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The End of Mercury Manometers with the Quantum-Based Pascal

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At NIST, new methods of pressure and vacuum realization that are based on quantum calculations are currently under development. This is exciting in that it fits with the current redefinition, that if a new technique relies upon a quantum property, measurement, calculation, or invariant of nature, then this technique can have served as a primary standard. Standards built this way are then directly tractable to the SI and will not itself require re-calibration. For the Pascal, NIST has developed a Fixed Length Optical Cavity (FLOC) and a Variable Length Optical Cavity (VLOC) that operate by measuring the gas pressure through the interaction of light with the atomic or molecular properties of the gas. Combined, these standards enable the elimination of mercury manometers, a standard that has been in use for four centuries. The talk will cover the current status of the project that was started over 5 years ago with an NIST Innovations in Measurement Science project, and will connect this effort to the broader context of SI-Redefinition. The talk will also briefly update activities on the Cold Atom Vacuum Standard (CAVS) project, and the NIST Thermodynamic Metrology Group.

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