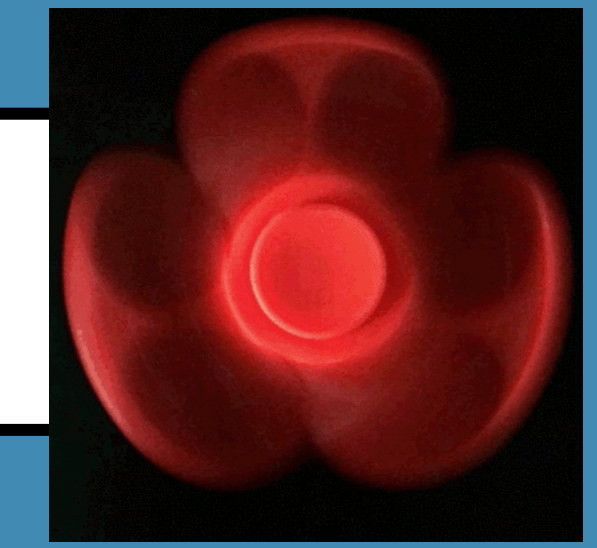


A slide from a 1878 collection



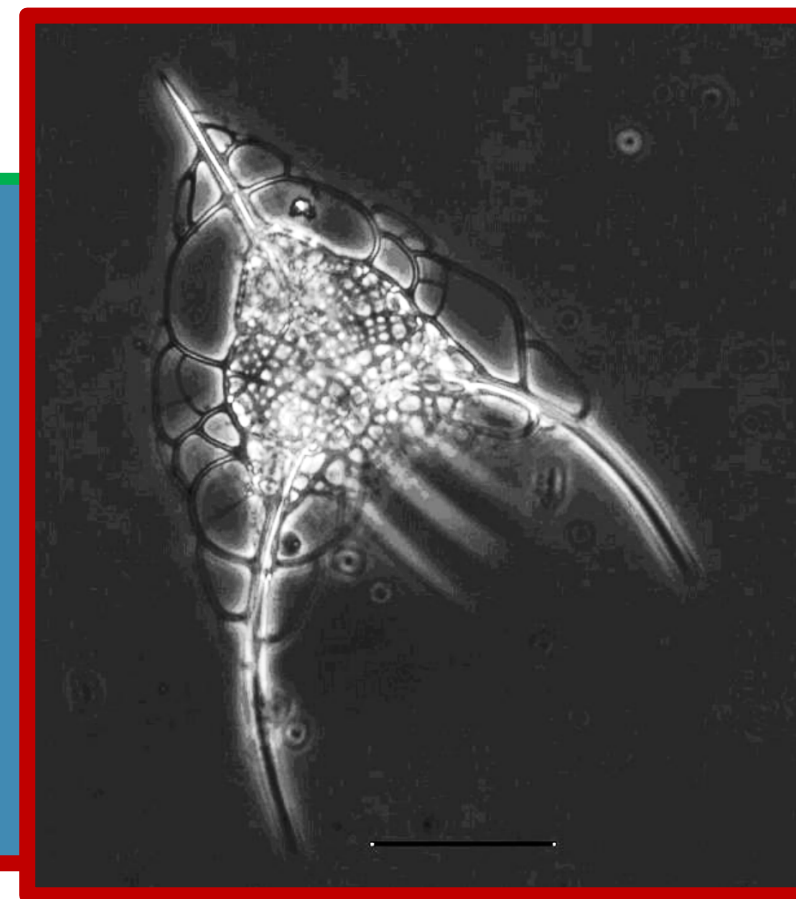
Radiolaria Cell Measurement Lab

Kathleen Nolan and Allen Burdowski, St. Francis College, Brooklyn NY. | 1201



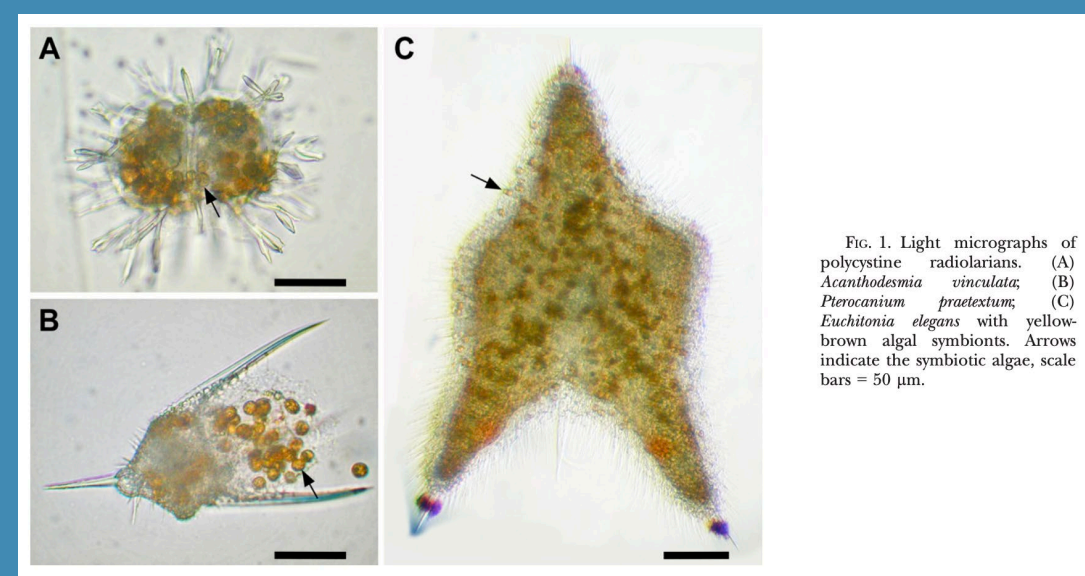
Abstract

This virtual lab utilizes the website <https://www.virtualmicroscope.org/collections>. The students will go to this website, then go to the Cabinet of Curiosities and click on Radiolaria from the West Indies. A picture of Radiolaria will open, along with magnifying and measurement tools. The students measure 20 radiolarians and populate an Excel spreadsheet with widths and lengths. Statistics such as mean and standard deviation are calculated. Research is conducted on college library databases in search for further knowledge of Radiolaria. The students then write a lab report based on their measurements and background information on these little-studied organisms.



Introduction

Radiolarians are marine protozoans—most are single-celled and produce silica “tests”, but some are colonial and “naked”. Siliceous ooze is made up of 30% organic material, much of which are the radiolarians and diatoms. Radiolarians originated in the Cambrian period, which was almost 500 million years ago. (Smalley 1963). Although many species have gone extinct, as seen in the fossil record, there are extant species that are continually being “discovered”. Radiolarians are little studied in biology courses, but they are fascinating indeed. Their unusual shapes and their preservation in “siliceous ooze” as tests, make their morphology and symmetry something beautiful and wonderful to behold. In this virtual lab, students will open up a slide of radiolarians and measure 20 specimens. They will perform simple statistical analyses on these protozoan. Students are encouraged to search the literature on Radiolaria and share information and pictures that they have found with the class.



Student Outline

For your **Introduction**, look up what radiolarians are. Type the definition (in your own words, as best as possible). Write down your source of information. Also, go to the SFC Library and open up databases. Find a research article about radiolarians, and include some of the data (statistics) from the article in this introduction.

Go to this website: <https://www.virtualmicroscope.org/collections>

Then go to Cabinet of Curiosities, and click on radiolarian---1 or 2--the microscope on the right.

Zoom in on a section of the radiolarian---(black button on left) randomly pick out and measure length and width of 20 radiolarians (click measure tool). Open up Excel, and put down your measurements for your data. Calculate minimum, maximum and averages for your data. How many species made up your sub-sample? Take into consideration that they might have been preserved in different planes---for example, a round dinner plate would look like a straight line if photographed from the side. Write down your observations.

Results---include some screen shots in your report showing what you saw.

