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Measurement Frontiers in Molecular Biology

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Developments of molecular measurements and manipulations have long enabled forefront research in evolution, genetics, biological development and its dysfunction, and the impact of external factors on the behavior of cells. Measurement remains at the heart of exciting and challenging basic and applied problems in molecular and cell biology. Methods to precisely determine the identity and abundance of particular molecules amongst a complex mixture of similar and dissimilar types require the successful design and integration of multiple steps involving biochemical manipulations, separations, physical probing, and data processing. Accordingly, today's most powerful methods for characterizing life at the molecular level depend on coordinated advances in applied physics, biochemistry, chemistry, computer science, and engineering. This is well illustrated by recent approaches to the measurement of DNA, RNA, proteins, and intact cells. Such successes underlie well founded visions of how molecular biology can further assist in answering compelling scientific questions and in enabling the development of remarkable advances in human health. These visions, in turn, are motivating the interdisciplinary creation of even more comprehensive measurements. As a further and closely related consequence, they are motivating innovations in the conceptual and practical approaches to organizing and visualizing large, complex sets of interrelated experimental results and distilling from those data compelling, informative conclusions.