BioEd℠

# Naturalist Journals

Baylor College of Medicine

by

**Gregory L. Vogt, Ed.D. and Nancy P. Moreno, Ph.D.**

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Cover photo: Astronaut/aquanaut Michael R. Barratt, NEEMO-7 mission specialist, types a journal entry at the galley table in the National Oceanic and Atmospheric Administration's (NOAA) Aquarius Underwater Laboratory, located off the coast of Key Largo, Florida, for the NASA Extreme Environment Mission Operations (NEEMO) project. Photo courtesy of NASA.

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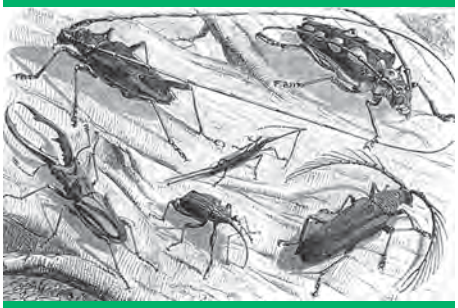

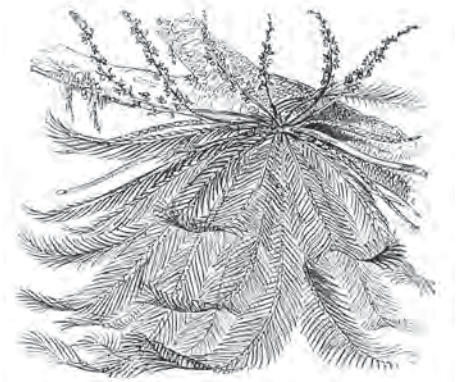

**Sketches made by Alfred Russell Wallace, a British naturalist, during his seven-year voyage to Malaysia beginning in 1854. The sketches were later refined and published. Before photography was widely used, naturalists relied on detailed sketches to depict wildlife.** Illustrations by A.R. Wallace, *The Malay Archipelago,* 1869. Public domain.

# Collecting and Recording Data

One of the oldest methods of scientific investigation consists of close examination and recording of observations of the natural world. Scientists and explorers throughout history have kept naturalist journals of their investigations, explorations, and experiences. Leonardo da Vinci, John Audubon, Lewis and Clark, Charles Darwin, and many others recorded their discoveries in notes and illustrations. Both techniques are still valid and scientifically useful. In fact, sketching and notating can be more beneficial to observation than photography or digital imaging.

To sketch an organism, you must study it very closely, looking for shapes and structures, both small and large, as well as patterns, textures and colors. A photograph or digital image contains far more information, but these media often encourage the observer to notice only the whole while missing small, often essential, details. Sketching and recording observations force you to discern both the detailed parts of a subject and their relationships to the whole. Further, comparative observations of similar species can lead to important insights about how living things adapt to their environments.

A naturalist journal is an ideal research tool for life science investigations involving organisms in space. Images of the subjects (butterflies, plant roots, spiders, etc.) are downloaded from the International Space Station daily for review. These images can be compared with similar "control" organisms living on Earth. It is relatively simple to set up habitats for ground-based organisms, following the instructions in each of the organisms "in Space" guides, such as "Spiders in Space." While digital images can be compared side-by-side, looking at each image closely, sketching, and making notes will accentuate details that are easily overlooked when just scanning the images.

## Pre-Mission Naturalist Journal Practice

To sharpen observation skills before an investigation like the "Spiders in Space" or "Plants in Space" activity, practice sketching an object, such as a potted plant, an insect, a fossil, or any other small item at hand. While sketching, record brief observations along the sides of the page. Notes might include descriptions of textures, colors, behaviors, and so on. Use pencils of differing hardness to outline and shade, and have an eraser available for corrections. Colored pencils are beneficial but not essential. Ink pens and markers are excellent for producing vivid illustrations, but they can be frustrating, because it is difficult to correct mistakes or adjust a sketch done in ink.

Graph paper is another very useful tool for naturalist journals, because it assists in making sketches to scale. For example, a spider might fill just four squares on the graph paper.

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**A page from the personal notebook of young naturalist Edward Drinker Cope (1840-1897). Cope was at the time seven years of age, on a voyage to Boston as a birthday present from his father.** Drawing date circa 1847. Public domain.


