Here we provide a how-to-do-it model for exploring how a single species can adapt to a variety of climates and, potentially, become a new species. The project involves the use of ecotypes of Arabidopsis (*Arabidopsis thaliana*) and integrates biology, geography, earth sciences, and mathematics. Students will grow different ecotypes of Arabidopsis under different environmental conditions and measure “fitness” of the ecotype to each treatment. They are allowed to select all experimental conditions themselves including the ecotypes, the environmental conditions, and which growth parameters to measure. Students “own” the experiments and, therefore, are more excited about the outcomes. The project can be modified to use from middle school through college and fits nicely into modules on plant growth and development and/or evolution and speciation. It is driven by student-led experimentation and provides an opportunity for in-depth discussion of scientific methods and implementation of an experimental design. It also allows students to critically evaluate how environmental factors direct plant growth, development and reproduction and might lead to speciation.

Arabidopsis is a member of the mustard family, a wild relative of such species as cabbage and radish. It is not a major agronomic plant species but offers important advantages to the research community. It is small plant that is easy to grow, with limited resources. Hundreds of plants can be grown in a 4” x 4” pot at room temperature with no special lights or growth conditions and can go from seed germination to seed harvest within six weeks. Because of its genetics characteristics, it has become the plant research model system (Somerville et al., 1985; Ausubel, 2000; Federspiel, 2000). It has the smallest genome of any known plant and was the first plant genome to be fully sequenced (Arabidopsis Genome Initiative, 2000). Arabidopsis self pollinates naturally but is easy to cross pollinate, produces thousands of seed per plant, and is easy to genetically modify. Literally, thousands of researchers around the world work with Arabidopsis on research relating to gene discovery, plant physiology, growth and development, and biotechnology. More recently, because of the variety of natural populations, it is gaining popularity with ecologists. Arabidopsis is also gaining popularity among teachers because of the vast resources and information available publicly.

**Arabidopsis Ecotypes: little plant with a big job**

- Number of hits on Google: ~14.8 million
- Plant size: ~20cm (8 in.) at maturity
- Lifecycle: 6 weeks
- Number of chromosomes: 5
- Genome size: 125,000 kb of DNA
- First plant genome fully sequenced: 2000
- First identified: 16th century by Johannes Thal
- First mutant discovered: 1873 by A. Braun
- First proposed as a model organism: 1943
- Multinational research community: thousands of academic, government, and industry laboratories.
- Number of research papers (1996-2006): 5597

For more information and references including a movie on its growth, check TAIR at [http://www.arabidopsis.org/info/aboutarabidopsis.jsp](http://www.arabidopsis.org/info/aboutarabidopsis.jsp).

Most important for this project are the ecotypes available from around the world through the Arabidopsis Biological Resource Center (ABRC, Columbus, OH). Over 750 natural accessions (commonly referred to as ecotypes) of Arabidopsis have been collected from around the world, and information about seed purchase and growth conditions is freely available at the TAIR Web site ([http://www.arabidopsis.org/](http://www.arabidopsis.org/)). The ecotypes vary in traits such as leaf shape, flowering time, disease resistance, seed dormancy,