

Geosciences (with special emphasis on Geology) - prepared by Prof. Pablo Llerandi, UPR-Mayaguez

Geoscientists have great curiosity for what is happening in our solar system and the rest of the universe. They are constantly conducting research at different sites looking for keys to understanding the various processes occurring in Earth and in other planets. Some of the research includes the study of soils, rocks, water bodies, and the atmosphere.

Geoscientists also develop land-use plans, environmental impact assessments, and find new or renewable resources to aid society. They provide important information to establish government policies to improve natural resources, management practices, environmental protection, and the protection of people's health and general well-being.

Geosciences are the best example of science integration, therefore, the volume of information needed to perform some studies or to acquire new knowledge, is usually overwhelming. Because of this, the Internet plays an important role as a place to find relevant information.

This website is intended as a guide of useful information for students of all levels, teachers, college professors, researchers, and the general community. It may serve as a focal point for geosciences information, especially related to earth science education, geology and the Caribbean region. The website will be updated regularly to include additional web pages and links to enhance the current information and to develop new subtopics related to geosciences. Everybody is invited to explore the content of this website and guide, to make suggestions, and to enjoy every link.

Caribbean Geology - Hydrogeology and Geology of Puerto Rico

Caribbean Geology, Geophysics and Tectonics

<http://www.ig.utexas.edu/research/projects/caribbean/carib.links.htm>. The University of Texas at Austin Institute of Geophysics (UTIG) hosts this site. Language: English, with a few links in Spanish, and French.

This site features a collection of up to date investigations on Caribbean Geology by UTIG researchers. It includes news, links to other Caribbean websites related to geology, on-line publications, meeting announcements, bibliographies, images and slide shows. This is a very complete website dedicated to cutting-edge geological research in our region. Several Puerto Rican references are included. It is an excellent tool for researchers, university students and high school teachers.

Origin of Caribbean Plate, Project 433

<http://www.ig.utexas.edu/CaribPlate/CaribPlate.html>. The University of Texas Institute of Geophysics (UTIG) hosts this site. Manuel Iturralde Vinent and Edward Lidiak are the co-leaders of the project. Language: English with few links in Spanish.

This site describes the progress of the International Geological Correlation Programme Project 433. The project deals with the scientific research on the origin of the Caribbean Plate, incorporating and supporting works by researchers of all over the Caribbean region and worldwide. It includes section on Caribbean Plate Models, bibliographies, reports, and meetings. Project 433 is a very important component of the regional geology; it has triggered enormous amounts of new information and discoveries on the geology of the Caribbean.

SLAR Images of Puerto Rico

<http://pubs.usgs.gov/openfile/of00-006/slrdown.htm>. Hosted by the Department of the Interior, United States Geological Survey, and maintained by Eastern Publications Group. Language: English.

The site main feature is the composite of Side-Looking Airborne Radar Images of Puerto Rico. These are images taken at more than 8,000 m in altitude. These radar images are especially useful in Puerto Rico because clouds do not obscure the view. The images are of high quality, and you can change the scale to see a more detailed picture. It is an interesting tool to start or complement any field-oriented project and for remote sensing.

USGS Water Resources of the Caribbean

<http://pr.water.usgs.gov/>. This is an USGS website dedicated to water resources of the Caribbean region; it is maintained by the USGS Caribbean District Webmaster. Language: English.

The website is an excellent resource for everyone looking for information on water resources on the Caribbean, especially in Puerto Rico. It contains valuable real-time data on stream flow, rainfall, and maps of Puerto Rico and the Caribbean, and real-time water levels of Puerto Rican reservoirs. It also contains information on current and past projects, publications, annual reports, and related links. This is an invaluable source of information for planners, earth scientists, biologists, and the public; it is also a great tool for educators.

Geologic Information about Puerto Rico and the Virgin Islands

http://geology.er.usgs.gov/states/pr_vi.html. The USGS hosts this site and maintained by Eastern Publications Group Web Team. Language: English.

