

Science and Society

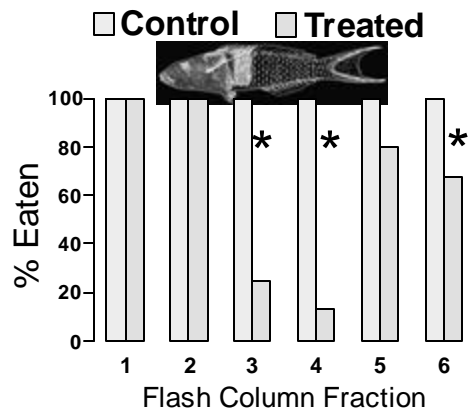
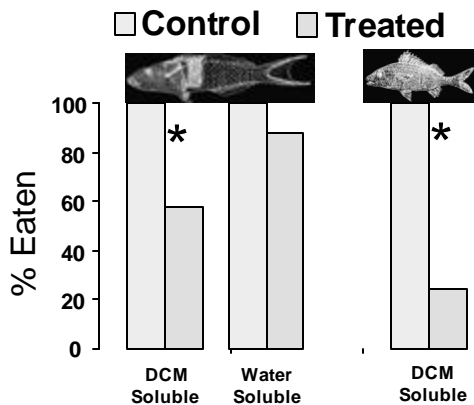
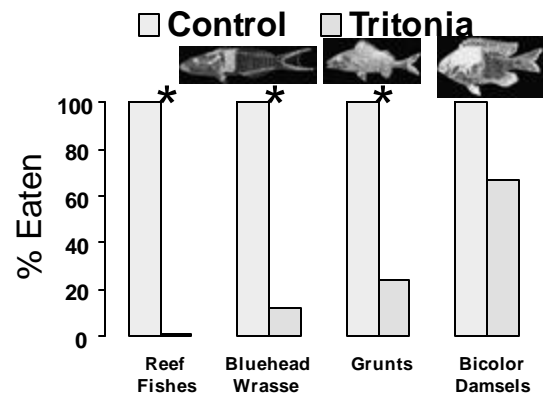
- Where does the information in your textbook (or superdoves) come from?
- How has science affected society?
- What are the greatest contributions of science to human society?
- Ecology specifically?
- Is science good or bad for society?
- Scientist try to explain observations and results of experiments as objectively as possible using natural laws, without evoking the supernatural, faith, ethics, morals, or personal beliefs.

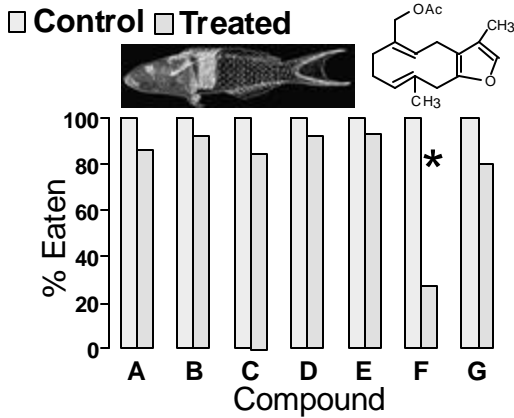
Ecology is Science

- the science of studying the interrelationships between organisms and their environment.
- Ecologists strive to understand factors that determine the distribution and abundance of species.
- As scientists, ecologists use the scientific method to advance their knowledge about the natural world.

Scientific method

1. make observations: what early naturalists did
2. formulate hypotheses: hypotheses cannot be proven, but can only be disproven.
3. design and carry out controlled experiments to test the hypothesis
4. interpret results and reformulate/retest hypotheses
5. communicate findings
6. increasing demand by society to *apply* knowledge to real-world problems that improves quality of life for humans.





Entire article can be found here:
<http://carbon.cudenver.edu/public/biology/MEPSTritonia95.pdf>

An outbreak of the dendronoid nudibranch *Tritonia hamnerorum* was observed on reefs in the Florida Keys, USA, during the summer of 1992. *T. hamnerorum* specializes on the sea fan *Gorgonia ventalina* and sequesters the furano-germacrene julicannafuran from its host; this compound effectively protects the nudibranch from a common predatory reef fish. *T. hamnerorum* densities were extremely high, with as many as 1700 nudibranchs found on a single *G. ventalina* colony. At high densities, *T. hamnerorum* feeding stripped areas of its *Gorgonia* host to its axial skeleton, allowed filamentous algae and other epibionts to colonize, and killed large areas of the sea fan colony. The density of *T. hamnerorum* on *G. ventalina* varied greatly on scales of cm, m, and km. High density patches of nudibranchs on individual sea fans were usually composed of equivalent-sized nudibranchs. These observations suggest that pelagic veligers have an incredible capability to find and settle synchronously on one portion of a sea fan, or that the larvae or juveniles hatch from egg masses and develop without leaving the sea fan. This study adds to a growing number of marine examples suggesting that feeding specialization occurs primarily among small, sedentary consumers that deter or escape predators by associating with defended hosts.

Nudibranch example:

- observations: conspicuous nudibranch is all over reef. nudibranchs lack shell
- previous knowledge: predation is intense on reefs.
- hypothesis: conspicuous nudibranch is numerous b/c fish don't eat them.....
- experiment: offer fish nudibranchs
- result: fish won't even taste nudibranchs
- hypothesis: nudibranchs taste bad
- experiment: offer fish pieces of nudibranch
- result: fish taste, but spit out nudibranch
- hypothesis: nudibranchs are chemically defended.....
- communicate: published in Marine Ecology Progress Series
- apply: compounds are being screened for pharmacological applications

Copernicus clash with faith

- Objective explanations of observations can be in conflict with faith, causing a multitude of reactions from different groups of people.
- Copernicus observations that the Earth revolved around the sun was at odds with Christian faith, and Galileo was placed under house arrest for 8 years because of his conclusions based on available data.
- Today, few people doubt that Earth revolves around the sun.

Darwin's interpretation of observations and data

Observations	Inference
Reproductive output is excessive	Production of more individuals than the environment can support leads to a struggle for existence, with only a fraction of offspring surviving to the next generation
Most populations are stable	
Resources are limited	Survival in the struggle for existence is not random, but depends in part on the hereditary constitution of surviving individuals. Those individuals with traits that fit them best for the environment will leave more offspring than less fit individuals.
Individuals in a population vary in their characteristics; no two are alike.	This uneven ability of individuals to survive and reproduce will lead to a gradual change in the population, with favorable traits accumulating.
Much of this variation is heritable	

Darwin's clash with faith

- Charles Darwin was a Christian that originally believed in Creation, but observations he made caused him to objectively conclude that species change (i.e., evolve) through time, and these changes can give rise to new species.
- The Origin of Species is concerned with the *EVOLUTION OF LIFE*, NOT the *CREATION OF LIFE*.