

November 17, 2006



Dear Librarian,

Percy Julian was one of the most accomplished scientists of the 20th century. His innovative research helped unlock the secret chemistry of plants and find treatments for the crippling effects of diseases like glaucoma and arthritis. Across the world today, millions of people still benefit from steroid medications based on the work Julian pioneered.

Although significant, these achievements shine even brighter in light of the daunting series of lifelong racial obstacles Julian had to overcome to achieve international stature and become director of a major industrial research laboratory, a successful entrepreneur, and prominent human rights advocate. On February 6, 2007, NOVA's *Forgotten Genius* uncovers the life and work of this remarkable and tenacious man who achieved success against tremendous odds.

With generous support from the National Science Foundation, we've produced this library resource kit to accompany the program. The kit, which has been reviewed by a national advisory board of public librarians, has been designed for libraries of all sizes and visitors of all ages. Use the display sheets to illuminate the contributions of scientists of color to our lives and times, or to explore the science of chemistry; conduct the activities to help children gain the sense of wonder Julian felt about the "natural laboratories" of plants; and engage visitors with handouts that offer doorways into Percy Julian's life and the science that excited him.

We hope you will use this library kit to create programming that helps your community gain insight into Percy Julian's life and how his science changed our world. We would love to hear how this kit works for you; please send your comments to [NOVA\\_librarykits@wgbh.org](mailto:NOVA_librarykits@wgbh.org). Your feedback will help ensure that future projects like this one are interesting and useful to all librarians.

A handwritten signature in black ink that reads "Paula S. Apsell". The signature is fluid and cursive.

Paula S. Apsell  
NOVA Executive Producer

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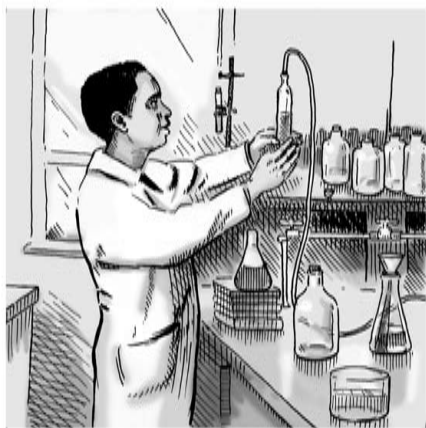
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# Using This Library Resource Kit

Welcome to NOVA's *Forgotten Genius Library Resource Kit*. This kit accompanies NOVA's two-hour program about Percy Julian, the trailblazing scientist who overcame racial discrimination to emerge as one of the most influential scientists of the 20th century. *Forgotten Genius* airs February 6, 2007, at 8 pm. (Check local listings as dates and times may vary.) We hope you will use this kit to create displays, conduct science and social studies activities, create library programs, and plan community events to help engage your audiences in the excitement and discovery of science and social studies.



## Copy Our Handouts!

Please feel free to copy any of the handouts in this kit. We have designed them to be reproducible. Find downloadable PDF color versions of all the pages in this kit at [www.pbs.org/nova/julian](http://www.pbs.org/nova/julian)

## CONTENTS

### Who Was Percy Julian?

Use this handout to help your patrons discover more about the life of Percy Julian.

### Program Ideas and Tips

Find ideas to help you incorporate NOVA's *Forgotten Genius* into your event and program schedule and tips for how you can partner with organizations to interest your audiences in Percy Julian, other scientists and notable African Americans, and the fight for equality. This section includes:

- Programs and Events
- Activities Using Library Resources
- Library Display Ideas

### Bibliography

Use the resources listed in the Bibliography to create displays and activities, or to help patrons learn more about Julian. The Bibliography includes resources for:

- Percy Julian's Life and Work
- Breakthroughs in Chemistry
- Civil Rights Milestones
- Scientists of Color

### Percy Julian Activities

Use these science and social studies activities with programs you host at your library or copy them to distribute to patrons.

### Social Studies Activities

- Who Am I? (ages 9 and older)
- Find Percy Julian (ages 10 and older)
- The Innovators Gallery (ages 12 and older)
- Answer Sheet for "Who Am I?" and "Find Percy Julian"

### Science Activities

- Ready, Set, Sort! (ages 4 and older)
- Soggy Science, Shaken Beans (ages 5 and older)
- Seeing Is Believing (ages 7 and older)
- Unmix It Up (ages 8 and older)
- Changing States (ages 12 and older)
- Percy Julian and His Work (coloring sheet) (ages 3 and older)

### Display Sheets

Use the following display sheets to create or supplement an exhibit on Julian.

- Natural vs. Synthetic
- Plant Medicines
- Chemistry and Stuff around Us
- I'm a Chemist
- African American Scientists

## Online Science Lesson

### [pbs.org/nova/teachers](http://pbs.org/nova/teachers)

Provide local teachers with a classroom activity that explores chemistry. The activity will be available in January 2007 on the NOVA Teachers site, listed in the section "Teacher's Guide by Program Title" under *Forgotten Genius*. For grades 6–8 and 9–12. Available in html and PDF formats.

## Percy Julian's Life

- 1899** Born in Montgomery, Alabama on April 11.
- 1920** Graduates first in his class from DePauw University with a bachelor's degree in chemistry.
- 1923** Earns master's degree in chemistry from Harvard University.
- 1928** Heads chemistry department at Howard University.
- 1931** Awarded Ph.D. from the University of Vienna, where he begins his work with plant compounds.
- 1932** Returns to teach at DePauw University.
- 1935** Succeeds in producing synthetic physostigmine, which leads to a glaucoma drug. Marries Anna Johnson, the first African American woman to earn a Ph.D. in sociology in the U.S.
- 1936** Begins working at the Glidden Company.
- 1939** Succeeds in producing progesterone on an industrial scale.
- 1940** Son Percy Jr. is born.
- 1942** Extracts a soybean protein that leads to the development of a fire-retardant foam that saves thousands of soldiers' lives in World War II.
- 1944** Daughter Faith is born.
- 1947** Receives the Spingarn Medal from the National Association for the Advancement of Colored People.
- 1949** Synthesizes Compound S, a major ingredient in low-cost cortisone.
- 1950** Named Chicagoan of the Year.
- 1951** Moves to Oak Park, Illinois, where his family's home is firebombed.
- 1953** Founds Julian Laboratories.
- 1961** Sells the company for \$2.3 million.
- 1960s and 1970s** Works with civil rights groups to fight discrimination.
- 1973** Elected to the National Academy of Sciences.
- 1975** Dies on April 19.
- 1993** U.S. Postal Service issues stamp in his honor.



## Tune In

Percy Julian overcame racial discrimination to emerge as one of the most influential scientists of the 20th century. Find out more in NOVA's *Forgotten Genius*. The two-hour program premieres on PBS February 6, 2007. (Check local listings.) Visit the companion Web site at [www.pbs.org/nova/julian](http://www.pbs.org/nova/julian)

## Who Was Percy Julian?

Dr. Percy Lavon Julian was a trailblazing chemist whose discoveries improved and saved countless lives. The grandson of slaves, Julian grew up at a time when African Americans faced extraordinary obstacles. Yet Julian refused to let racism prevent him from becoming one of the most influential scientists of the 20th century, as well as a leader in business and civil rights.



Julian was born in Montgomery, Alabama, on April 11, 1899. He attended a segregated elementary school. And, because Montgomery had no public high school for African Americans, he was forced to attend a teacher training school.

In 1916, Julian entered DePauw University, a largely white liberal arts school in Indiana. Despite the many struggles Julian faced, he not only earned a bachelor's degree in chemistry, he graduated Phi Beta Kappa and first in his class.

Julian was the first African American to earn a master's degree in chemistry from Harvard University. Julian eventually became head of the chemistry department at Howard University, a leading African American institution. Determined to continue his education, Julian enrolled in the University of Vienna, where he earned a Ph.D. in chemistry—the fourth African American to achieve this distinction. It was in Vienna that he began his lifelong inquiry into the chemistry of plants.

Returning to DePauw University, Julian became an expert in synthesis, the process of turning one substance into another through planned chemical reactions. In 1935, Julian and Josef Píkl synthesized physostigmine—still used to treat glaucoma—found in Calabar beans. The American Chemical Society later recognized their work as a National Chemical Landmark—one of the top 25 accomplishments in American chemical history. Despite this achievement, DePauw refused to appoint Julian to a permanent faculty position.