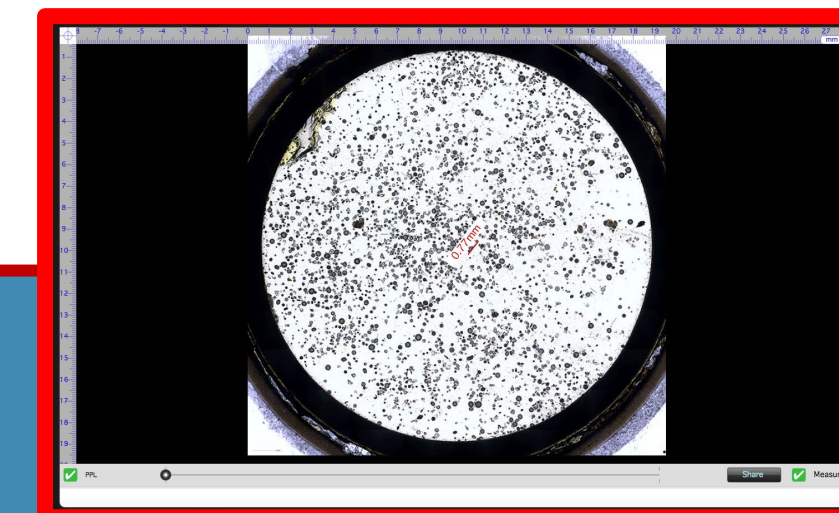


Figure 1. Radiolarians at low magnification.

