Curriculum Supplement Series

Environmental Influence on Gene Networks

ISB Systems Education Experiences

In this curriculum module, students in high school biology, genetics, biotechnology, and STEM courses complete the steps scientists would take when investigating how organisms induce phenotypic changes in response to the environment. Students learn that it is not just genes that control phenotypes. Lessons may be taught separately or together as a two week module.

The Baliga Lab at the Institute for Systems Biology has been translating their research into user friendly curriculum modules since 2004. Through forming collaborative teams comprised of scientists, educators, and students, today's research and methods have become hands-on, accessible systems-level activities for students.

In the *Environmental Influence on Gene Networks* module, students apply their background knowledge of genetics and networks to experiment with a model organism to test how the environment changes gene expression. Student teams exchange and interpret information in order to build a possible network, and in the laboratory, test this network by altering environmental conditions. This leads to further experimentation to verify and draw conclusions about network interactions using experimental data and a computer simulation. Students act as scientists while planning, implementing, and evaluating an investigation in the context of a real regulatory network.

To gain background knowledge in networks, prior to this set of lessons, students can complete the cell phone simulation activity from our *Ecological Networks* module. In this activity, students learn how to build a network and discover the power of using computers to build and analyze a graphical depiction of a network.

Environmental Influence on Gene Networks		
Name of Lesson	**Driving Question**	**# of 50 min. Class Periods**
1. Scientists Prepare and Plan	What do scientists need to know before starting research of environmental impact on gene regulation using a model organism?	1
2. Growth and Phenotypic Response of Halo in Different Environmental Conditions	In what ways do cells respond to their environment?	3
3. Data Analysis to Propose Network Function	How do cells function as networks between genes, proteins, and the environment?	1-2
4. Analysis of Laboratory Results to Verify Network Interactions	What tools and methods are available to help scientists analyze experimental results and answer complex questions?	3

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Please see the Module pages at http://see.isbcience.org for more information.

Environmental Influence on Gene Networks

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2006 Development Team	**2007 Development Team**	**2009 Development Team**
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