Discrimination led Julian from academia to business. For over 18 years, his highly successful research for the Glidden Company uncovered new uses for chemicals from soybeans. Julian's work was not only enormously profitable, but it helped relieve human suffering across the globe. He extracted a soy protein used in fire-fighting foam, which saved thousands of lives during World War II. His process for isolating steroids from soybean oil led to the manufacture of synthetic hormones. He also played a key role in making synthetic cortisone affordable to millions of arthritis sufferers.

In 1953, Julian established Julian Laboratories to produce synthetic steroids. He became a millionaire when he sold it in 1961. By the 1970s, Julian was widely recognized as an innovator who made medicines more affordable. For his contributions to humanity and civil rights, Julian received 18 honorary degrees and more than a dozen civic and scientific awards; he was the second African American elected to the National Academy of Sciences and the first chemist.

Percy Julian died of liver cancer in 1975, at the age of 76.

For a more expanded version of Percy Julian's biography, go to: [www.pbs.org/nova/julian](http://www.pbs.org/nova/julian)

# Program Ideas and Tips



“What marvelous laboratories plants are. You can’t imagine the joy it’s given me to work with the natural laboratories over the years.”

—Percy Julian



## General Tips

- Contact the outreach coordinator at your local PBS affiliate to help plan and promote your events.
- Offer materials on your library Web site. Link to online downloadable versions of the handouts included in this kit. Augment these resources with a calendar of events and programs or related books.
- Create and distribute posters and fliers announcing your event or program.
- Send event information to media outlets, such as newspapers, science center and club newsletters, and local radio and television stations. Supply the information to community, city, and school Web sites in your area.

## PROGRAMS AND EVENTS

### ADULTS

- **Invite a guest speaker to deliver a lecture or slide show.** Topics to consider include Percy Julian’s life and work; breakthroughs in chemistry and the resulting impact on society; contributions of scientists of color and/or female scientists; discrimination in education, housing, sports, science, or other arenas and the ways in which activists have challenged such bigotry; and life during the Jim Crow era in the South, the North, and in your community. Contact a local university for presenters. Distribute copies of the “Who Was Percy Julian?” handout, if applicable.
- **Show videos about famous scientists and/or civil rights leaders.** After each, have a facilitator lead a follow-up discussion to explore the person’s life and work, the impact of the scientific innovations, or ongoing challenges to achieving full equality.

### YOUNG ADULTS

- **Hold a science essay contest.** Invite young adults to submit essays of up to 500 words on “How have scientific advances improved your life?” Work with a local science teacher to develop judging criteria. Award prizes and see if your local newspapers will publish the winning entry. Display the essays in the library.
- **Sponsor a “What Do Chemists Do?” program.** Ask a local teacher to bring in chemistry equipment (vials, beakers, burners, etc.) for display. Talk about scientific method and related books and resources in the library. Do the “Changing States” science activity provided in this kit. Make it a multi-week program: add the “Seeing Is Believing” activity and science activities in this kit or from the resources in the Bibliography.
- **Host a Jeopardy-style game.** Work with representatives from a local university’s chemistry and history departments to create questions highlighting scientific advances made by Percy Julian, scientists from other fields, and civil rights activists. Award small prizes.

### CHILDREN

- **Organize a storytime, video presentation, or Family Science Fun Night.** Present an age-appropriate book or video about a famous scientist or civil rights leader (see the Bibliography for suggestions). Then do some of the fun science activities in this kit.
- **Conduct a science activity.** Use an age-appropriate activity from this kit to introduce children to some of the scientific advances made by Percy Julian. Recruit high school students or science club members to help.
- **Create a picture board.** Read a book on Percy Julian or another notable scientist of color, have children work in groups to create a series of drawings or a mural illustrating the person’s life. (Younger children can color the “Percy Julian and His Work” coloring sheet in this kit.) Display the artwork.
- **Sponsor a scavenger hunt.** Use the “Find Percy Julian” handout to introduce families to Percy Julian’s life and work. Award small prizes for each completed scavenger hunt.



“The story I will tell you tonight is a story of wonder and amazement, almost a story of miracles. It is the story of laughter and tears. It is a story of human beings, therefore, a story of meanness, of stupidity, of kindness and nobility.”

—Percy Julian



### Contest Incentives

Think about offering incentives for contests and other events. Incentives might include tickets to a local museum or science center, books or videos on Percy Julian or related topics, math games or manipulatives, construction toys, or science project supplies. Contact local retailers such as hobby and craft stores, toy stores, and bookstores for possible donations.

## ACTIVITIES USING LIBRARY RESOURCES

### ADULTS

- **Arrange a rare book room tour.** Arrange a guided tour for patrons of texts and artifacts related to science or civil rights.
- **Create bookmarks.** Create a series of reproducible bookmarks to highlight your library’s resources on scientists of color and/or civil rights activists. Type your resource information on the bookmarks, copy, and distribute.
- **Highlight original documents.** Plan a discussion about advances in science or the struggle for equal rights. Use copies of primary and secondary source materials related to the topic, then provide guidance on how and where patrons can locate these materials in the library. Resources to highlight include online databases, newspapers, journals, and reference works.

### YOUNG ADULTS

- **Sponsor a song-writing contest.** Have young adults research a local or national civil rights leader and create a song—rap, ballad, rock—about that person. Host a public performance of the winning songs at the library.
- **Hold an innovators gallery competition.** Prepare a list of call numbers or keyword search terms related to innovators in science, civil rights, and other areas. Ask young adults to complete “The Innovators Gallery” handout, explaining that the stamp designs and profiles they create will be entered into a contest. Display their creations on a bulletin board and invite patrons to vote for their choice of top innovator. Award a prize for the winning profile(s).

### CHILDREN

- **Create resource posters or bookmarks.** Identify the location of resources in the children’s area related to civil rights and its leaders, notable scientists, and the importance of science in our daily lives. Then have children create and hang posters or bookmarks to mark the locations.
- **Play the “Who Am I?” game.** Distribute the “Who Am I?” handout, which asks kids to match each profile to the corresponding scientist.
- **Host a word hunt.** Give children a list of science terms commonly used in chemistry (such as *experiment*, *laboratory*, *data*, and *chemical*) or associated with the Civil Rights movement (such as *Jim Crow*, *segregation*, *discrimination*, and *nonviolence*). Ask them to use library resources to find the meaning of each term. Provide a small prize to each child who completes the task.
- **Make molecules.** Show some images of molecules to children, then provide marshmallows, wooden craft sticks, and other materials for them to construct their own unique molecules.



“For the first time in my life,  
I represent a creating, alive,  
and wide-awake chemist.”  
—Percy Julian



## LIBRARY DISPLAY IDEAS

### PERCY JULIAN'S LIFE AND WORK

- **Books and videos on Percy Julian.** Display one or more photographs of Percy Julian (also the poster in this kit), selected books and videos (see the Bibliography for suggestions), and some of the activity handouts and display sheets in this kit.

### Display Tips

- Use copies of the Bibliography, activities, and display sheets provided in this kit to enhance your displays.
- When creating display titles, use a few short words in large type size along with alliterative phrases to grab patrons' attention (for example, “Contributions to Chemistry” or “Julian's Genius”).
- Use fabric instead of paper for bulletin board backgrounds—it lasts longer and is easy to reuse.
- Cover tables with cloth or plastic tablecloths. Place one or more small boxes or stands on a table to create risers. Highlight one book or display item on each riser to create an appealing table display.
- To create a poster-size picture for display, photocopy a copyright-free image on a transparency, then use an overhead projector to magnify it onto a large piece of paper taped to a wall. Trace the outline of the image and then color it in to make the poster. You may want to laminate or cover it with clear contact paper.
- Borrow beakers, test tubes, and other science equipment from a local school or university to enhance the display.

### BREAKTHROUGHS IN CHEMISTRY

- **Chemistry's benefits.** Create a wall or table display highlighting inventions or discoveries by chemists. Some chemists to consider include Rosalind Franklin (DNA), Leo Baekeland (plastic), Marie Curie (radium), and Percy Julian (plant chemistry). Include selected books and videos about chemistry, and display sheets from this kit.
- **Science activities.** Showcase one of the science activities in this kit along with selected books. Have copies of the activity handout available for distribution.
- **Science fair projects.** Display selected science fair projects created by students. You might want to display a series of projects so that students at different schools in your area can see their work highlighted. Contact local science curriculum coordinators and homeschool groups for referrals.
- **A new generation of scientists.** Invite local colleges and universities to contribute materials (such as academic and extracurricular program information, career information, etc.) for a display on opportunities for students to study science in your city or state. (You may want to use the “I'm a Chemist” display sheet.)