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Sketching it at its original size would be challenging and provide limited detail. However, if the sketch is drawn to fill 64 squares, the final illustration will have a magnification of 16. The squares assist in sketching the spider's cephalothorax, abdomen, and legs in proper proportion. Blank notebooks with graph pages can be purchased. As an alternative, a journal of graph paper can be assembled in a binder.

## Data Coordination

Participating in a space- and Earth-based life science comparative investigation requires daily coordination of images from space with sketches or images from Earth. While space images can be printed and used in hard copy, comparison of the space and Earth subjects can be more effective if sketches of subjects in the space images are made directly from the computer screen. (This controls for individual sketching skills.) If desired, printed images also can be included in the journal.

In space, digital images will be taken daily after the investigation begins and will be made available online as soon as possible. Go to the Experiments in Space page on BioEd Online to view or download images, and to find images from past missions at www.bioedonline.org.

## Collecting Ground-based Photographs and Digital Images

If your research plan calls for digital images or photographs, advanced preparation is essential. It is best to practice taking the pictures or images before the investigation starts.

Begin by determining the optimal focus distance for your camera. Take several practice photos of your subject. If using an enclosure to hold your subject, focus on the subject and not the enclosure or habitat. When face. Depending upon the investigation, it may be necessary to get very close to your subjects, so be sure to use a camera with macro focus.

Because some investigations involve clear plastic enclosures as habitats, extra care should be taken when composing photos to avoid reflections. Adjust the angle of the enclosure slightly to eliminate some, if not all reflections. Black poster board also can be used to block stray reflections. Another technique for reducing reflections, especially those of the camera and photographer, is to 1) cut a camera lens-sized hole in the middle of a sheet of dull black poster board and 2) shoot photos through the hole in the poster board.

Place a ruler or object of known size inside the habitat, where it will be visible in photographs. This simple step will facilitate measurements and estimates of size.

Avoid touching the front or back surfaces of the habitat enclosure. When possible, handle the enclosure by the sides. Fingerprints and dust collected on the surfaces should be cleaned before the investigation starts.

To capture good photos, you also will need sufficient light to properly expose the inside of the habitats. Room light or small flashlights, pointed through the sides or top of the enclosures, will brighten the subjects. Do not illuminate from the front or use the camera's flash, as this will cause a strong reflection. (The "Plants in Space" investigation solves the illumination problem by placing bright white holiday LED lights inside the box housing plants and

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**Scientists from a variety of disciplines use journals and field notebooks to record data and observations. In this photo, members of the U.S. Antarctic Search for Meteorites (ANSMET) expedition are logging data about the recovery site of a meteor. Relevant data is logged into a notebook, including latitude and longitude coordinates.** Photo by Linda Martell courtesy of NSF and NASA, http://psrd.hawaii.edu/Feb02/meteoriteSearch.html.

growth media. Refer to the "Plants in Space" teacher's guide for details.)

The background in each habitat also can affect photo quality. For example, a plain, light-colored background in a butterfly habitat will permit sharp, high-contrast images. A dark background may make it easier to see spider silk in a photo. In all cases, be sure to focus directly on the subject. Otherwise, the subjects may appear dark or blurry. If the camera permits adjustments, set the camera for "spot" or "center-weighted" metering.

Low-cost time-lapse cameras are available for creating movies. These cameras, normally used for bird watching and plant growth monitoring, are able to focus at short distances. They can be used for space investigations, with the image stream they collect downloaded to computers for study. Time-lapse cameras are available from nature supply companies.

Even if photos will be the main source of data, be sure to take notes and make sketches, which will help in the analysis and interpretation of the pictures. Be sure to include a date with all pictures or sketches, so they can be matched with their corresponding space images.

From time to time, videos will be taken of the space subjects. Computer controls will allow the videos to be stopped for sketching, such as plotting the movements of spiders or butterflies (like tracking footprints in snow or sand). Making the same sketches of Earth subjects will permit comparison of behaviors.

## Additional Resources

For additional information about naturalist sketches and field notes, visit the Biodiversity Counts web resource of the American Museum of Natural History www.amnh.org/education/resources/biocounts/what_is.php.

# *Naturalist Journal Practice Sheet*

Name: _____

## Materials Needed

- Pencils of varying heaviness (colored pencils preferred)
- Eraser
- Metric ruler

## Procedure

Use an object from nature that you have selected or that your teacher has provided. Pretend that you have come across the object while on a nature walk. Make a detailed sketch of the object. Label the parts that you think are important. Write down all of your observations, including measurements.

## Your Sketch



16 cm square