



**JAMES MADISON**  
UNIVERSITY®

**SEMINAR**  
Friday, February 7

**Dr. Richard Vachet**

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University of Massachusetts*

## **Mass Spectrometry Imaging of Nanomaterial Therapeutic Delivery Systems and their Biochemical Effects**

**Abstract.** Nanomaterial (NM)-based delivery systems are attractive for drug treatments due to their ability to deliver a wide range of therapies in a way that ensures their maximum efficacy. While NM-based drug delivery systems have great potential, there is a need for tools to map their biodistributions and their biochemical effects to most effectively design and use these systems. To meet this need, we are developing and applying mass spectrometry (MS) imaging techniques that act as a sort of 'molecular histology' to reveal how different molecules, including NMs and their cargo, are dispersed in biological tissues.

Dr. Vachet will discuss two complementary MS-based imaging tools that we have developed and used. One of these techniques, MALDI-MS imaging, provides site-specific information about the molecular effects of the NMs and their therapeutic cargo on the tissues they are delivered to. Another technique, known as laser ablation inductively-coupled plasma (LA-ICP)-MS imaging, provides quantitative information about how much of the NM and its therapeutic cargo are present in different cells within a given organ. When used together, these MS imaging tools provide new chemical and biochemical insight that are leading to the improved development of NM drug delivery systems.

**About Dr. Vachet.** Richard Vachet is a Professor in the Chemistry Department at the University of Massachusetts Amherst. He received a Ph.D. in Analytical Chemistry from the University of North Carolina-Chapel Hill and did postdoctoral research at the US Naval Research Laboratory from 1997 to 1999 as a National Research Council Postdoctoral Research Associate. He began his independent career at the University of Massachusetts Amherst in 1999. His current research focuses on (a) the development and application of mass spectrometry-based methods to study protein amyloid formation; (b) the development of new tools to study the higher order structure of protein therapeutics; and (c) the detection and imaging of nanomaterial drug delivery agents in biological systems. He has published over 170 peer-reviewed journal articles and has been a member of the Editorial Board of the Journal of the American Society for Mass Spectrometry and the Features Panel for Analytical Chemistry.

Group webpage: <https://elements.chem.umass.edu/vachetgroup/>

**Meet the Speaker**  
**Seminar**

**2:00 pm, PCB 3144**  
**3:30 pm, King 159**