompanied by appropriate music. An open discussion will lead into the unit syllabus. Through research, summarizing and the writing process, the students will investigate chemistry-related discoveries in three specific areas and begin choosing their areas of interest. Consider, for example, the questions: What percentage of doctors are women? What percentage of research scientists are women?

According to a National Science Foundation study *Women, Minorities, and Persons with Disabilities in Science and Engineering*, it is heartbreaking and exasperating that the ratio of men to women in the field of scientific research and development is almost seven to one, in management and administration, five to one, in computer applications, four to one and other categories, four to one. In the teaching profession the ratio is approximately one and a half to one. However, looking at professors, the ratio of men to women is almost nine to one.

Coming from a family of six females, you share attitudes, beliefs, and aspirations. You also hear the aggravations that surround experiences or the lack of having the experience or ability to comprehend and participate in science or science related activities and topics. It must be similar to the feeling a non-reader would have standing in a library, frightened and lonely, but terribly curious for the information and knowledge that is hidden within, but unable to excavate it.

I remember going to an all girl's school and only seniors were allowed to attend the neighboring all boys' school that had the equipment and teachers for the advanced sciences. I know that it will take years to eradicate this difference in the classroom, and it will take a while

longer to show an equal representation in the various scientific fields. However, the effort to eradicate the difference seems to be slowing down and not becoming a center point of focus. Has it fallen by the wayside? Is it no longer of interest? In conducting this research, I discovered that many of the Internet sites dealing with girls and science have been discontinued due to funding and other reasons.

Some of the research implies that the gender gap has contracted, but if you look at the current statistics and walk through hallways of various scientific institutions, you will see differently.

Previous studies during the “race to the moon” impacted our schools and education. We are now at a drastic turning point in America’s scientific education and our country’s future. Outsourcing of jobs has already affected both our economy and discouraged our young collegians. Additionally, the medical and educational fields in America are operating under an all time crisis. We continue to look for nurses, research scientists, professors in sciences, and classroom science teachers outside our own country. Our youth, and females in particular, need the exposure and the chance to relate the impact of science and chemistry to their daily lives. Females need relatively more attention than males, due to the existing state of females in the sciences and females in society. Our young women need mentors and role models from the scientific commercial and college sector. Our classrooms and libraries need to provide research, lectures, presentations, and field experiences to demonstrate the relevant significance of chemistry to their daily lives and the future. Making the unit exciting, stimulating, and attractive will include reading a selection of Science Fiction, watching chemistry related videos, visiting university facilities, conducting chemical experiments, and consulting with educators beyond the school facility. Chemistry is an immense topic requiring the unit to focus on three broad areas: Health, Beauty and the Environment.

TEACHING STRATEGY:

HOW THE TEACHER WILL CONVEY THE MATERIAL TO THE STUDENTS

Information will be conveyed to students through inspiring group discussions, held either in the library or the classroom. I have chosen to call these discussions “A Coroner’s Brunch.”

INTRODUCTION UNIT – PAST SCIENTISTS AND DISCOVERIES

The unit will initially start with an introduction to early breakthroughs in science in general and later on in chemistry and biochemistry, especially those dealing with female scientists. What is chemistry and biochemistry and how does it affect us in our daily lives? I will accomplish this by the use of PowerPoint presentations, video, and class discussions.

The students will initially research various scientists and their contributions, which must include at least five female scientists, by using electronic databases provided through the library, books in the library and the Internet. I will use this exercise to demonstrate to the children the past accomplishments of scientists, especially those of females, and the impact that they have had on civilization. From this lesson, I hope to inspire the children and get them excited about the field of science, that it is fun and exciting, that it would make an excellent career, and to show them the benefit that they could make to society and to their community.

TOPICS OF STUDY

The children will choose from three broad categories of chemistry/biochemistry to further research: beauty, health and the environment. They will keep in mind that their final objective is to propose or postulate a discovery for the future in one of the three categories. In order to look to the future, one must look to the past. We will start with brainstorming using graphic organizers to include such things as beauty, health and the environment.

I will ask the students, what areas are you interested in? What do you want to do when you grow up? What do you want to do with your life? What do you want to do for society, your community and the world at large?