### CIVIL RIGHTS MILESTONES

- **The long road to equality.** Select and display titles and resources based on a theme, such as young people and the Civil Rights movement, pivotal court cases, or the history of school desegregation in the United States.
- **Local civil rights events and activists.** Create a display on local events with historical significance and heroes. You might want to weave these events into a national civil rights time line (see books and resources under “Civil Rights Milestones” in the Bibliography, including Civil Rights: A Chronology at [www.civilrights.org/library/permanent\\_collection/resources/crchron.html](http://www.civilrights.org/library/permanent_collection/resources/crchron.html))

### PIONEERING SCIENTISTS OF COLOR

- **Scientists who made a difference.** Create a wall or table book display highlighting scientists of color. Use the enclosed “African American Scientists” display sheet and books in the Bibliography for other scientists. Consider featuring scientists from your area.
- **Did You Know?** Create a display featuring artifacts from the work of scientists of color that answer the question “Did You Know?” Artifacts can include pictures of their inventions or the actual invention (e.g., empty pill bottle). See the “Who Am I?” handout, the “African American Scientists” display sheet, and the Bibliography for suggested scientists.

# Bibliography

This bibliography contains resources about Percy Julian, breakthroughs in chemistry, the Jim Crow era and milestones in the Civil Rights movement, and notable scientists of color.

“Every penny my father could scrape together went into building a wonderful library for his children. For the public library was closed to us. My father created, in my imagination, brave new worlds to conquer.”

—Percy Julian



## PERCY JULIAN'S LIFE AND WORK

### Books

#### Black Pioneers of Science and Invention

by Louis Haber.

Harcourt, Odyssey Classics, 1992.

*Chronicles the lives of 14 African Americans, including Percy Julian, Benjamin Banneker, and George Washington Carver, who made significant contributions to science and industry.* (C) (YA)

#### Distinguished African American Scientists of the 20th Century

by James Kessler et al.

Oryx Press, 1996.

*Profiles 100 African American scientists and mathematicians.* (YA)

#### Great Black Heroes: Five Brilliant Scientists

by Lynda Jones and Ron Garrett (illustrator).

Scholastic, Cartwheel Books, 2000.

*Describes the early lives and key achievements of Percy Julian and four other scientists.* (C)

#### Outward Dreams: Black Inventors and Their Inventions

by Jim Haskins.

Walker, 1991.

*Presents biographical profiles of Percy Julian and other notable African American inventors.* (C) (YA)

#### The Hidden Contributors: Black Scientists and Inventors in America

by Aaron E. Klein.

Doubleday, 1971.

*Provides an overview of the achievements of African American inventors, including Percy Julian.*

(YA) (A)

### Biographical Sketches

“Percy L. Julian’s Fight for His Life,” *Ebony*, March 1975

“The House that Joyce Built,” *Fortune*, May 1949

“The Man Who Wouldn’t Give Up,” *Reader’s Digest*, August 1946

### Videos & DVDs

#### NOVA: Forgotten Genius

*Portrays the life of Percy Julian—chemist, humanist, and business leader.*

(YA) (A)

#### Tracing the Path: African American Contributions to Chemistry in the Life Sciences

American Chemical Society, 1994.

*Examines scientific contributions to the field of chemistry by precolonial Africans, African Americans during the 1800s and 1900s, and contemporary African Americans.* (Available at many public libraries.) (YA)



### Key

- (C) = Children
- (YA) = Young Adult
- (A) = Adult



“The only thing that enabled me to keep doing the creative work was the constant determination: Take heart! Go farther on!”  
—Percy Julian



### Web Sites

NOVA: Forgotten Genius  
[www.pbs.org/nova/julian](http://www.pbs.org/nova/julian)

*Companion Web site to the documentary Forgotten Genius includes articles, interviews, interactive activities, teacher lesson plans, and other resources relating to Percy Julian.*

(YA) (A)

African American History Vignette—Percy Julian

[http://faculty.washington.edu/qtaylor/aa\\_Vignettes/julian\\_percy.htm](http://faculty.washington.edu/qtaylor/aa_Vignettes/julian_percy.htm)

*Presents a summary of Percy Julian's life, along with profiles of numerous other prominent figures in African American history. Also contains a comprehensive listing of Web sites on African American history.* (YA) (A)

National Academy of Sciences, Biographical Memoirs—Percy Lavon Julian

[www.nap.edu/html/biomems/pjulian.html](http://www.nap.edu/html/biomems/pjulian.html)

*Provides a sketch of Julian, including an impressive listing of the awards and honors he garnered during his lifetime, as well as a bibliography of his scientific writings.* (A)

People and Discoveries, Percy Julian

[www.pbs.org/wgbh/aso/databank/entries/bmjuli.html](http://www.pbs.org/wgbh/aso/databank/entries/bmjuli.html)

*Discusses the life of Percy Julian.* (YA) (A)

Percy Lavon Julian: Life and Legacy

[www.chem.temple.edu/main/faculty/williams/percy%20Lavon%20Julian%201.htm](http://www.chem.temple.edu/main/faculty/williams/percy%20Lavon%20Julian%201.htm)

*Highlights Percy Julian's life and work.*

(YA) (A)

Portrait Gallery: Percy Julian

[www.lewiston.k12.me.us/~lewschdept/projects/gallery/pjulian.htm](http://www.lewiston.k12.me.us/~lewschdept/projects/gallery/pjulian.htm)

*Describes Julian's life and achievements for young readers.* (C)

Science Alive! The Life and Science of Percy Julian

[www.chemheritage.org/scialive/julian](http://www.chemheritage.org/scialive/julian)

*The Chemical Heritage Foundation offers a comprehensive and interactive examination of Julian's life and career, with rich material on his childhood, college years, scientific discoveries, and civil rights work. Includes illuminating pictures, activities, readings, a time line, and a comprehensive teacher's guide.* (YA) (A)

## BREAKTHROUGHS IN CHEMISTRY

### Books

**190 Ready-to-Use Activities that Make Science Fun**

by George Watson.

Jossey-Bass, 2003.

*Offers chemistry activities related to atoms and elements for students of varying ability levels.* (YA) (A)

**A to Z of Chemists**

by Elizabeth H. Oakes.

Facts on File, 2002.

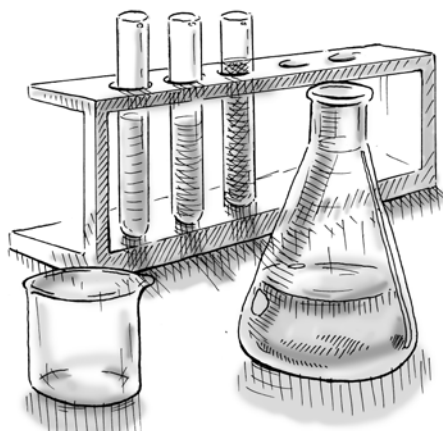
*Tells the stories of 150 historical and contemporary chemists.* (YA) (A)

**Chemical Achievers: The Human Face of the Chemical Sciences**

by Mary Ellen Bowden.

Chemical Heritage Foundation, 1997.

