"THE SCIENCE AND TECHNOLOGY OF QUANTUM CASCADE LASERS: FROM QUANTUM ENGINEERING TO THE INTERNET OF EVERYTHING"

Federico Capasso
School of Engineering and Applied Sciences
Harvard University, Cambridge MA 02138

Thursday, 5 February 2015, at 14:00,
in Malka Brander Hall of Justice, Trubowicz Building

The mid-infrared region of the spectrum (3-15 microns) for a long time did not realize its full potential, scientifically and technologically, notwithstanding its paramount importance for chemistry, spectroscopy and a myriad of potential applications, mainly because of the lack of a compact, room temperature, widely tunable and eye-safe semiconductor laser. This situation started to change drastically with the advent of the Quantum Cascade Laser (QCL) in 1994 (Ref. 1) and its subsequent momentous development in the following two decades. [2] I will illustrate the impact of QCLs in science (spectroscopy, chemical physics and atmospheric chemistry)[3] and technology, present and future, ranging from IR countermeasures to a wide range of sensor applications including health, security and, ultimately, the "internet of everything" . I will illustrate how the impact of this laser is directly related to its fundamentally different design based on quantum engineering and its intriguing physics, which showcases a rich variety of often unexpected phenomena.

1. J. Faist, F. Capasso, D. L. Sivco, A. L. Hutchinson, and A. Y. Cho, *Science* 264, , 553 (1994)
2. F. Capasso, *Journal of Optical Engineering* **49**, 111102 (2010)
3. R. F. Curl, F. Capasso, C. Gmachl, A. A. Kosterev, B. McManus, R., Lewicki, M. Pusharsky, G. Wysocki, and F. K. Tittel, Chem. Phys. Lett.487, 1 (2010)