This site highlights selected geological research in Puerto Rico and the Virgin Islands. It includes several links to articles, abstracts, projects, symposiums, and related USGS information.

Earth System Science

GEOL 3105: Images of the Earth

<http://cacique.uprm.edu/geol3105/>. Authored and maintained by Fernando Gilbes Santaella, Ph.D., Professor at the Department of Geology, University of Puerto Rico, Mayagüez Campus (UPRM). Language: English.

This is an academic website designed to be part of an undergraduate course called: Images of the Earth at UPRM. It includes a syllabus with the following main sections: The Earth System, Observing the Earth from Space, The Lithosphere and Asthenosphere, The Hydrosphere and Cryosphere, The Atmosphere, and The Biosphere and Integration of the Processes. In each of the sections, Dr. Gilbes included three to five subtopics, detailed class notes (pdf files), and related links. This is a highly recommended site for those who want to learn geosciences in an interdisciplinary way. The class notes are comprehensive, and easy readable. The site features information from the Earth-Moon-Sun system to Tectonics, and Biogeochemistry. Dr. Gilbes specialty is remote sensing, and this is evident when surfing the site. It aims to undergraduate students, but the easy readable style should help non-specialists and high school students to increase their knowledge on geosciences, again this is a highly recommended well-designed site.

Earthquakes – Seismology

Plate Tectonics, the Cause of Earthquakes

<http://www.seismo.unr.edu/ftp/pub/louie/class/100/plate-tectonics.html>. Maintained by J. Louie, Associate Professor of the University of Nevada at Reno. Language: English.

This on-line course relates plate tectonics and seismology. It presents various images such as: satellite views, photos, and diagrams to help visualize what is teaching. It has an emphasis on the U.S. but the general information is very useful, it also has some related links.

Puerto Rico Seismic Network (Red Sísmica de Puerto Rico)

<http://rmsismo.uprm.edu/English/index.html>. The PRSN under the Department of Geology at the University of Puerto Rico, Mayagüez Campus operates the page. Language: English, Spanish information is available to the public by contacting the staff.

The Puerto Rico Seismic Network is an important organization that characterizes the seismic activity on Puerto Rico and the Caribbean. It is a central focus for earthquake research in the Caribbean. It has extensive historical records and information about local and regional seismicity and provides reports to the National Earthquake Information Center in Colorado, and other countries. In this site, you will find information on earthquakes, seismograms, current seismicity, monthly reports and other links.

USGS National Earthquake Information Center

<http://www.neic.usgs.gov/>. Madeline Zirbes maintains this page. Language: English.

It is an excellent source of information on worldwide seismicity, including current activity. This center works together with Seismic Networks around the globe. The site includes general earthquake information and historic events.

Environmental Geosciences

Geobiología

<http://www.acevedocity.com.ar/efa/geo.htm>. Escuela de la Familia Agrícola Acevedo, in Argentina, operates the site. Language: Spanish.

This is an example of the growing interest in multidisciplinary and interdisciplinary approach to science. The site is almost completely dedicated to present data on the relationship between Geobiology and Radiation, and its effect on life. It includes vast information on the history of Geobiology, its foundation and several scientific studies.

Purdue University Geomorphology Lab

<http://www.eas.purdue.edu/geomorph/>. Jon Harbor and his research staff maintain the site. Language: English.

This is an informative academic website dedicated to show the work done in the Geomorphology Lab. It has information on the publications, presentations and current research of the group, as well as links to field-oriented educational projects.

Survey of Elementary Geobiochemistry, Home

<http://www.sfu.ca/person/lower/TUTORIALS/geochem/index.html>. The site is the property of Stephen Lower, Simon Fraser University, California. Language: English.

It has twelve web pages with information regarding the Earth and its lithosphere, the Hydrosphere, the Atmosphere, and the Biosphere. Its purpose is to introduce geosciences as an interdisciplinary field.