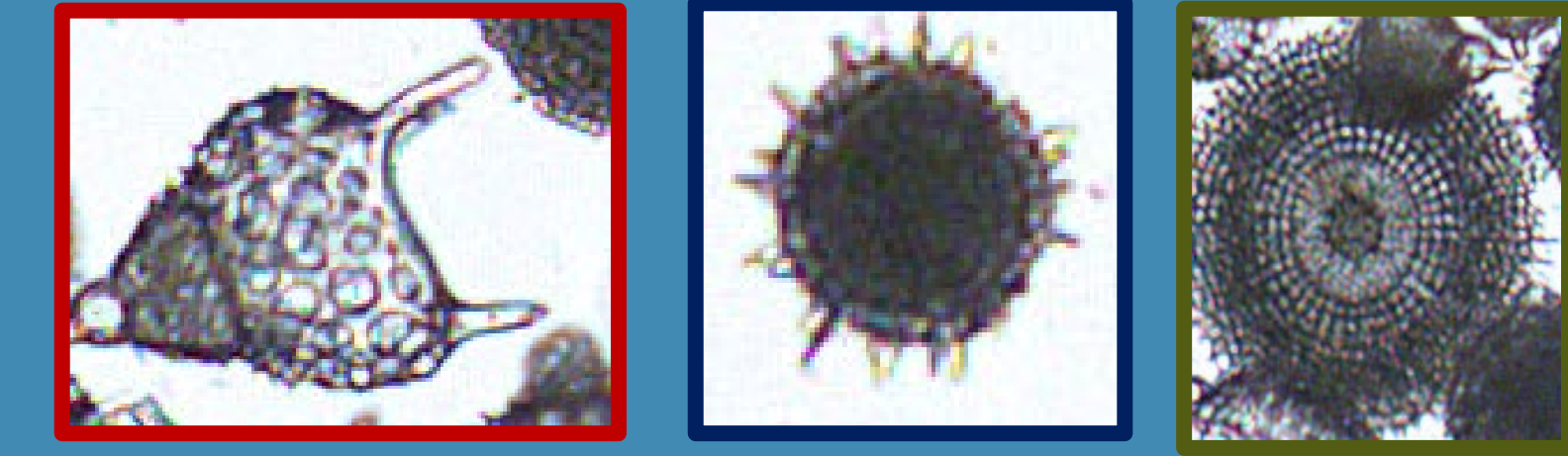
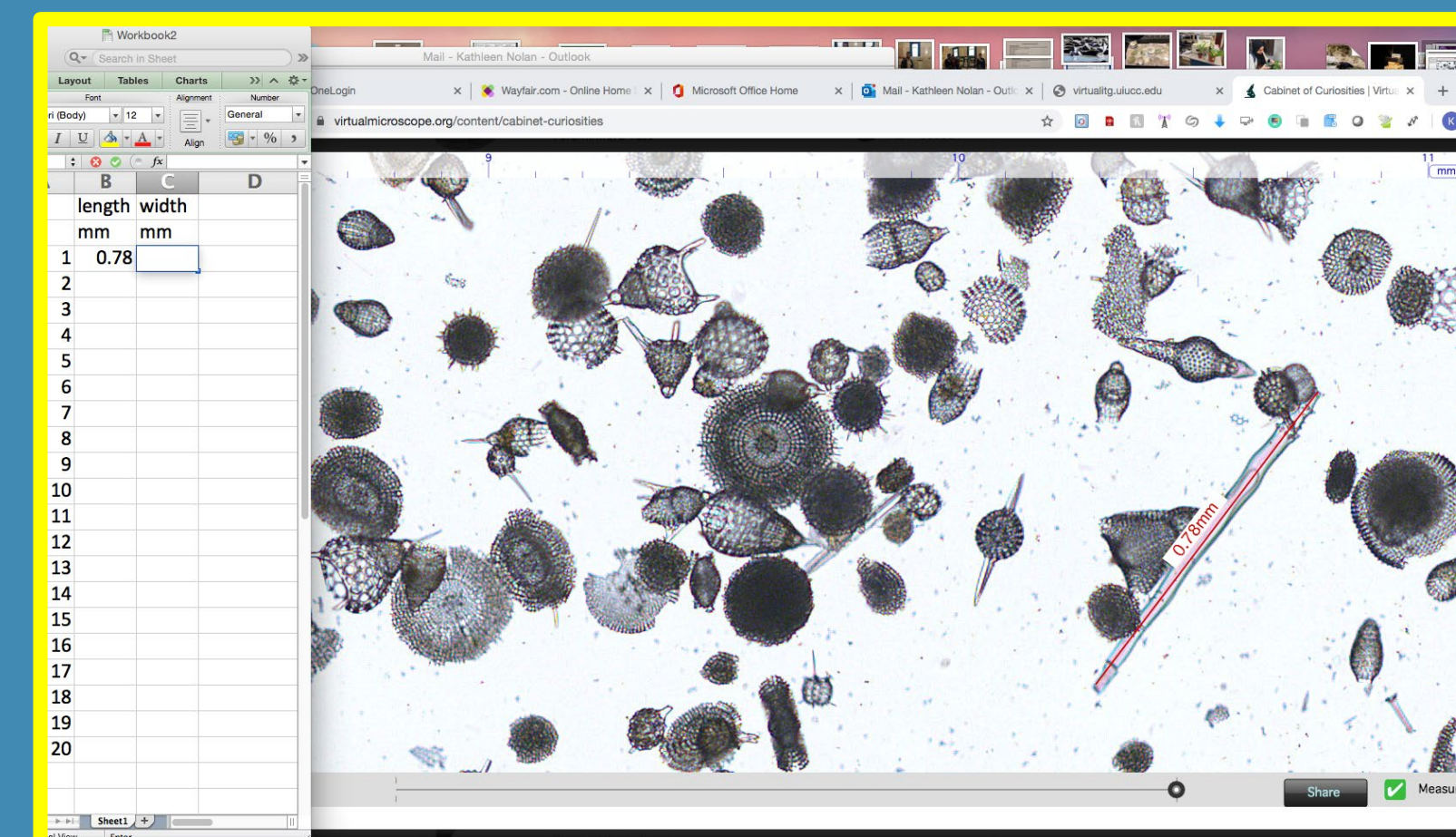


Figure 4. Three types of radiolaria from <https://www.virtualmicroscope.org/collections>

