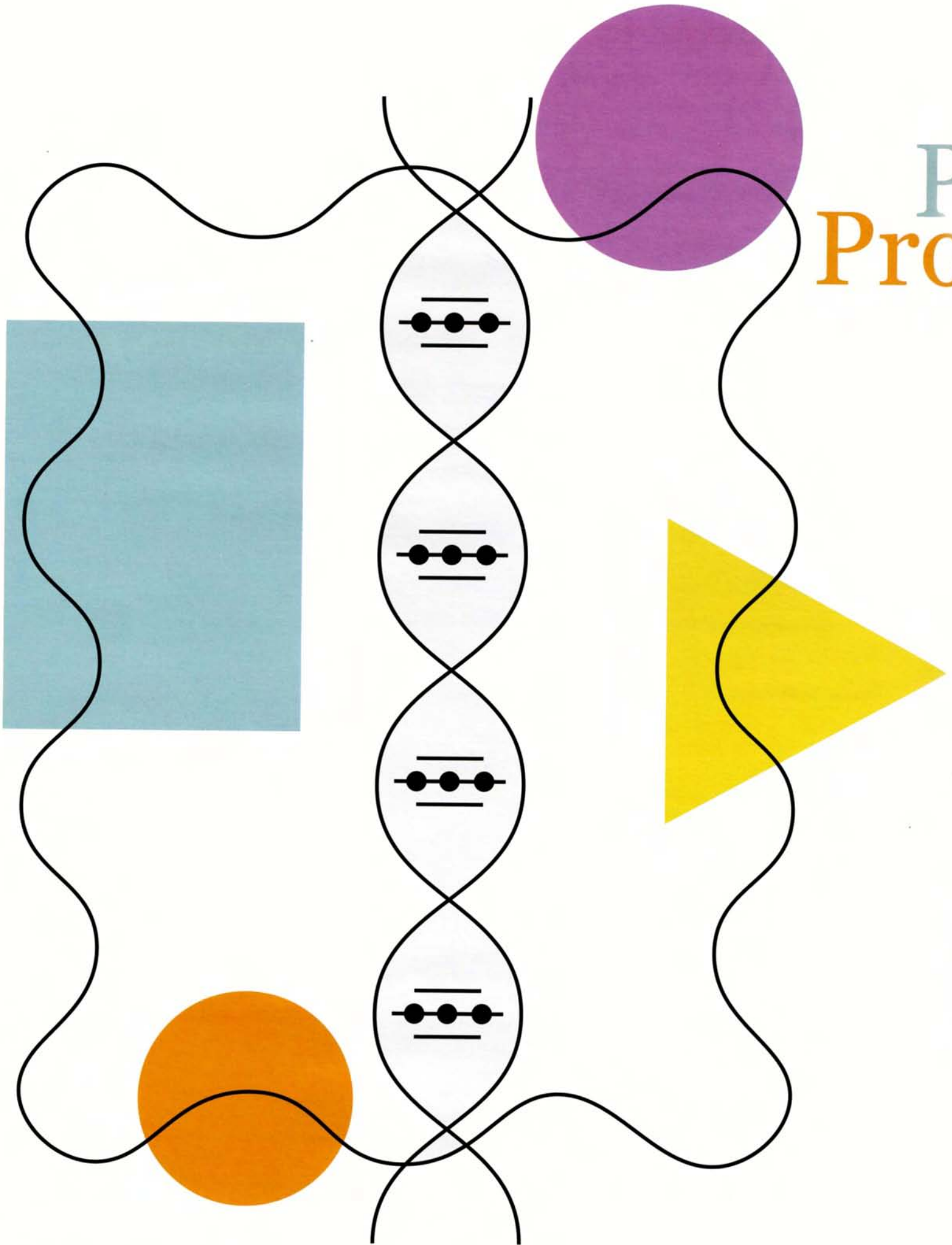


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We are only just beginning to appreciate the power and limitations of the genomics revolution, yet hard on its heels, proteomics promises an even more radical transformation of biological and medical research. Encoded proteins carry out most biological functions, and to understand how cells work, it is important to know what proteins are present, how they interact with each other and what they do. Our body is largely made up of proteins, and genes are the blueprint for these proteins. The term proteome defines the complete set of proteins in a given cell, tissue or organism. Proteomics, a method for identifying these proteins, is very much a technology-driven enterprise. By studying global patterns of protein content and activity and how these change during development or in

response to disease, proteomics research is poised to boost our understanding of global cellular behavior. Clinical research also hopes to benefit from proteomics by both the identification of new drug targets and the development of new diagnostic markers.