General Geology and Geosciences

Illustrated Glossary of Geology Terms

http://www.geology.iastate.edu/new_100/glossary.v2.html. It is hosted by the Department of Geology at Iowa State University. Language: English. Updated continuously.

The site features a glossary of geological terms with illustrations. It is very useful to undergraduate and high school level students or non-specialists with basic science knowledge. It uses non-technical, science-oriented language.

Tierra – Red Temática de Ciencias de la Tierra de España

<http://tierra.rediris.es>. RedIris hosts this site, and is coordinated with several forums, databases, and web sites specialized in Earth Sciences. Language: Spanish, with some links in English.

It is a comprehensive web site including numerous links to Earth Science resources, articles, scientific research, and research groups. It includes links to academic departments and geological surveys, symposia and scientific meetings. The web aims to all audiences, but scientific knowledge is recommended, especially to access the research group's websites.

Understanding Earth

<http://wzar.unizar.es/doc/buz/bibliotecas/geol/bib/WEBNOTES/GEOHOME.HTM>. Authored by W.H. Freeman & Co. and Sumanas, Inc. It is based on the second edition (1998) of *Understanding Earth*, written by Frank Press and Raymond Siever. Language: English.

This is a useful collection of all links presented at the end of each chapter of the second edition of *Understanding Earth*, by Press, F., and Siever, R. (1998). It includes sections on Educational Materials, links to geological-oriented Newsgroups, and places to find earth science software.

United States Geological Survey

<http://www.usgs.gov/>. The USGS Web Team maintains this site. Language: English.

It is the official site of the U.S. Geological Survey. This is a comprehensive, very informative website containing valuable data on mineral resources, geology, hydrogeology, hydrology, maps, aerial photos, scientific meetings, educational resources, funding opportunities for students, reports by U.S. states, and much more. From this site, you can access other pages related to the geological sciences, especially in the U.S., and including data on Puerto Rico.

Geosciences Education

Destination: Earth

<http://www.earth.nasa.gov>. This is one of NASA websites. Language: English.

This site contains some sections on teaching Earth Sciences, science for kids, research opportunities and related links. It also features science news, articles and links to download images.

Education Planet the Educational Web Guide

http://www.educationplanet.com/search/Science_and_Engineering/Earth_Sciences/Geology/. Education Planet, Inc. owns this site. Language: English.

This is a guide to Internet resources and educational websites on several science fields. This refers specifically to geology, and has various subcategories, like: Earthquakes, Glaciers, Libraries, marine Geology, Mining, Rocks and Minerals, Volcanoes, etc. Each subcategory has links to other sites of interest. Some of these sites are rated and categorized according to the student level (i.e. K-12). This will be a useful guide to educators and students at all levels, including undergraduate students.

Science Education WWW Links

<http://alex.edfac.usyd.edu.au/Methods/Science/ScienceWWW.html>. The Faculty of Education, at the University of Sydney, Australia hosts this site. Language: English.

The site is a comprehensive and very useful guide to science websites. It is recommended to intermediate to high school teachers and students, although there are some links useful to elementary teachers, and other are useful to college level students. It contains a collection of recently discovered websites of interest to science teachers, and lists of sites categorized under various subjects. The geoscience

community will benefit from this resource. This is a highly recommended website for those looking for information on science education.

U.S. Environmental Protection Agency, Environmental Education Center

http://www.epa.gov/teachers/curriculum_resources.htm. The U.S. EPA maintains the site. Language: English.

In this site, you will find activities ideas and curricula on a variety of environmental topics, such as: Air, Ecosystems, Waste & Recycling, Conservation, Human health, and Water. In each section are present a series of links related to the main topic and followed by educational activities. The site has links to other pages such as: Kids Site and Teachers Site, Environmental Laws, and EPA Publications. The site is recommended for those of you looking for a place to start an environmentally oriented course or to learn more about the subject.