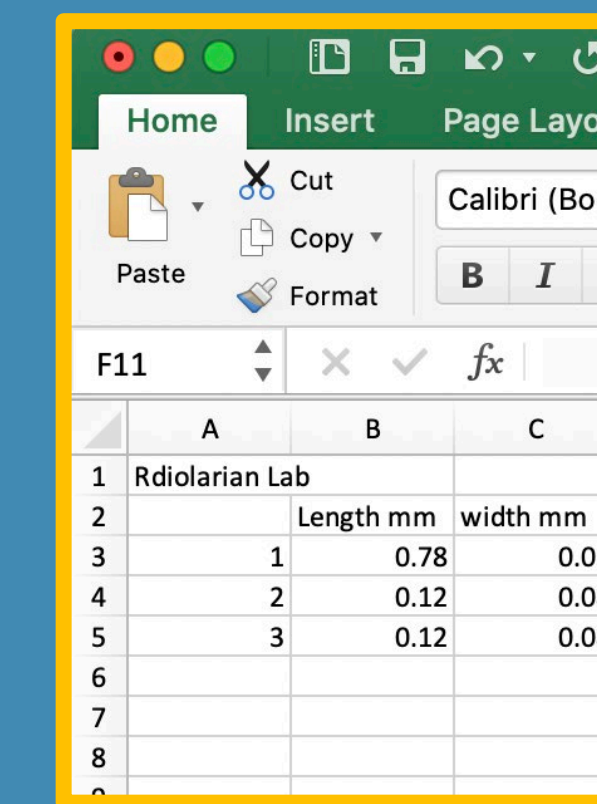
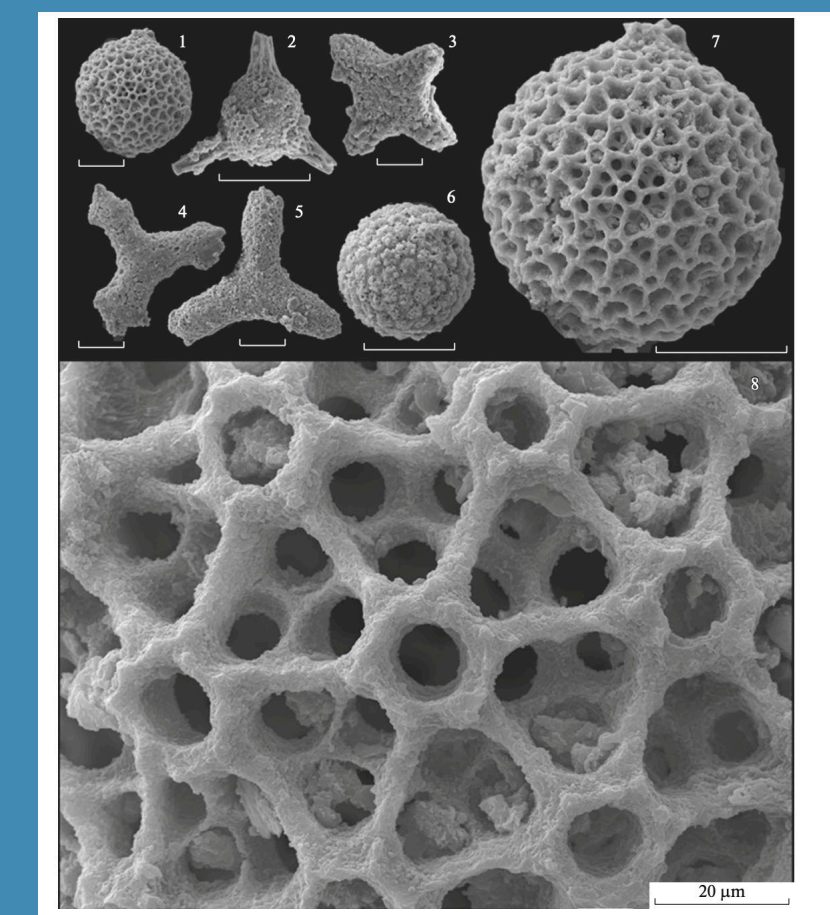
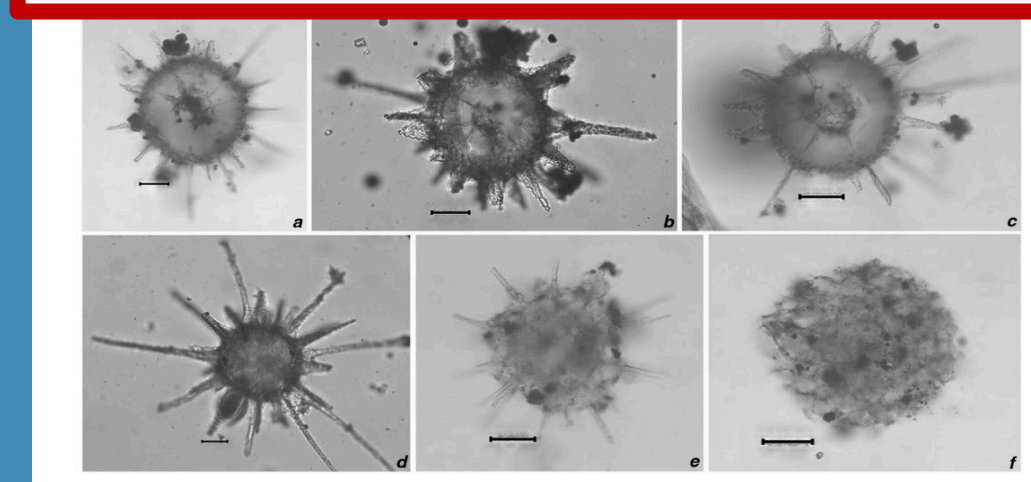