Proteomics techniques are at the cutting edge of current biomedical research, and are viewed as a next step in discovery, after the genomics revolution of the 1990s. The identification of genes and the regulation of the proteins they produce are important facets in our understanding of normal and abnormal developmental processes, genetic disorders and environmental issues. Researchers are interested in the field of proteomics because, while it is more complicated than genomics, it produces more specific information about cell activity than

genomics can provide. While the genome is a static entity, the proteome can change rapidly in response to environmental or developmental signals. The many branches of proteomics involve some sort of protein separation method to assist the processing and identification of individual proteins. Data sets of protein expression provide investigators with a comprehensive cellular snapshot of existing proteins in a given protein complex, cell type, tissue and environmental condition, at any given time.

Researchers in hearing science are interested in proteomics because it allows them to identify and isolate causative extrinsic factors, infectious organisms and the complexity of host response involved in several diseases that cause hearing loss and related disorders. Scientists at the House Ear Institute are using proteomics

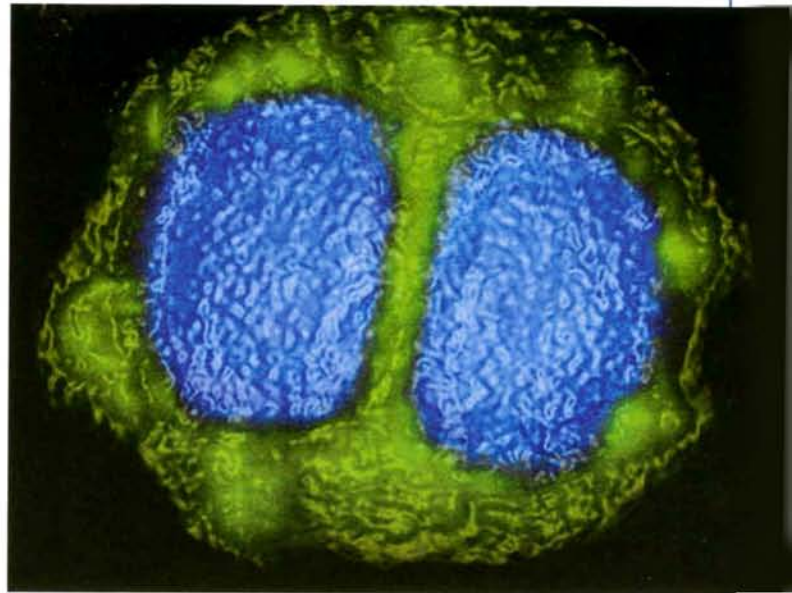
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in multiple research studies. For example, Paul Webster, Ph.D., is using proteomics technology to detect bacterial biofilms as the causative agent of persistent ear infections (otitis media) in children, which may help decide a suitable course of treatment. David J. Lim, M.D., and his research group are identifying the signaling molecules associated with bacterial virulence and pathogenesis in otitis media. Federico Kalinec, Ph.D., is using proteomics to investigate protein expression in auditory cells and how the proteome changes in response to noise and ototoxic drugs. Robert Gellibolian, Ph.D., is utilizing the power of this technology to discover and identify markers of disease using the Institute's temporal bone archive. Though researchers at the Institute have been applying proteomics techniques for



some time, the addition of a new state-of-the-art mass spectrometer machine, funded by HEDCO Foundation, will soon allow them to attain study results in a matter of days, rather than weeks or months. ❖

Rodrigo Aguilera, Ph.D., manages the proteomics core facility at the House Ear Institute. Dr. Aguilera became an authority in the field of the use of IRMS (Isotope Ratio Mass Spectrometry) in drug testing used by athletes. In fact, he was responsible for drug testing analysis by IRMS at the Salt Lake City Winter Olympics games, as well as at other sporting events. Two of the methods he developed and validated are standard

methods used by the World Anti-Doping Agency (WADA) drug testing labs all over the world. Dr. Aguilera is currently expanding his experience to the field of proteomics and metabolomics. He is using his expertise to help the scientists at the Institute and House Clinic expand their research and identify and discover new biomarkers for hearing disorders. ❖



Rodrigo Aguilera, Ph.D.