Miscellaneous Geological and Geographical Resources

Explorezone.com EarthZone

<http://explorezone.com/earth/index.htm>. The site is in English, and active on 10/09/02. Owned and operated by Space.com, Inc.

This is a comprehensive electronic science magazine, featuring science articles for the general audience. It includes articles on various fields, but the link above is related to Geology, Environmental Geosciences, and Climatology.

General Earth Science WWW Resources

<http://www.earth.ox.ac.uk/~davewa/geores.html>. Dave Waters own and maintains this site. Language: English.

This is a guide to online resources in Earth Science and Earth Science Teaching. It contains very useful lists of links on Petrology, Metamorphic petrology, and Mineralogy. A shorter list is available on: <http://teachserv.earth.ox.ac.uk/resources/resource.html>.

Geoindex

<http://www.geoindex.com>. Datasurge Company owns the site. Language: English.

This is a search engine dedicated to daily news and information about the environment, oil/energy, Geotechnical engineering, geology, and petroleum. It also contains information on books on various Geoscience topics.

Geoscience Journals

<http://www.uni-mainz.de/FB/Geo/Geologie/GeoJournals.html>. Owned and operated by Institut für Geowissenschaften MAINZ / Erdwissenschaften ETH-Zürich. Language: English with links in several languages, including Spanish.

The Institute for Geosciences, University of Mainz, Germany, hosts this site. It is a comprehensive list of links to Geoscience Journals worldwide. It also includes links to Geoscience Societies, Surveys, jobs, Oil and Gas, Companies, and Geo-Software. It has the most important Geoscience Journals on the web.

Map Collections

<http://bubl.ac.uk/link/types/maps.htm>. The site is hosted by BUBL Information Services, Andersonian Library, Strathclyde University - Glasgow, Scotland. Language: English.

It is a comprehensive collection of cartographic resources, including geographical atlases, water resources maps, historic map collections, national territory maps, political maps, and other interesting resources. This is a worldwide collection.

Natural Hazards (related to Geology)

Puerto Rico Tsunami Warning and Mitigation Program

<http://poseidon.uprm.edu/>. The University of Puerto Rico, Mayagüez Campus, hosts this site. Language: It has an English and Spanish version.

This project will influence low-lying areas of Puerto Rico and the Caribbean region. It is an important tool for educators, planners, and scientists to better understand the current risks and history of natural hazards in the region. It includes an educational section, publications, downloads, and a 30 minute on-line presentation called: Tsunamis en Puerto Rico: El Peligro Olvidado.

Paleontology

Burgess Shale Fossils

http://tabla.geo.ucalgary.ca/~macrae/Burgess_Shale/. Owned and operated by Andrew Macrae macrae@geo.ucalgary.ca of the University of Calgary. Language: English.

It is a general overview of the historic and paleontological aspects of the Burgess Shale Formation in British Columbia, Canada. It includes relevant information of its importance in the geological sciences, photos, information explaining the fossil structure and habitat, and links to help understand some geological concepts. A list of references is included.

Learning from the Fossil Record

<http://www.ucmp.berkeley.edu/fosrec/>. The University of California at Berkeley hosts this site. Language: English.

The main sections are: Paleontology and Scientific Literacy, Tapping Educational Resources, Learning From the Fossil Record, National Science Standards Matrix, and The Geologic Time Scale. Each section includes several articles and educational activities. The first section deals with the importance of fossils for science and society. The second section includes several classroom activities. The third section has numerous articles and activities related to microfossils, biodiversity, time scale, fossilization, relative and absolute dating, paleoclimate and paleoenvironments. The fourth section shows tables and data regarding the National Science Standards and the teaching of concepts relating paleontology. The last section is completely dedicated to the Geological Time Scale, with educational links. The content of this page is for middle to college level students.

Paleontología Hispana

<http://www.paleontologia-hispana.com/>. The page is property of Antonio José Molina Gutiérrez. Language: Spanish.

