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Single-Molecule, Real-Time (SMRT™) Monitoring of Biomolecules: 3rd Generation DNA Sequencing and Beyond

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Understanding the dynamics of biological processes is fundamental to understanding life itself. At Pacific Biosciences, we are developing applications to observe individual biomolecules at work in real time. The first is monitoring DNA synthesis by single DNA polymerase molecules, allowing the speed, processivity, and efficiency of the enzyme to be exploited for new capabilities in DNA sequencing. The power of this new sequencing technology - characterized by long readlengths and fast run times - is highlighted through examples from diverse applications, such as finishing genomes, characterizing transcript and gene fusion diversity, rapid pathogen sequencing, and the direct detection of epigenetic markers.

The same instrumentation can be used to eavesdrop on other fundamental life processes, including transcription, reverse transcription, splicing, translation, and multi-component biomolecular interactions. Several examples of this paradigm will be described, including the dynamics of translation initiation and elongation by single ribosomes, and the dynamic action of anti-retroviral drugs on HIV reverse transcriptase.

