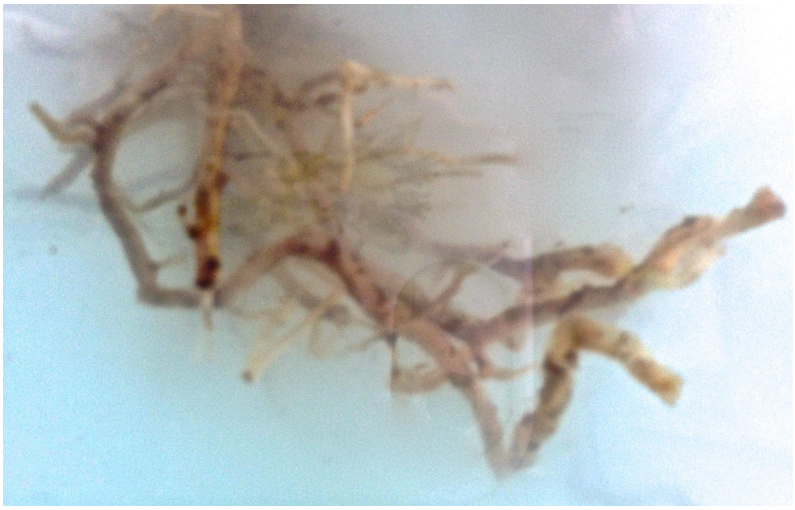
Testing a Transparent Hydrophilic Copolymer as a Suitable Soil for the Observation and Study of Plant Root Growth

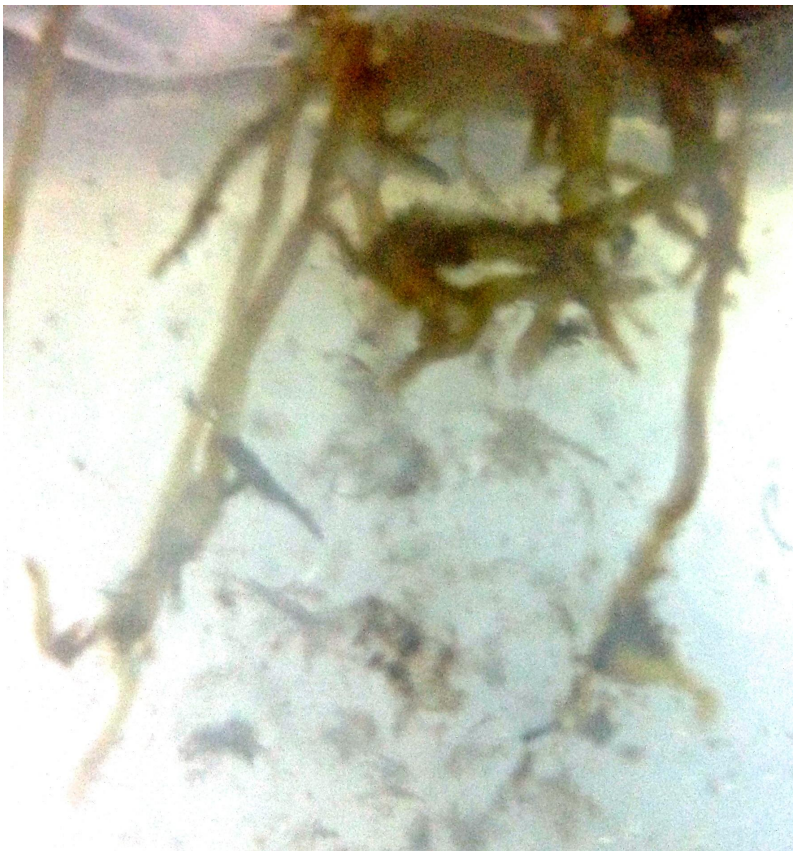
Linda Dombi & Jason Econome

Research

Title: Testing a Transparent Hydrophilic Copolymer as a Suitable Soil for the Observation and Study of Plant Root Growth

A plant's root system is critical to its health. The ability to view, through the means of a transparent soil, how roots anchor a plant, absorb water, and absorb necessary nutrients, will help us to optimize conditions for plant growth. What is learned from this study can impact existing agricultural methods in many ways. The fact that this transparent soil can retain up to 200 fold their weight in water means crops can now be farmed in more arid environments. Moreover, being able to see how microbes interact with a plant's roots, we can improve nitrogen fixation or retard disease transmission thus improving crop yields. This study used Aquabeads, an ionized copolymer, to construct the transparent soil. When hydrated these beads are nearly transparent with a refractive index matching that of water. A number of supplements were tested to give the plants the best chance of surviving in their new environment. Research goals were to optimize the soil conditions for plant growth while, at the same time, improving transparency. It was demonstrated that an Aquabead-based soil visibly and quantifiably supports growth of a plant.