In this site, you can start your voyage through time, learning basic paleontology concepts, looking at colorful images of ancient seas, and updating your knowledge while reading the news. This is an interesting place to learn paleontology for the Spanish-speaking community, including various sections on last discoveries, photos, drawings, books, fossil groups, and more.

Planetary Geology and Solar System Astronomy

Earth and Moon Viewer

<http://www.fourmilab.ch/earthview/vplanet.html>. Developed and maintained by John Walker, co-author of AutoCAD. Language: English.

This site features images of the Earth, Moon, the sky and Solar System from various places. For example, you can view the Earth from the Sun, the Moon, or artificial satellites orbiting our planet. You can see the sky from any coordinate. The same occur with the Moon, which is seen from several locations. This site includes other interesting links to visualize our place in the Solar System.

The Solar System in Pictures

<http://www.the-solar-system.net/>. Alwyn Botha is the website owner, the images are courtesy of NASA/JPL except where stated otherwise.

This website has over 50 web pages with over 200 pictures. This website has two purposes: To give a pictorial overview of the solar system and to quiz you about these pictures. After each page of information about the solar system, there are some review questions about the pictures on that page. There are also 15 picture quizzes with 75 questions - each question comes with a picture. The site is designed with middle school students in mind.

Views of the Solar System

<http://www.solarviews.com/eng/homepage.htm>. Calvin J. Hamilton owns and maintains the site. Language: English. A multimedia adventure unfolding the splendor of the Sun, planets, moons, comets, asteroids, and more: includes the latest scientific information, the history of space exploration, rocketry, early astronauts, space missions, spacecraft and an archive of photographs, scientific facts, text, graphics and videos.

Volcanes Marcianos

<http://argos.observatorio.unal.edu.co/miembros/docentes/grek/marte/MARSVOLC.html>. Authored by Miguel Torres, Universidad Nacional de Colombia. Language: Spanish.

The site features images of nearly twenty Martian volcanoes with a short and simple explanation of their origins and processes, according to what is interpreted by remote sensing. Rocks and Minerals (Mineralogy, Crystallography, Petrology, and Petrogenesis)

Atlas of Igneous and Metamorphic Rocks, Minerals, & Textures

<http://www.geolab.unc.edu/Petunia/IgMetAtlas/mainmenu.html>. The University of North Carolina hosts it. Language: English.

It contains an illustrative collection of images of minerals, and plutonic, volcanic and metamorphic microtextures. All images are thin section photos with good resolution, either with crossed polars, or plain light. Some useful explanations are available per image. This is a good site to learn some basic concepts on the identification of minerals and rock textures using the petrographic microscope. It aims to undergraduate students and every person interested in petrology.

Crystals – A Handbook for School Teachers

<http://www.iucr.org/iucr-top/index.html>. Authored by Elizabeth A. Wood (1972), and is hosted by the International Union of Crystallography. Language: this page is in English, but the handbook has several translations, including Spanish, Arabic, Czech, Polish, and Russian.

The handbook reviews basic concepts on crystallography, clearly indicating the academic level to which is designed. It includes activities with procedures, materials, and teaching suggestions.

Mineralogy and Petrology Research on the Web,

<http://homepages.udayton.edu/~koziol/resminpet.html>. Andrea Koziol, Professor at the University of Ohio – Dayton, owns and operates the site. Language: English. Last updated: August 7, 2002.

The site includes comprehensive lists of links related to mineralogy, petrology and other geological fields. Most of the pages linked to this site aim to high school to graduate students and educators. There are several oriented to researchers. The main sections are: Journals, Publishers, Topic-oriented sites, Mineralogic Databases, Professional Societies, and Research Groups, Mineral Collecting, Laboratories, and Commercial sites.

Soil Science

Departamento de Edafología y Química Agrícola, Universidad de Granada

<http://edafologia.ugr.es/index.htm>. *The University of Granada in Spain hosts this site. Language: Spanish.*

An academic website with on-line courses, links to images of rocks, sands, and soil profiles, with explanations. It is dedicated to the study of soils under the microscope and their classification. The images are of good quality and provide aid in the identification of rocks and soil profiles.