*Provides teachers with photos and biographies of 80 chemists, many of whom are people of color.* (A)



“It was this little accidental discovery—the kind that characterizes the development of science so often—that led to a practical method for the isolation of steroids from soybean oil.”  
—Percy Julian



### **Chemistry Connections: The Chemical Basis of Everyday Phenomena**

by Kerry K. Karukstis and Gerald R. Van Hecke.  
Elsevier Science & Technology, 2003.  
*Presents a broad range of explanations of chemical processes.* (YA) (A)

### **The Joy of Chemistry: The Amazing Science of Familiar Things**

by Cathy Cobb.  
Prometheus Books, 2005.  
*Includes science and history, and connects chemistry to the real world.* (YA) (A)

### **The Magic School Bus Gets Baked in a Cake: A Book about Kitchen Chemistry**

by Joanna Cole.  
Scholastic, 1995.  
*Uses kitchen-based experiments to introduce children to the principles of chemistry.* (C)

### **Videos & DVDs**

#### **People Who Took Chemistry, That's Who!**

American Chemical Society, 1998.  
*Introduces high school students to the chemistry involved in our everyday lives by showing how recyclable soda bottles, compact discs, and antiperspirants are produced.* (YA)

#### **Squibs Disc 5—In Matter: Atoms, Elements, & Chemistry**

Ignite! Learning, 2005.  
*Uses animation to introduce young people to key concepts in chemistry, including the periodic table and chemical reactions.* (C)

### **Web Sites**

Chemistry Fun & Humor  
<http://chemistry.about.com/od/chemistryfunhumor>

*Takes a humorous look at chemistry.*  
(YA) (A)

Chemistry.org: Educators & Students  
[www.chemistry.org/portal/a/c/s/1/educatorsandstudents.html](http://www.chemistry.org/portal/a/c/s/1/educatorsandstudents.html)

*Features an extensive array of activities, readings, and resources for educators and students from kindergarten through college.* (C) (YA) (A)

General Chemistry Online!  
<http://antoine.frostburg.edu/chem/senese/101/index.shtml>

*Provides a thorough overview of chemistry basics in an accessible format.* (YA) (A)

NOVA Teachers  
[www.pbs.org/wgbh/nova/teachers/resources/subj\\_02\\_05.html](http://www.pbs.org/wgbh/nova/teachers/resources/subj_02_05.html)

*Lists NOVA sites that include chemistry topics and related lessons.* (YA) (A)

## **CIVIL RIGHTS MILESTONES**

### **Books**

#### **At Canaan's Edge: America in the King Years, 1965–68**

by Taylor Branch.  
Simon & Schuster, 2006.  
*Chronicles Martin Luther King Jr.'s life and work.* (YA) (A)

#### **Pillar of Fire: America in the King Years 1963–65**

by Taylor Branch.  
Simon & Schuster, 2006.  
*Looks at America during the King years.* (YA) (A)

"In much of my life I've had to pick up the broken fragments of chance and turn them into opportunity."

—Percy Julian



### Parting the Waters: America in the King Years 1954–63

by Taylor Branch.  
Simon & Schuster, 2006.

*Presents a Pulitzer Prize-winning account of the Civil Rights movement, with a focus on the emergence of Martin Luther King Jr. as a national leader.*

(YA) (A)

### The Civil Rights Movement for Kids: A History with 21 Activities

by Mary C. Truck.  
Chicago Review Press, 2000.

*Introduces children to the historic movement for equality in the U.S.* (C)

### The Strange Career of Jim Crow

by C. Vann Woodward.  
Oxford University Press, 1974.

*Traces the history of racial segregation in the U.S.* (A)

### Videos & DVDs

#### Eyes on the Prize

Blackside, 1987 and 1990.

*Immerses viewers in the events, triumphs, and tragedies of ordinary people who fought for civil rights in the U.S. Consists of 14 hour-long documentaries.* (YA) (A)

#### Martin Luther King, Jr.—Great Americans for Children Series

Schlessinger Media, 2003.

*Profiles King's life and achievements.* (C)

#### The Rise and Fall of Jim Crow

PBS Video, 2002.

*Four-part series that chronicles the history of racial segregation in the South and North.* (YA) (A)

### Web Sites

Civil Rights: A Chronology  
[www.civilrights.org/library/permanent\\_collection/resources/crchron.html](http://www.civilrights.org/library/permanent_collection/resources/crchron.html)

*Provides a chronology of the Civil Rights movement.* (YA) (A)

KIDS Report: Civil Rights  
[www.madison.k12.wi.us/tnl/detectives/kids/KIDS-000314.html](http://www.madison.k12.wi.us/tnl/detectives/kids/KIDS-000314.html)

*Created by kids for kids, this site contains an extensive collection of annotated links to civil rights resources online.* (C) (YA)

The History of Jim Crow

[www.jimcrowhistory.org/](http://www.jimcrowhistory.org/)

*Examines racial segregation and offers multiple teaching resources to accompany the four-part PBS series on Jim Crow.* (A)

### SCIENTISTS OF COLOR

#### Books

##### Asian-American Scientists

by Lisa Yount.

Facts on File, 1998.

*Profiles 12 Asian American scientists who have made important contributions to science.* (C) (YA)

##### Black Stars: African American Women Scientists and Inventors

by Otha Richard Sullivan.

Wiley, Jossey-Bass, 2001.

*Describes the lives of 30 little-known African American women who made contributions to our culture over the last 300 years.* (C)

##### Created Equal: The Lives and Ideas of Black American Innovators

by James Brodie.

HarperCollins, Quill Books, 1994.

*Documents the lives of more than 60 African American inventors, from slavery to the present.* (YA) (A)

Julian's family strived for educational excellence and achievement. Two of his brothers became doctors, and three of his sisters earned master's degrees.



**George Washington Carver:  
Scientist and Inventor**

by Barbara Kramer.  
Enslow Publishers, 2002.

*Profiles the agriculturist and public speaker who started life as a slave.* (C)

**Lost Talent: The Underparticipation of Women, Minorities, and Disabled Persons in Science**

by Jeannie Oaks.  
Rand, 1990.

*Reports on opportunities for, and participation of, women, people of color, and disabled persons in the sciences.* (A)

**Videos & DVDs**

**Breakthrough: The Changing Face of Science in America**

PBS Video, 1996.

*Chronicles the scientific contributions made by people of color.* (YA) (A)

**From Dreams to Reality: A Tribute to Minority Inventors**

U.S. Patent and Trademark Office,  
1986.

*Highlights the myriad achievements of people of color to American science, technology, and medicine.* (YA) (A)

**Inventing the Future: African American Contributions to Scientific Discovery and Invention**

American Chemical Society, 1994.

*Profiles selected African Americans who have contributed to scientific discovery in the United States from colonial days to the present.* (C) (YA) (A)

**Web Sites**

A Conversation with Neil deGrasse Tyson

[www.pbs.org/wgbh/nova/origins/tyson.html](http://www.pbs.org/wgbh/nova/origins/tyson.html)

*Includes an interview with Dr. Tyson in which he discusses discoveries in origins research.* (YA) (A)

African American Heritage Sites for Kids

[www.chipublib.org/003cpl/afroamj.html](http://www.chipublib.org/003cpl/afroamj.html)

*Provides numerous links to sites covering African American history, art, science, and culture.* (C) (YA) (A)

Biography Project

[www.sacnas.org/biography/](http://www.sacnas.org/biography/)

*Presents profiles of Chicano/Latino and Native American scientists, mathematicians, and engineers.* (YA) (A)

Profile: James McLurkin

[www.pbs.org/wgbh/nova/sciencenow/3204/03.html](http://www.pbs.org/wgbh/nova/sciencenow/3204/03.html)

*Profiles James McLurkin, a designer of robot swarms, or robot groups, that work together to perform a task.* (YA) (A)

Society for Advancement of Chicanos and Native Americans in Science Biography Project

<http://64.171.10.183/biography/default.asp>

*Features biographies of Chicano/Latino and Native American scientists; a resource for K–12 educators.* (A)

# Who Am I?

Ages 9 and older.

Many important scientists are unfamiliar to us, even though their achievements are amazing. In this activity, you will learn about several lesser-known scientists of color who have made major contributions to their fields. Working on your own or with a partner, use resources at your library—books, encyclopedias, or the Internet—to match three of the names on the list below to their descriptions. Then see if you can answer the question about each scientist. (Your librarian has the answer sheet.)

## SCIENTISTS

- St. Elmo Brady
- Shirley Ann Jackson
- Mario Molina
- Mae Jemison
- Percy Julian
- Ellen Ochoa

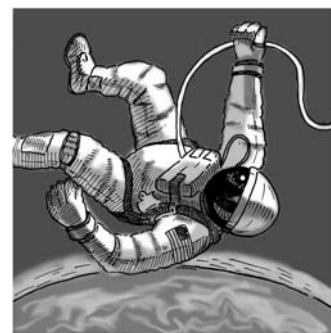


I was born in Alabama, and I went to a segregated elementary school. Though some people tried to prevent me from becoming a scientist, I followed my dream and eventually earned an advanced degree in chemistry. My research led to a drug that helped millions of people suffering from arthritis. For many years, I did research on one particular plant and discovered ways to use parts of this plant to help make paint, a soy-based coating for paper, and foam for fire extinguishers. What was the plant that I focused on in my research?

