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Abstract for an Invited Paper
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**Irving Langmuir Prize in Chemical Physics Lecture: The Inner Machinery of Single Molecules:
resolving the unresolved with the STM**
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The scanning tunneling microscope (STM) is a unique instrument that can probe and induce changes in a molecule with atomic scale resolution. Its operation is based on the current that flows between the tip and the substrate with the molecule sandwiched in between. Therefore, the STM can be used to understand the coupling of electrons to the different states and excitations in the molecule and to investigate the influence on them by its environment. From the spatial and energy dependences of the coupling to the charge, spin, and nuclear motions in the molecule, verification of and new insights into the quantum mechanical properties of molecules can be obtained, including the discovery of new conduction and energy transfer mechanisms. This understanding of electron-molecule interactions with the STM enables rational ways to control chemistry and the exploration of novel physical technologies based on molecules.