BEAUTY PRODUCTS

Most young girls are interested in beauty and beauty products. I hope to get young girls interested in chemistry by tantalizing them with a subset of chemistry that they might identify with or find exciting. For example, I will get the students to list different types of beauty products, such as nail polish and polish remover. How about hair color and/or bleaching and streaking, what is mascara, how does artificial tanning work, how does sunscreen work, what is lipstick, what is eye shadow, what is foundation makeup, and what is mascara? What about soap, hair shampoo, conditioner, and body deodorant? What are perfume, cologne, and splash-on? What about skin conditioners and/or skin softeners?

What is the chemistry of these products? How are they made? How do they work? What are the benefits of the products? What are the risks of the products? Can you make a living inventing, making, marketing and selling these products? How do you stop other people from stealing your hard work and inventions? I will discuss the use of patents and trade secrets to convey to the students the importance of intellectual property, what it is, what it is used for, what it does and what it doesn't do.

HEALTH

Treatment Medicines

This section is almost endless and is, of course, of greater importance to mankind and to animals and plants for that matter. The first broad topic I will cover is medicine. I will interact with the students to get them to name various types and/or names of medicines. Cough medicine, antibiotics, allergy medicine, asthma medicine, pain medication—topical (stings, cuts, scrapes and bruises, and burning) and ingested (aspirin, Tylenol, Advil, etc.) and intravenously or otherwise administered (for operations)—medicine for various stomach ailments and for constipation and diarrhea, and medicine for glaucoma, to name just a few.

Preventive Medicines

What are the medicines used to treat tuberculosis, the measles, Diphtheria, polio, tetanus, malaria, small pox, and immunization shots used for? Are they chemicals or biochemicals that involve a subset of chemistry?

How are they made? What are they used for? What are the benefits? What are the side effects or downsides of their use? What are the various professions involved? Do you need science to work in these fields? Can you make a living and a career out of these professions? How do you stop other people from stealing your hard work and inventions? I will discuss the use of patents and trade secrets in a similar fashion.

Vitamins

What are vitamins? Are they chemicals or biochemicals? How are they made? What are they used for? What are the benefits? What are the side effects or downsides of their use?

Homeopathic versus Medicines versus Vitamins

What are the differences, similarities, the good and the bad of each? What is regulated and what is not? How and who will evaluate?

Genetics and Biochemistry

Genetics will of course focus on biochemistry, a subset of chemistry, introducing concepts such as genes, deoxyribonucleic acids (DNA), ribonucleic acids (RNA), proteins, and amino acids. Are these chemicals/biochemicals? What do they do? How are they made? Are they important and if so how are they important?

Environmental Chemistry

How is chemistry involved in environmental areas such as water, air and land pollution?

I will introduce at our first coroner's brunch the concepts of pH, (is it acidic or basic?), dissolved oxygen, nitrification, (conversion of ammonia and organic nitrogen to nitrate) denitrification (conversion of nitrate to nitrogen gas) for water. The students will be introduced to basic oxidation and reduction reactions, aerobic, facultative and anaerobic reactions. The vocabulary will be used on a word wall and in their cross-curriculum writing. We will discover and discuss how microorganisms degrade various organic contaminants in the water utilizing oxygen, and how carbon dioxide is emitted into the air. Note-taking will be one of the areas of concentration with this lesson with the vocabulary enrichment and Science Discovery.

As the causes and effects of air pollution are discussed and national ranking of our city is reviewed, we will discuss ozone pollution (smog): what it is, what causes it, and what it does. Although not pollution, I will also discuss photosynthesis and how carbon dioxide is converted to oxygen in the atmosphere as another biochemical process involving the air. Finally, I will discuss decomposition of matter and compost piles for biochemical reactions involving the land.

STUDENTS SELECT A TOPIC: BEAUTY, HEALTH, OR THE ENVIRONMENT

After the students have researched past scientists and have been introduced to the three main categories of study: Beauty, Health or the Environment, each child will choose the topic of interest. This topic will remain their focus for developing research, futuristic discovery, and a comic book story.

Every student and/or group, (girls will be encouraged to work in cooperative groups, as research has indicated that females learn better cooperatively). Each group will have its own journal divided into the four following sections. Each member will choose a specific section to lead. The leader will be in charge of recording the information in 'notes' and the resources used with that area.