**Scientist 3:** \_\_\_\_\_

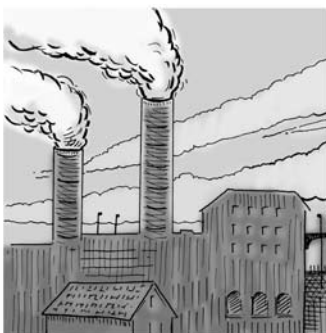
**Answer to Question:** \_\_\_\_\_

I was the first woman of color sent into space. After studying chemical engineering in college, I became a doctor. On the space shuttle, I conducted many experiments in space. In 1994, I started a science camp called The Earth We Share, for kids ages 12 to 16. It brings young people together “to come up with solutions to real-world global dilemmas.” What was the name the space shuttle I traveled in and what year was it?



**Scientist 1:** \_\_\_\_\_

**Answer to Question:** \_\_\_\_\_



I was born in Mexico City, which is one of the most polluted cities in the world. I became a chemist and have spent a lot of time studying the ways that chemicals affect the environment. My work focuses on the impact that chemicals have on the ozone layer, which protects the Earth from harmful radiation. In 1995, I won a major international prize for my research. What was this prize?

**Scientist 2:** \_\_\_\_\_

**Answer to Question:** \_\_\_\_\_

## LEARNING MORE

### Black Pioneers of Science and Invention

by Louis Haber.

Harcourt, Odyssey Classics, 1992.

*Chronicles the lives of 14 African Americans, including Percy Julian, Benjamin Banneker, and George Washington Carver, who made significant contributions to science and industry.*

Celebrating Black History and the Accomplishments of African-American Women Scientists

[www.chemistry.org/portal/a/c/s/1/feature\\_acs.html?id=c373e901dc6f113b8f6a17245d830100](http://www.chemistry.org/portal/a/c/s/1/feature_acs.html?id=c373e901dc6f113b8f6a17245d830100)

*Profiles an African American astronaut, a meteorologist, and an inventor.*

# Find Percy Julian

Ages 10 and older.

This scavenger hunt is made up of questions about the pioneering chemist Percy Julian. To answer these questions, you'll need to use library resources (books, magazines, reference materials, and the Internet). There is no time limit; working by yourself, with a partner, or with members of your family, take as long as you need to track down responses to each set of questions. When you're done, ask your librarian to check your answers. There's a small prize for a completed questionnaire. Enjoy the search!

## 1. Percy Julian's Childhood

- In what city did Julian live as a boy? \_\_\_\_\_
- When was he born?  
\_\_\_\_\_
- What are the names of his parents? \_\_\_\_\_ and \_\_\_\_\_

## 2. Percy Julian's Education

- What university did Julian get his bachelor's degree from?  
\_\_\_\_\_
- What university did Julian get his master's degree from?  
\_\_\_\_\_
- In what city did he earn his Ph.D.?  
\_\_\_\_\_

## 3. Scientific Breakthroughs

- Julian discovered a soy protein which was used to create a fire-fighting substance during World War II. What was the name of that substance?  
\_\_\_\_\_

- Julian found a way to synthesize (make in the lab) a chemical found in soybeans. This chemical (Compound S) was the basis for a synthetic version of a drug used to treat millions of arthritis sufferers. What is the name of this drug?  
\_\_\_\_\_

- What civic honor was bestowed upon Julian in 1950?  
\_\_\_\_\_

## 4. Standing for Justice

- How did Julian respond when racists firebombed his family's house in Oak Park, Illinois?  
\_\_\_\_\_
- What civil rights group gave Julian a major award in 1947?  
\_\_\_\_\_
- In what year did the U.S. Postal Service issue a stamp in honor of Julian?  
\_\_\_\_\_

## 5. Scientists of Color Today

Percy Julian paved the way for countless other people of color to enter the sciences. Locate a biography of another scientist of color and skim the introduction. Scientist's name:  
\_\_\_\_\_

What is the focus of this scientist's work?  
\_\_\_\_\_  
\_\_\_\_\_

## 6. Which library resources did you use to find your information?

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## LEARNING MORE

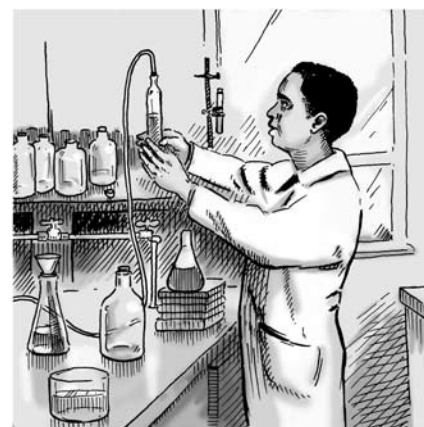
### Great Black Heroes: Five Brilliant Scientists

by Lynda Jones and Ron Garnett (illustrator).  
Scholastic, Cartwheel Books, 2000.  
*Describes the early lives and key achievements of Percy Julian and four other scientists.*

Science Alive! The Life and Science of Percy Julian

[www.chemheritage.org/scialive/julian](http://www.chemheritage.org/scialive/julian)

*Offers a comprehensive and interactive look at Julian's life and career, with rich material on his childhood, college years, scientific discoveries, and civil rights work. Includes illuminating pictures, activities, readings, a time line, and a comprehensive teacher's guide.*



# The Innovators Gallery

Ages 12 and older.



In 1993, the U.S. Postal Service issued a stamp in Percy Julian’s honor. What other pioneers or innovators deserve to be featured on a stamp? Do some research and come up with a suggestion of your own, or choose an innovator from the list on this page. Once you’ve made your choice, conduct research at your library to learn more about this person. Then use the space below, design your stamp, and write a short essay on why your subject deserves to be commemorated. Your entry will be displayed in “The Innovators Gallery” at the library so that library patrons can vote to determine which proposed stamp(s) is the most popular in your community. So put your artistic ability to work!

## INNOVATORS

- St. Elmo Brady
- Amelia Earhart
- Jane Goodall
- Meredith Gourdine
- Mae Jemison
- Sabrina Kay
- Lewis Latimer
- Antonia Novello
- Ellen Ochoa
- Rosa Parks
- Chief Red Cloud
- Jackie Robinson
- Tamara Ulibarri
- Jerry Yang (engineer)

**My Innovator’s Name:**

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## LEARNING MORE

**Dear Mrs. Parks: A Dialogue with Today’s Youth**

by Rosa Parks and Gregory J. Reed.  
Lee & Low Books, 1997.

*Includes questions to Mrs. Parks from young people and her responses.*

Biography Project

[www.sacnas.org/biography/](http://www.sacnas.org/biography/)

*Presents profiles of Chicano/Latino and Native American scientists, mathematicians, and engineers.*




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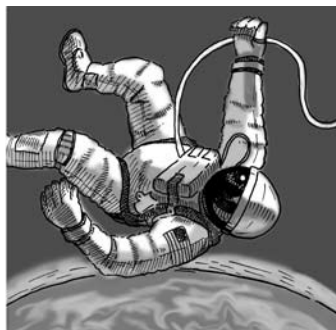
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Learn about some of the other scientists who have been featured on stamps at:

[www.usps.com/communications/news/stamps/2005/sr05\\_024.htm](http://www.usps.com/communications/news/stamps/2005/sr05_024.htm)

# Answer Sheet

## WHO AM I? ACTIVITY



**Scientist 1:** Mae Jemison; the space shuttle Endeavour was launched in 1992.



**Scientist 3:** Percy Julian; the plant that Dr. Julian focused on was the soybean.



**Scientist 2:** Mario Molina; Dr. Molina received the Nobel Prize in Chemistry.

## FIND PERCY JULIAN ACTIVITY

### 1. Percy Julian's Childhood

- a. Montgomery
- b. April 11, 1899
- c. James and Elizabeth

### 2. Percy Julian's Education

- a. DePauw University
- b. Harvard University
- c. Vienna

### 3. Scientific Breakthroughs

- a. Aer-o-foam
- b. cortisone
- c. Chicagoan of the Year

### 4. Standing for Justice

- a. He refused to move from Oak Park or to be intimidated.
- b. National Association for the Advancement of Colored People
- c. 1993

### 5. Scientists of Color Today

Answers will vary.

### 6. Which library resources did you use to find your information?

Resources will vary.

## Soybeans

Today, 3 billion bushels of soybeans are grown each year in the United States. Soy products are used in virtually every American industry, from medicine to plastics.





# Ready, Set, Sort!

Ages 4 and older.

Have you ever picked your favorite colors from a bag of jelly beans? If you did, you were separating the jelly beans by color or by the flavor you like most. A scientist named Percy Julian separated parts of seeds to get what he needed to make medicines and other products.