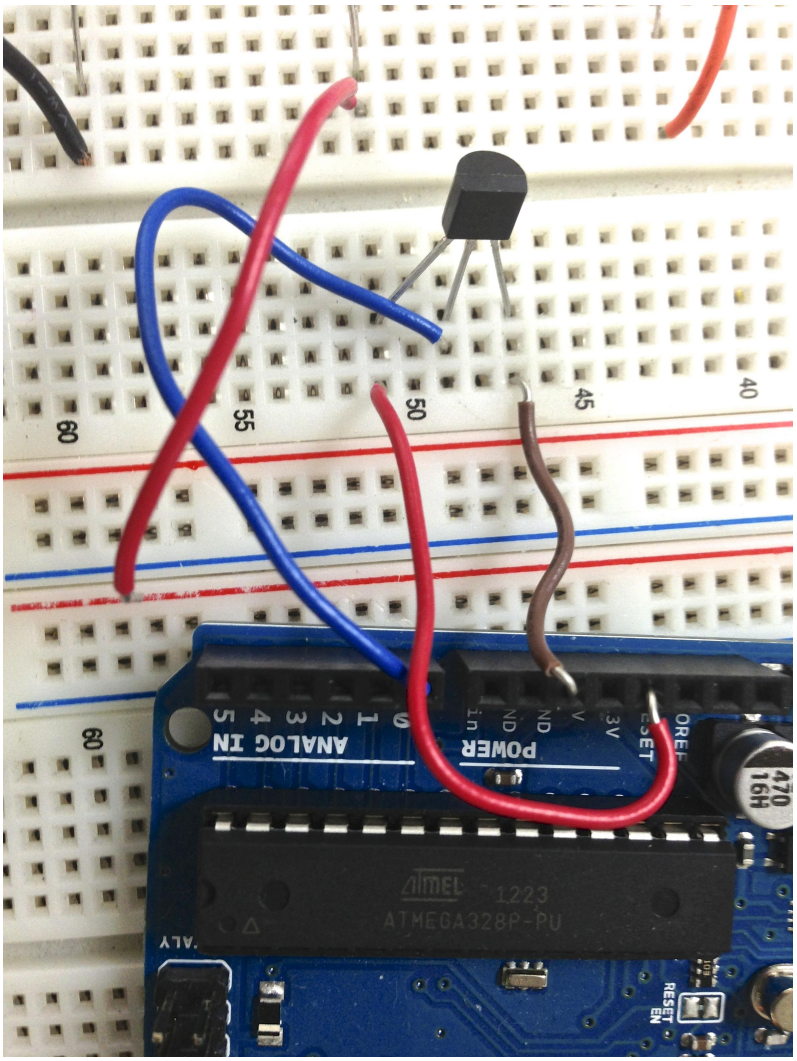


Sample plant roots invading the Aquabeads transparent soil

Lesson Plan

Title: Transparent Soil? That Hot!

Groups of students will research, design, and construct their own terrarium. They will identify those key factors that allow a plant to adequately perform photosynthesis. Such critical factors may include the concentration of bead to water mixture, the amount of light, water, and temperature. In subsequent weeks, student groups will periodically monitor conditions and record root growth data. In addition, the students will assemble a thermal sensing apparatus. They will build an enclosure for their thermal sensor, calibrate it, and build a circuit using a breadboard and an Arduino microcontroller. At the conclusion of the project they would present their findings to their classmates.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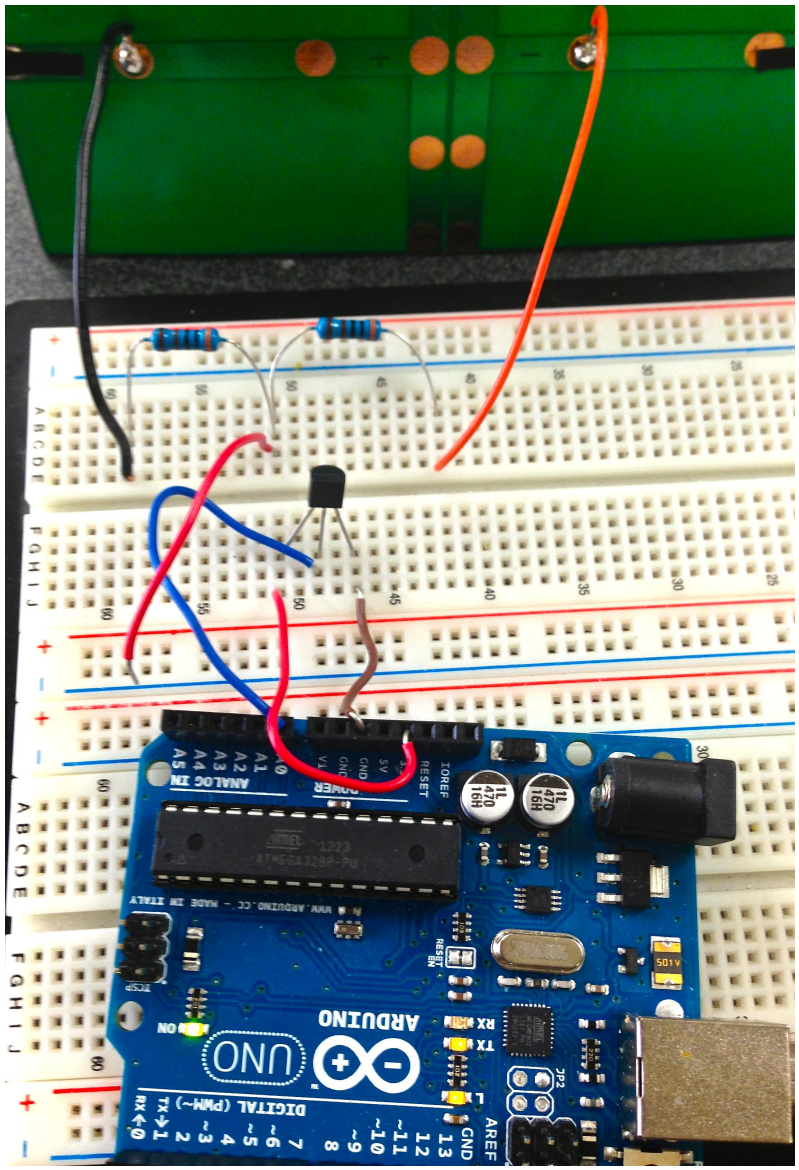

Sample circuitry with temperature sensor and Arduino microcontroller