- I. KWL (what I know, what I need to know, what I learn) section
- II. Vocabulary section
- III. Inventions associated with chemistry section
- IV. Wonders / futuristic inventions section.

The journals will be used throughout the unit for notes, wonders, and analysis of the four areas. Vocabulary will be defined by using the words in a sentence and asking a question. As with the current SAT, writing and using antonyms for the new vocabulary will be part of the lesson.

The students will perform several mini-searches on the topics following the Big 6 research model.

RESEARCH

The students will perform mini-searches using reference, non-fiction, interviews, and online databases. A minimum of three facts from each area will be required. The students will use note cards for each fact, including the bibliographic information on the back of each card. Using the note cards, the students will develop an outline for a minimum of a five-paragraph paper with a

bibliography page. The final product will include specifics from the collaboratively planned teachers' objectives in a PowerPoint format, paper, or originally designed product.

INTERACTIONS WITH THEIR SCIENCE TEACHERS

A science teacher will introduce the curriculum objectives for the year. The students will jot down a few areas of interest as originally directed for their KWL section of the journals.

The students will be directed to read the *New York Times* science, health and fitness section, and other periodicals found on district databases, and to listen to current scientific events to collect supporting information for their interest areas. One requirement for the reading is that it pertains to current scientific findings or events related to the topic. The choice will be approved by the science teacher for curriculum-related material. Using their chemical journals, the students will make daily entries in the appropriate sections of their journal and participate in 'poisons brunch' discussions. The student's final products will include a minimum of twenty-five slides of a PowerPoint presentation with a bibliography and a personal analysis of the topic. Each group or student will designate an original representative for the readings.

RELATING TO MENTORS

After another coroner's poisonous brunch, when we review our questions and procedures, the students will take a fieldtrip to one of the local universities to learn more about their area of interest and participate in one of their lab experiments. Working with scientists in the fields will effectively demonstrate the application and significance of experimentation and the sciences. It will also increase the general knowledge of the students and bring excitement to the field of science.

In preparation to visiting the university labs as well as the collaborative planning with the school science teachers, we will go through an introductory safety lesson on proper safety techniques and procedures in a laboratory environment.

It is envisioned that three university representatives will speak to the students on each of the three subject areas; 20 minutes on environmental chemistry, 20 minutes on biochemistry (DNA and medicines) and 20 minutes on the chemistry in beauty, i.e. cosmetics, etc. Biographical studies and scientific discoveries will be included with the visit related to the presentations given by the professors. Unfortunately these professors most likely will be male according to the data I found.

Alternatively or additionally the students will correspond with an appropriate mentor about their area of interest. NASA Quest, for example, profiles leading women scientists and can be accessed at <http://quest.arc.nasa.gov/women/WON.html>. What is the hot topic for today? Where is research heading in the future? What tools do I need to develop to succeed in this area in the future?

Alternatively or additionally I will arrange for successful female scientists to visit the school as part of a career awareness segment. I will have a very successful dentist, nurse and entrepreneur in the medical field, a chemist and a doctor visit to show females what type of a career they can look forward to in the scientific field and how chemistry and biochemistry are valuable tools for achieving that goal.

The students will compile their newfound information, integrating the new information with their previous research. Based on the combined information, the students will do further research on the area that interests them utilizing the tools mentioned above. They will use this information to theorize or fantasize a new discovery for the future.

WEBPAGE

The students will cooperatively develop a web page reflective of the three areas developed in the unit, with links that include the highlights of their research and that expound upon their fantasies for the future. The WebPages will be housed on the school library's section of the school computer server. Under each category there will be links for old discoveries including who discovered them, current discoveries and who discovered them, and fantasies for the future. There will be a special section emphasizing women scientists. There will be a section on why science is important for America.

PICTURE BOOK OR GRAPHIC NOVEL

Either individually, or as partners (females), they will create a minimum of a five-page picture book or graphic novel explaining what chemistry is and what it holds for the future. They will use vocabulary associated with the phase of chemistry that they researched earlier.