Soil Science Education Home Page

<http://ltpwww.gsfc.nasa.gov/globe/index.htm>. *This is a NASA website, maintained by Izolda Trakhtenberg. Language: English.*

Very complete web page, which includes sections explaining basic soil science concepts, pH, the Nitrogen Cycle, Soil of the Month (a featured soil profile from someplace in the world), and several activities, principally oriented to elementary and middle school students, but modifiable to higher grades. The page contains complete information on GLOBE soil protocols, scientific instruments and activities. Includes sections such as: Soil & Society, Soil & the Environment, Working with Soil, Soil & Students, Soil & Agriculture, and Index. All sections are for non-specialists or require only basic scientific knowledge. Special sections on soil physics, soil microbiology, soil morphology, soil chemistry, and soil fertility are found within the Soil Basics section. Links on soil science, environmental science, science activities, and science education are included. Links to scientific journals are also included.

In general, this is an excellent place to learn scientific concepts on soils and soil properties in an easy-readable format. It has numerous links to web pages with variable degrees of difficulty oriented primarily to K-12 and undergraduate level students and educators. Its special sections related to the GLOBE program are the most complete sections.

Suelos

<http://www.fortunecity.es/expertos/profesor/171/suelos.html>. *Ingeniería Ambiental & Medio Ambiente owns the site; FortuneCity hosts it. Language: Spanish.*

You can find detailed information about the structure, formation and general characteristics of soils in this excellent site. It includes information on rocks (detailed), soil pollution, soil sciences, and geology. Numerous photos and diagrams help to visualize better the information. The site is perfect for those who want to learn basic concepts of soils in an effective way.

Tectonics

PALEOMAP Project

<http://www.scotese.com>. *Authored and maintained by Christopher R. Scotese of the University of Texas – Arlington. Language: English.*

The web site features colorful illustrated and animated tectonic models of the Earth, showing the relative position and movements of the continents and ocean basins for the last 1100 million years. Other models show the relative position of landmasses for hundreds million years in the future. The Caribbean region is represented in one of these models. It contains sections on paleoclimate, paleogeography, and scientific research. Teaching materials including an exact copy of the web site, CD-ROM, maps, Earth Globes and free stuff are available through the site. It is an excellent tool to help visualize the complexities of tectonic movements worldwide.

UNAVCO

<http://www.unavco.org>. UNAVCO, Inc, hosts this site. Language: English.

UNAVCO, Inc. is a non-profit membership-governed organization that supports and promotes Earth science by advancing high-precision geodetic and strain techniques such as the Global Positioning System (GPS). The main feature of this site is the International Lithosphere Project's Global Strain Rate Map (GSRM). It is a globally tectonic strain rate and velocity model, using geodetic and geologic field observations. You can access the tectonic plate models by clicking on the planet image and accessing the following link: archive.unavco.ucar.edu/ilp_gsrn. It has up to date information on tectonic motions around the globe.

Vulcanology

Página de Ciencia: Los Volcanes <http://cts.usal.es/~elena/volcanes.htm>. María Elena de la Fuente Arias, a Spaniard physicist designed this page. Language: Spanish, with links in English.

A visual website with photos, definitions of vulcanology concepts, and interesting related links. It has information on the role of volcanoes on humanity, mythology, volcano types, eruption types, and the volcanic activity of Spain. It has middle school students in mind.

Volcano World

<http://volcanoworld.org>/ BrainSpace.org operates the site. Language: English.

A comprehensive web site dedicated exclusively to teaching about volcanoes. In several sections includes lists to current worldwide volcanic activity, educational activities, movies, stories, and related links. The Learning section is very complete. In the Mall section, it includes contact information to buy books, CD-ROM, catalogs, etc. It is a good site to introduce students of all levels about the fascinating world of volcanoes.