## YOU WILL NEED

- bag of mixed beans (pinto, kidney, black, lima or any 4 types of beans that look different from each other)
- sheet of white paper

## WHAT TO DO

1. Gently pour your beans onto the sheet of paper.
2. Look at your beans. Are they all the same? Are some different from others?
3. Think of different ways to sort (separate) the beans (for example, by color, size, what else?).
4. Separate your beans based on your rule. Don't tell others your rule.
5. Take turns guessing each other's separating rule.
6. Were the rules all the same? Why do you think some rules were different? *(Often a group of objects that are different from each other can be separated in many ways. Beans can be separated by color, size, and shape.)*

## LEARNING MORE

### Science Play

by Jill Frankel Hauser and Michael P. Kline (illustrator).  
Williamson Publishing, 1998.  
*Contains a variety of science activities for children two to six years old.*

### Super Science Concoctions: 50 Mysterious Mixtures for Fabulous Fun

by Jill Frankel Hauser and Michael P. Kline (illustrator).  
Williamson Publishing, 1997.  
*Includes science experiments that introduce chemistry to young children.*

Chem.Org/Kids

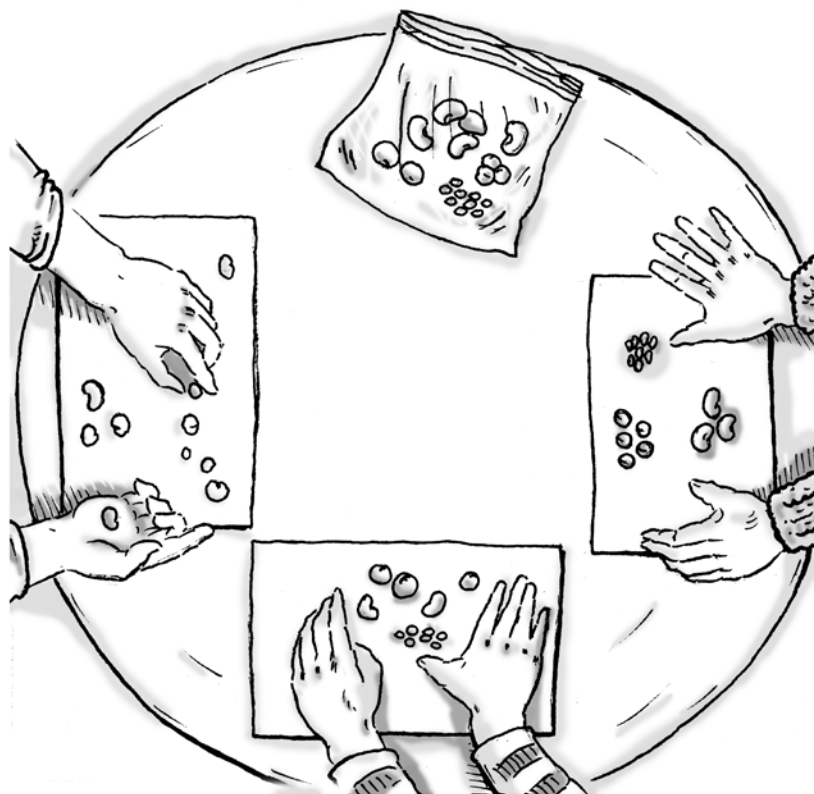
[www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=kids/index.html](http://www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=kids/index.html)

*Features chemistry activities for young children.*

Curious George

[pbskids.org/curiousgeorge/parentsteachers/activities/disc\\_guide.html](http://pbskids.org/curiousgeorge/parentsteachers/activities/disc_guide.html)

*Includes a grouping activity called Sort It Out.*



## Percy Julian and Separation

Percy Julian was a chemist, and separating materials is an important part of chemistry. Julian separated out some of the parts that make up soybeans. These parts were then used to make medicines and other products, such as foam to put out fires.



# Soggy Science, Shaken Beans

Ages 5 and older.

Have you ever heard of soy sauce, soy milk, or tofu? Soybeans are plants used to make these foods. Soybeans can be many different colors (black, brown, gray, and yellow). Soybeans are nutritious, so people and some animals use them as food. They are even used to make some kinds of crayons. Percy Julian used soybeans to make medicines, special paints, and other items. In this activity, you will observe and learn about soybeans, then make a shaker that has soybeans inside.

## YOU WILL NEED

- 1/2 cup dry soybeans soaked overnight in water (purchase at Asian markets)
- about 25 dry soybeans (in one of the 3-oz cups)
- empty paper towel or toilet paper cardboard tube
- two 3-oz paper cups
- magnifying glass
- masking tape
- crayons or markers
- optional: string, feathers, and glue for decorating shaker

## Percy Julian and Soybeans

Percy Julian was a teacher and a scientist. As a scientist, he separated chemicals from soybeans that were eventually used to make many things such as medicines, foam to put out fires, paper coatings, and paints.

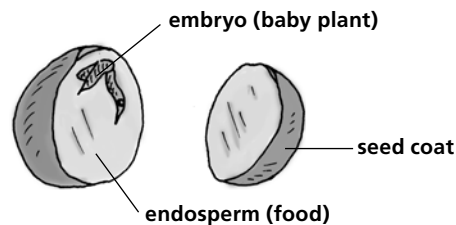


## WHAT TO DO

### Part 1

Use a magnifying glass.

1. Look closely at the dry soybeans. What do they look like? What color are they? What do they feel like? Are they all the same size?
2. Next, look at a soybean that has been soaked in water for 2 or 3 days. How has the water changed the soybean? Peel the covering. This is the seed coat. Why do you think it is called a coat? Why do you think the bean has a coat?
3. Use your fingers to pry open the soybean to see the inside of it (an adult may have to help you). What color is the inside? What does it look like? What does it feel like? Do you see something that looks like a baby plant?



### Part 2

1. Make soybeans shakers.
  - Draw colorful designs or patterns on the tube.
  - Place the bottom of a cup into one end of the tube (see picture).
  - Tape the cup to the tube.
  - Gently pour the dry soybeans into the tube.
  - Hold the tube so that the open end faces up and the soybeans stay inside the tube.
  - Place the bottom of the second cup into the open end of the tube, and tape this cup to the tube.
2. Shake away!

## LEARNING MORE

### Field of Beans

by Soni Ware.  
Berry Books, 1999.

*Describes various uses for soybeans and includes an activity.*

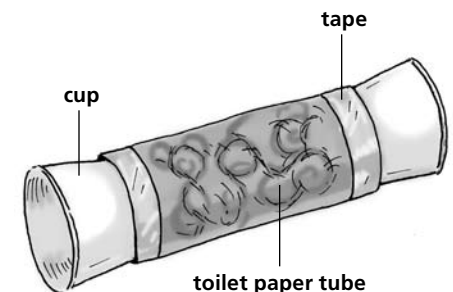
### One Bean

by Anne Rockwell and Megan Halsey (Illustrator).  
Walker, 1998.

*Describes how a bean sprouts and includes three bean activities.*

North Carolina Soybean Producers Association—Connections for Kids  
<http://www.ncsoy.org/kids.htm>

*Explains the history of soybeans and how soybeans are grown, used, and processed. Includes a word search, soybean quiz, and science experiments.*



# Seeing Is Believing

Ages 7 and older.

Have you ever walked in the dark and bumped into something? Some people have an eye disease called glaucoma that causes them to see only straight ahead. They can't see what most people see out of the corners of their eyes, so it's sometimes difficult not to bump into things. In this activity, you will learn about how people with glaucoma see. Percy Julian helped make an eye medicine for people with glaucoma.

## YOU WILL NEED

- two 3-oz opaque paper cups for each person
- sharpened pencil

**Note:** Only one pair of partners should be in motion at a time.

## WHAT TO DO

1. Find a partner. Read all of the directions before you begin.
2. Turn your cups upside down. Use your pencil to poke a hole in the middle of the bottom of each of the cups. Put the pencil all the way through the hole and pull it out the other side (see illustration).



3. Decide who will place the cups over his or her eyes first. Without wearing the cups, walk with your partner around the table and back to your seat.
4. Now, hold both cups up to your eyes, placing the rim of the cups around your eyes, so that you can see only through the holes in the cups. With your partner as a guide, carefully walk around the table and back to your seat.