Students will be encouraged to ask high level questions that stimulate and require research and discussions such as: Are bacteria and biochemical reactions our friend or enemy? What developments from the past and present are needed to solve possible problems for our future? How could we restore polluted waters so that they are fishable and swimmable? Do scientists think it is likely that genetic engineering will result in new medical solutions? What were some of the previous breakthroughs in chemistry and biochemistry under these topics and how did they occur? What have been the effects of these chemical developments? What is needed for a healthy tomorrow?

Following literature and writing elements, the researchers will "imagine" other possible discoveries that could be developed. The students will imagine and develop possible new fascinating compounds and new uses and combinations of these compounds. Using chemistry and the different molecular structures, the researchers will plan possible further exploration and discovery in their chosen area. This could also take the format of a science fiction picture book.

FINAL PRESENTATION

Finally, the students will list possible careers in chemistry, both now and in the future, that are appealing. The random survey I conducted regarding prospective studies in science at the high school and university level substantiated my readings and thoughts. Females often take the easier route. Time is the most damaging for most girls. Their choices are for more social activities. This is where I ask at our coroner's brunch, "How can we make science activities and studies more appealing for you? Which format is the one that you will spend more time on? Where would you be more inclined to participate?" The students will answer these questions when they present their final discoveries and predictions for the future in their science class with a representative product, charts and graphs, power points and demonstrations.

LESSON PLANS

Lesson Plan 1: The Changing Face of Science

See the lesson plan *The Changing Face of Science: The Contributions of Women to Science and Mathematics Past and Present*, written by Martha C. Phelps-Borrowman. It can be accessed at the following website: <http://teachertech.rice.edu/Participants/mborrow/Lessons/femalsci.html>.

This lesson involves researching and charting women scientists: their names, nationalities, birth and death dates, fields of science or mathematics, and contributions.

Lesson Plan 2

Research and Writing on One of the Three Topics Using the Big 6 Skills

Background needed: The Big 6 Skills is a six-step process that helps students or researchers seek or apply information in order to solve a problem or to do research. It was developed by Mike Eisenberg and Robert Berkowitz.

Objectives:

1. The student will conduct research on one of the three topics, beauty, health or the environment, using The Big 6 Skills.
2. The student will locate information from print resources, district online databases, and the Internet.
3. A minimum of three facts from each area will be used.
4. The student will prepare notes on note cards.
5. The student will cite their sources using MLA on the back of each card
6. Using the note cards, the students will develop an outline with a minimum of 5 paragraphs.
7. The student will type their paper with a bibliography.

Materials:

1. Access to print resources (reference and nonfiction) in the library.
2. Access to OPAC, district online databases, and the Internet in the library.
3. Access to word processing program in the library.
4. Note cards

Procedures:

After a classroom discussion on the topics of chemistry and biochemistry involving beauty, health and the environment, the children will be asked to choose an area of concentration from one of the three areas.

Students will take notes on notecards.

Discussion of The Big 6 Skills.

1. Task Definition
2. Information Seeking Strategies
3. Location and access
4. Use of information
5. Synthesize
6. Evaluation

Students need a review on MLA for citing sources in a bibliography.

Students will write their paper with a bibliography.

Lesson 3

Creating a Graphic Novel

Background needed:

Basic computer literacy

Objectives:

Develop a characterization and setting, possibly a super hero that will discover a new and important discovery in chemistry and biochemistry.

Materials:

1. A computer
2. *Kreative Komix Super Hero Comic Book Maker*, CD ROM
3. District databases
4. *Science and Technology Breakthroughs* or *The Biographical Dictionary of Women in Science*

Procedures:

After classroom discussions on the involvement of women in sciences and the topics of chemistry and biochemistry, the students will choose an area of concentration.

1. The students will follow the Big 6 steps to make discoveries of interest related to beauty, health or the environment.
2. The students will contrive a substantive discovery, "invention," for one of the three areas or write a biography of a science heroine in comic book format using the CDROM, *Kreative Komix Comic Book Maker*. The benefit to society will be explained in at least five slides with a minimum of six paragraphs using the chosen speech bubbles and the story pages. A previous or futuristic discovery will be presented as a heroine character in science fiction format. English, Reading, Science, and Social Studies teachers will collaboratively plan objectives to implement with the final product.

