

# Physics Colloquium

Michigan Technological University

Thursday, December 6, 2007

4:00 pm

Room 139, Fisher Hall

## Water Drop Electrification

**George E. Ewing**

Department of Chemistry

Indiana University

Bloomington, IN 47405 USA

**Abstract:** Lightning associated with thunderstorms, hurricanes, tornadoes, active volcanoes, and waterfalls, together with a host of other atmospheric electrical phenomena [1, 2], are a consequence of charge separation processes at the interface of water [3].

We have re-examined some water drop electrification experiments [2], one going back to the 19<sup>th</sup> century [4]. We have measured the charge on drops that arise from vigorous bubbling of air into water [5]. Since bubbling action in this experiment approximates that in turbulent natural waters, our results have relevance to atmospheric electrification. Folding in both recent experimental [6] and theoretical [7] insights into the nature of interfacial water, we offer a new mechanism for the electrification of drops.

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- [2]. D. C. Blanchard, *From Raindrops to Volcanoes*, Dover Science Books, 2004.
- [3]. H. R. Pruppacher and J. D. Klett, *Microphysics of Clouds and Precipitation*, 2<sup>nd</sup> edition Kluwer Academic Publishers: Dordrecht, 1997.
- [4]. P. Lenard *Ann Phys.* **46**, 584 (1892).
- [5]. J. T. Maze, L. W. Zilch, J. W. Smith, G. E. Ewing, and M. F. Jarrold, *J. Phys. Chem.* A submitted (2007).
- [6]. E. A. Raymond and G. L. Richmond, *J. Phys. Chem. B* **108**, 5051 (2004).
- [7]. P. Jungwirth and D. J. Tobias, *J. Phys. Chem. B* **106**, 6361 (2002).