5. Switch roles so your partner does steps #3 and #4 above.

## Questions:

- What was it like wearing the cups over your eyes?
- What was different about seeing only through the center hole in the cups and not seeing out of the corner of your eyes?
- What sort of activities might be more difficult for you to do if you couldn't see out of the corner of your eyes?
- What did you do while wearing the cups to keep from bumping into things?
- Some people with glaucoma can see well after taking the eye medicine Percy Julian helped to discover. How might their lives change because of the eye medicine?

**Extension:** Try walking around the table with only one eye covered by the cup. Does it look or feel different?  
*Note: This activity can be adapted for younger kids using adults as the helper.*

## LEARNING MORE

### Great Black Heroes: Five Brilliant Scientists

by Linda Jones and Ron Garnett (Illustrator).  
Scholastic, Cartwheel Books, 2000.  
*Presents the life and work of Percy Lavon Julian, George Washington Carver, Ernest Everett Just, Shirley Ann Jackson, and Susan McKinley Stewart.*

### The Magic School Bus Explores the Senses

by Joanna Cole and Bruce Degen.  
Scholastic, 2001.  
*Allows children to explore the senses by traveling in a school bus through an eye and ear.*

Neuroscience for Kids: The Eye  
<http://staff.washington.edu/chudler/bigeye.html>  
*Explains vision and has a diagram of the eye as well as a crossword puzzle and related games.*

## Percy Julian and the Eye



Percy Julian became a chemistry professor and a research scientist. He succeeded in synthesizing a drug named physostigmine (fie so STIG meen), which is used to treat glaucoma, a disease that can lead to blindness.

# Unmix It Up

Ages 8 and older.

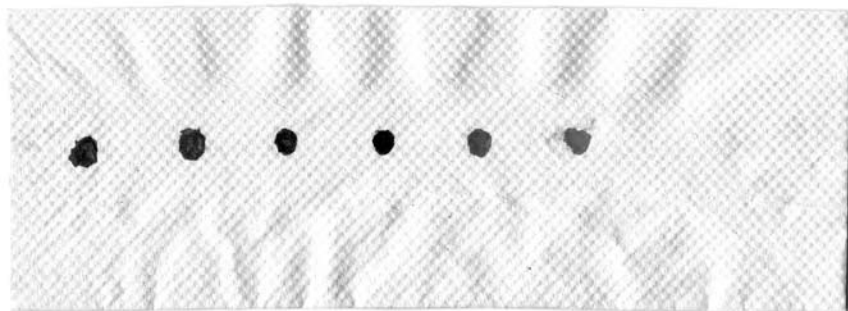
Have you ever mixed different colors together to make a new color? Chromatography (a technique for separating complex mixtures) can be used to separate colors that have been combined to make a single color. In this activity, you will separate the colors in marker ink.

## YOU WILL NEED

- white paper towel
- washable or water-based colored markers (two or more brands; pretested, if possible, to make sure the ink will separate in some of the inks)
- water
- eye dropper or pipette
- newspaper or plastic (to absorb excess water)

## WHAT TO DO

1. Cover your work area with newspaper to keep the area dry.
2. Make a large dot on the paper towel with one of the markers. Keep the marker on the towel for several seconds to make sure your dot has a lot of ink.
3. Repeat on the same paper towel with different-colored markers (same brand) until you have 5 to 10 dots in a line on the paper towel (see picture below).



4. Add drops of water to the towel near, but not on, the line of the dots. Add one drop at a time and give the water time to slowly spread through the towel. Do not add too much water.
5. Observe what happens to your dots after 10 minutes. Notice that different colors form when different inks run into one another.
  - What colors came out of different inks?
  - How many inks separated into different colors? Which ones?
  - Why do you think some colors did not separate out?
  - Which ink had the most colors?
  - How do you know some of the marker inks were made from more than one color of dye?
  - Which marker color surprised you the most in terms of the number of dyes used to make it?
  - What did you learn about separating mixtures?

**Extensions:** Make a design with dots of ink clustered around the middle of the paper towel. Then add water to the middle of the design and watch what happens. Try different brands of markers. Compare to see if all brands use the same color combinations and which produces the most combinations.

## Percy Julian and Chromatography

Percy Julian used chromatography to separate molecules that were used to make medicines and other products. He taught his chemistry students how to set up and carry out chromatography experiments.



## LEARNING MORE

### Chemistry for Every Kid: 101 Easy Experiments that Really Work

by Janice Pratt VanCleave. Wiley, 1989.

*Includes chemistry experiments for children in grades 3–8.*

### Janice VanCleave's 201 Awesome, Magical, Bizarre, & Incredible Experiments

by Janice Pratt VanCleave. Wiley, 1994.

*Includes chemistry, biology, earth science, astronomy, and physics activities to be carried out with parents, guardians, or teachers.*

American Library Association  
Great Web Sites for Kids: Chemistry & Physics

**[www.ala.org/gwstemplate.cfm?section=greatwebsites&template=/cfapps/gws/displaysection.cfm&sec=29](http://www.ala.org/gwstemplate.cfm?section=greatwebsites&template=/cfapps/gws/displaysection.cfm&sec=29)**

*Includes chemistry links for ages pre-K through adult.*

# Changing States

Ages 12 and older.

Percy Julian was a professor and a chemist. He practiced chemistry and helped make many different medicines and household products. Chemistry is sometimes called the science of change—chemists watch how materials interact with each other, and they observe how molecules change with heat or mixing. In this activity, you will observe changes in the materials that are mixed.

## YOU WILL NEED

- 1 resealable sandwich bag
- 1 tsp baking soda
- 2 tbsp vinegar
- 1 plastic bottle cap
- 8-oz paper cup
- safety goggles


## Percy Julian, Chemist

Percy Julian earned his Ph.D. in chemistry from the University of Vienna in Austria in 1931. He worked in chemistry laboratories and was a careful observer of change in the materials he used. For example, he saw changes in soybean oil when water leaked into a tank. This observation helped him discover an inexpensive process for making the hormone progesterone.



## WHAT TO DO

Ask an adult to help you with this activity.

1. Read all the instructions first. If possible, work with a partner to make it easier to handle the materials.
  2. Put on your safety goggles.
  3. Open the sandwich bag. Place it in the cup and fold the open end of the bag over the top of the cup. Pour the vinegar into the bag.
  4. Put the baking soda in the bottle cap. Set it aside.
  5. Take the bag out of the cup, being careful not to spill the vinegar. Feel the bottom of the bag and note the temperature of the vinegar.
- 
6. Use one hand to place and hold the bottle cap (and baking soda) inside the bag. Without dropping any baking soda into the vinegar, hold the bag against your body and use the other hand to carefully remove the air from the bag. Seal the bag.
  7. Drop the bottle cap into the vinegar. Gently move the bag to mix the baking soda and vinegar.
  8. Observe the changes that occur. Questions:
    - What changes did you notice?
    - How did the baking soda change? How did the vinegar change?
    - Did the temperature of the liquid in the bag change? If so, how?
    - What happened to the bag? Why do you think this happened?
  9. Percy Julian sometimes made new substances in the laboratory by mixing different chemicals. Did you end up with a different substance than the ones you started with? Was this new substance a solid, a liquid, or a gas?

## LEARNING MORE

### The Science Discovery Book

by Anthony D. Fredericks, Brad K. Cressman, and Robert Hassler. Scott Foresman, 1987.

*Discusses the scientific process and includes chemistry activities for students in grades 4–6.*

### The Science Explorer

by Pat Murphy, Ellen Klages, Linda Shore, and the staff of the Exploratorium; Jason Gorski (Illustrator). Henry Holt, 1996.

*Includes many hands-on science experiments, some related to chemistry.*

### Chemistry

by Ann Newmark. DK Children, 2005.

*Considers the nature of chemistry and different types of chemical reactions.*

Chemistry

<http://library.thinkquest.org/j001539>

*Provides chemistry information and experiments for children in grades 4–8.*

# Percy Julian and His Work



# Natural vs. Synthetic

**Vitamin C tablets, the hair in a wig, and hormones for treating a condition or disease—does it matter if they are *natural* or *synthetic*? What exactly do those words mean?**

## How We Usually Think about Natural and Synthetic



When we hear something described as “natural,” we often think that it comes from nature (such as lemons) or is made from a substance that occurs in nature (such as lemonade made from lemon juice).