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<http://teachertech.rice.edu/Participants/mborrow/Lessons/femalsci.html>
This website contains excellent lesson plans on the contributions of women to science and mathematics. Lessons can be used freely if attributed to Ms. Phelps-Borrowman.
- Profiles – Women of NASA*. NASA Quest. <http://quest.arc.nasa.gov/women/WON.html>
This website includes profiles of women astronomers, geologists, astrobiologists, engineers, and additional science fields.

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Uretsky, Arnie. *Kreative Komix Super Hero Comic Book Maker*. Visions Technology in Education, 2001. CD-ROM. This program covers single-page graphic writing programs to comic book publishing programs.

Women, Minorities, and People with Disabilities in Science and Engineering. National Science Foundation. November 1994. <http://www.nsf.gov/statistics/wmpdse94/>

Supplemental Resources

Teacher Resources

Chemistry (A 9 part series). Per. The Standard Deviants. Cerebellum, 2004.

A series of movies that are lesson based learning supplements that will capture the student’s attention and make the lecture come alive.

Lerner, Lee K., and Brenda Wilmoth Lerner, ed. *World of Genetics*. New York: Gale Group, 2002.

Volume two of a two volume set containing eight hundred entries which provide information on a variety of topics related to genetics, including biographies of the pioneers of genetics, examinations of current research, and explanations of key terms and concepts.

Newton, David E., and Lawrence W. Baker, ed. *Chemical Elements*. Detroit: UXL Gale, 1999.

The individual chemical elements are explained in a discovery timeline. Photographs of people and places make this book and the explanations of the chemical elements manageable. This book is an excellent resource for everyone, especially beginning chemists.

Pedersen, Ted, and Francis Moss. *Make Your Own Web Page!* New York: Scholastic INC., 1998.

Explains how to set up your own website, including guidelines for basic planning and design, help on writing HTML and creating hypertext links, and tips on adding graphics. IBM and Macintosh compatible instructions.

Secret of Photo 51. Dir. Garry Glassman. Perf. Sigourney Weaver. NOVA, 2003.

The untold story behind the discovery of DNA’s double helix. Rosalind Franklin was never credited with her part in the discovery of DNA’s double helix; whereas, James Watson and Francis Crick were credited with the discovery.

Valian, Virginia. *Why So Slow? The Advancement of Women*. Massachusetts: MIT Press, 1998.

This excellent book tries to explain how humans categorize and perceive women. An excellent social science read about the fundamental questions of equality.

The Internet

Advocating Women – Why Should Women be Encouraged to Pursue Science

<http://www.sciam.com/article.cfm?articleID=0003941F-C583-1CE1-8583809EC5880000>

The 50 Most Important Women in Science (Discover Magazine, November 2002)

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Information about Women in Science and Their Careers

<http://www.sciencecareersweb.net.PSU2DE/WomenInScience.htm>

Why Science Must Adapt to Women (Discover Magazine, November 2002)

http://www.discover.com/nov_02/gthere.html?article=featadapt.html

Student Resources

Camp, Carole Ann. *American Women of Science*. Berkeley Heights, New Jersey: Enslow Publishers, Inc., 2001.

A simple collective biographical resource of American women in science. It talks about the obstacles from society and their cultures, gives web sites, and has photos.

Hillstrom, Kevin and Laurie Hillstrom. *Biography Today Environmental Leaders 2*. Detroit: Ominographics, 2000.

Web sites, pictures, and short concise career highlights with quotes make this an easy and favorite resource for students.

The Grolier Library of Science Biographies. Danbury, Connecticut: Grolier Educational, 1997.

This is a ten volume collection of scientists from around the world with photos and additional resources.

Ogilvie, Marilyn and Harvey, Joy. *The Biographical Dictionary of Women in Science Volume 1 and 2.* New York: Routledge, 2000.

Another excellent source for study of science and women. It is extensive in that it details their struggles and successes.

Proffitt, Pamela. *Notable Women Scientists.* Detroit: Gale Group, 1999.

This resource is an alphabetical listing of the 485 women from around the world who have made contributed to science by discoveries, first achievements, and involvement of influences in education and organizations.