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Faculty Research: Florian Muckenthaler and Shama Uma

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Fruit Fly Research Brings Success in Shrewsbury

The idea of genes in fruit flies that are similar to those that cause cancer in vertebrates may seem strange to some persons but not to Dr. Florian Muckenthaler of the Department of Biological Sciences. Dr. Muckenthaler studied the effects of one of these genes in the embryos of fruit flies during a recent sabbatical leave spent doing research in the laboratory of Dr. Sam Wadsworth at the Worcester Foundation for Experimental Biology in Shrewsbury, Massachusetts. He studied the pattern of protein production dependent on one so-called “src” gene in the different stages of embryonic development in the fly, Drosophila melanogaster. Dr. Muckenthaler utilized monoclonal antibodies (with specific binding properties) developed in Dr. Wadsworth’s lab to determine which of the developing parts of the embryo produced the protein and in what relative concentrations it was accumulated. The object of such studies is to learn more about the normal function of a gene that is like one that has the potential for turning normal cells into cancerous cells. Fruit flies are especially valuable organisms for this kind of study because they are grown readily and so much is known about their genetics and development. A paper co-authored by Dr. Muckenthaler and describing his work appeared in a recent issue of the journal, Developmental Biology. During the past summer Antoinette Lambiase, a senior Biology major, used these same techniques to carry out a directed study project with Dr. Muckenthaler at Bridgewater.

Mathematical Relationships Help Solve Diverse Problems

Dr. Shama Uma of the Department of Mathematics and Computer Sciences sees commonalities in problems as different as the scheduling of flights from O'Hare International Airport in Chicago and the quality of sound produced by a violin. Dr. Uma is writing a text for use in undergraduate courses in applied mathematics in which future marine architects, airport managers, and perhaps, builders of fine violins, may learn to use mathematical relationships to help solve their disparate problems. She argues that the ability of five runways to accommodate a thousand flights in twenty-four hours can be expressed in mathematical terms, as can the influence of the size and placement of sound holes on the richness of a violin's voice. As an applied mathematician, she has studied how mathematical principles can be used to solve problems confronted in a wide range of fields. The terms of the equations are dictated by the laws of the specific field, such as hydrodynamics, molecular physics, or electromagnetics, with more complex problems requiring the combination of forces from several areas. So a mathematical model describing the way a violin produces sound would have to quantify the density and flexibility of the wood, the shape of the sound box and the movement of air within it, the chemistry of the varnish on the wood, the physical vibration of the strings and perhaps dozens more factors. As Dr. Uma acknowledges, there are problems so complex that their solution by the application of field theory is unlikely soon.