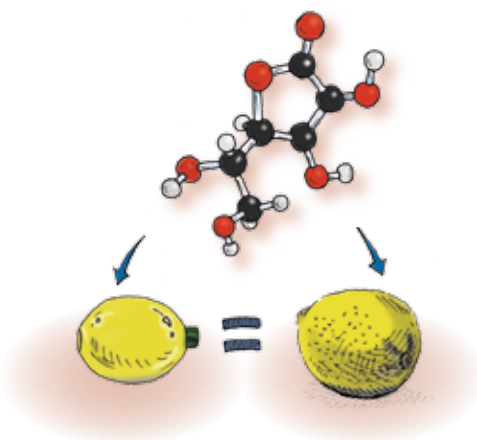
When we hear something described as “synthetic,” we often think that it is “not real” (or imitation) and that it is made by people in a laboratory or factory—not by nature. It may be similar to the natural material, but not identical. For example, synthetic hair in a wig may look and feel like natural hair, but under a microscope, the two are not identical.



Percy Julian synthesized physostigmine (fie so STIG meen), in the lab, making this glaucoma treatment readily available. He assembled molecules that were exactly the same as the physostigmine found in Calabar beans. Like vitamin C, both versions of physostigmine have the same effect on the body because their chemical structures are the same.



## Natural and Synthetic in Chemistry



Lemons are a source of vitamin C, but vitamin C can also be synthesized in the lab. Synthesized vitamin C has the same molecular structure as the vitamin C in a lemon. Both have the same exact effect on our bodies. The difference is the process used to make them. So, since both forms of vitamin C are identical in structure and how they work in the body, one can substitute for the other.

Natural hair and a wig are not the same chemically, but the differences probably don't matter to a lot of people.



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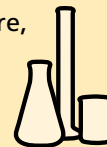
# Plant Medicines

Throughout history, humans have used plants to treat all kinds of illnesses. Today, about 40 percent of our prescription medicines come from plant extracts or synthesized plant compounds. Plant-based medicines are everywhere, including the shelves of our local drugstores.



## Chemistry and Plants

Percy Julian practiced natural products chemistry, which is the process of separating chemicals from plants, figuring out their molecular structure, and making them in the laboratory.



## Throat Lozenges, Muscle Creams, and Cold and Nasal Medicines

**Derived from:** Mint (*mentha*)

**Parts used:** Leaves

**Active ingredient:** Menthol. Menthol is now made synthetically or from peppermint or other mint oils.

**Use:** Relieves itching, relaxes muscle soreness, opens congested sinuses and upper respiratory tract

*Mint can be grown easily in a garden. The leaves can be used for tea, salads, and as an herb in foods.*

## Aspirin

**Derived from:** Willow (*salix*)

**Part of plant used:** Bark

**Active ingredient:** Salicin, a compound that breaks down to become salicylic acid (aspirin). Salicylic acid (aspirin) is now synthesized.

**Use:** Alleviates pain, reduces fever and inflammation (swelling), prevents heart attacks

*More than 80 million aspirin tablets are used each year in North America.*

## Quinine (Malaria Drug)

**Derived from:** Cinchona tree (*cinchona pubescens*)

**Part used:** Bark

**Active ingredient:** Quinine. Quinine and quinidine are both extracts from cinchona bark. Both are still used against malaria parasites.

**Use:** Treatment for malaria

*10,000 tons of cinchona bark is harvested annually to make drugs to treat malaria.*



# Chemistry and Stuff Around Us

## Stuff We Use



You're walking on chemicals. Your favorite **sneakers** have soles—and probably other parts—made of plastic. Many **soda bottles**, your **computer mouse**, and even some of the **clothes** you wear are made of or have plastic in them. Plastics are polymers made by chemical processes. Polymers are molecules that link together like beads. Each molecule has carbon, hydrogen, oxygen, and/or silicon atoms.



"Ouch! I got a sunburn." The chemical ingredients in some **sunscreens**, titanium dioxide and zinc oxide, protect your skin from the sun's ultraviolet (UV) radiation. They do this by reflecting and scattering UV light. Other types of chemicals in sunscreen absorb UV light and disperse it as heat.



Did you know that when you use shampoo, your hair gets wetter? That's because water has surface tension (the molecules stick together). The chemicals in **shampoo** (or any soap) break the surface tension so water soaks more easily into hair.

### Percy Julian

Percy Julian extracted oils, proteins, and other compounds from soybeans, which were used to make latex paints, coatings for paper, glue, plastics, and even some foods.



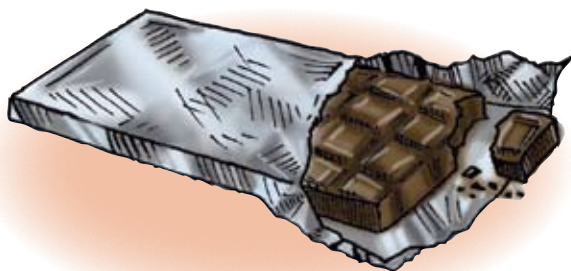
# Chemistry and Stuff Around Us

## Stuff We Eat



**Root beer** was made in Colonial America. An extract made from a variety of natural ingredients (such as sassafras root, wild cherry bark, allspice, etc.) is added to sugar and boiling water. The flavored sugar water is cooled and yeast is added to begin the chemical process of fermentation—breaking down sugar and giving off carbon dioxide. The root beer is ready in 12–24 hours.

**Chocolate** is made from cocoa beans. The chemical lecithin, an oily material first extracted from soybeans in Percy Julian's laboratory, is often added to chocolate to make it smooth.



To make **yogurt**, helpful bacteria are added to milk. The bacteria break down the sugar in the milk in a chemical process that makes the milk thicken and become yogurt.



Many foods in grocery stores contain the chemical **preservatives** calcium propionate, BHA (butylated hydroxyanisole), and sodium nitrite. Calcium propionate kills molds and bacteria so they don't grow on foods such as pizza crust, pudding, milk, and jam. BHA preserves fat and is found in butter, processed meat, and chewing gum. Sodium nitrite inhibits the growth of harmful bacteria.

# I'm a Chemist

I search crime scenes looking for evidence that can be analyzed, such as fibers, residues, and DNA.



forensics

I develop foods and beverages, make them taste better, and preserve food so it lasts longer.



food

I help farmers grow crops and improve their use of the land by examining the chemicals in different soil types and how different soils affect crops. I also help solve problems like contaminated soil.



soil

## Here's what I do.

art



I help create, preserve, and present art by testing polymers (plastics) and other materials in paints. I even helped develop the wax used in the figures in wax museums.

marine



I study chemical reactions and the composition of water and the sediments in bodies of water, like the ocean. I try to find out what conditions are best for marine life.

### I'm an Organic Chemist



Percy Julian was an **organic chemist**. Organic chemists study compounds that have carbon in them. The word *organic* comes from a time when carbon-containing compounds were thought to come only from living things. Today, medicines, fibers, plastics, and other products that are made in laboratories or factories also contain carbon.

# African American Scientists

In addition to his successes in chemistry, Percy Julian was a trailblazer who helped open the field of chemistry to African Americans by giving them jobs and inspiring them to become chemists. Today, African American scientists work in many fields.



## Marie Maynard Daly

Chemist and Biochemist  
Born April 16, 1921

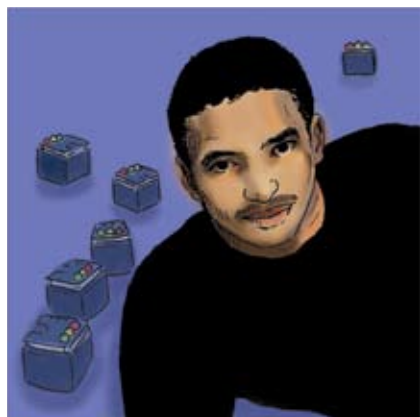
Marie Maynard Daly was the first African American woman to receive a Ph.D. in chemistry. Now retired, she studied the chemistry of our bodies and other living things to find better ways to treat diseases.



## Neil deGrasse Tyson

Astrophysicist  
Born October 5, 1958

Neil deGrasse Tyson studies star formation, exploding stars, dwarf galaxies, and the structure of our Milky Way. He gathers information from telescopes around the world. Dr. Tyson is the director of the Hayden Planetarium in New York.



## James McLurkin

Robotics Engineer  
Born 1972

James McLurkin builds and studies swarms of mobile robots. His work with robot swarms is inspired by the way ants and bees work together to solve problems. McLurkin hopes to learn how individual robots influence the behavior of the whole group.



## Mae Jemison

Astronaut  
Born October 17, 1956

Mae Jemison was the first African American woman in space. In 1992, she was chosen by NASA as a mission specialist on the space shuttle Endeavour.