Fig. 3. Measurements of 3 radiolarians from high magnification. <https://www.virtualmicroscope.org/collections> YOU need to measure 20! Also, calculate the MEAN or AVERAGE, and the Standard deviation for length and width.

Discussion

Students should make and compare Excel spread sheets of the specimens they chose to measure. They should search the literature for information about the Radiolaria, and, if directed, additional protists such as foraminifera and the diatoms. They should write a lab report that has an abstract that includes information about the types of Radiolaria they measured (at least three), and interesting information about Radiolaria that they gleaned from the literature. This could include information about the symbiosis that occurs in some radiolarians with dinoflagellates, the use of radiolarians to discern information about geology, and others. They should write a materials and methods section that describes how they used the virtual microscope site above. Their results should include screenshots of the three radiolarians they measured and an Excel spread sheet of their measurements. They should report the range, mean, variance, and standard deviation for each sample of both the length and width, if appropriate, or just the diameter. Students can also write a discussion comparing and contrasting these measurements and can discuss future work that could be done with Radiolarians. They might even want to mention that most likely the Radiolaria inspired people to create such inventions as the fidget spinner!!



Reference

<https://www.virtualmicroscope.org/collections>

Itaki, T. and Khim, B. (2007) "Radiolarians from the British North-Polar Expedition (1875-1876): re-examination of the H. B. Brady (1878) collection", *Journal of Natural History*, 41(37-40), pp. 2537-2542. doi: 10.1080/00222930701664401.

Kršinić, I. and Kršinić, A. (2012) "Radiolarians in the Adriatic Sea plankton (Eastern Mediterranean)", *Acta Adriatica*, 53(2), pp. 189-212.

Smalley, I.J. (1963). "Radiolarians: construction of spherical skeleton". *Science*. 140: 396-397. doi:10.1126/science.129.3363.396

Stapanjants, S.D., G. Cortese, S.B. Kruglikova, and K.R. Björklund. 2006. "A Review of Bipolarity Concepts: History and Examples from Radiolaria and Medusozoa (Cnidaria)". *Marine Biology Research* 2 (3): 200-241. doi:10.1080/17451000600781767.

Tetard, Martin, Paula J. Noble, Taniel Danellian, Claude Monnet, Alfred C. Lenz, and Jisuo Jin. "A New Gorstian Radiolarian Fauna from the Upper Silurian of the Cape Phillips Formation, Cornwallis and Bathurst Islands, Canadian Arctic." *Canadian Journal of Earth Sciences* 52, no. 10 (October 2015): 863-79. doi:10.1139/cjes-2015-0028.