Statement of the Independent Investigating Committee Regarding Allegations of Research Misconduct at ORNL

C. Barry Carter, Department Head
Department of Chemical, Materials & Biomolecular Engineering
University of Connecticut

David B. Williams, President
The University of Alabama in Huntsville

Paul S. Peercy, Dean of Engineering
University of Wisconsin–Madison

An independent external investigation has concluded unanimously that there is no evidence for research misconduct, although some errors were made that have been acknowledged by the authors. These errors were judged to have no material impact on the scientific conclusions.

During the review of a manuscript "Direct measurement of charge transfer phenomena at oxide interfaces" by M. Varela et al, submitted to *Nature Physics* in early 2006, a referee anonymously alleged that the article contained potential data manipulation and misrepresentation. The Associate Editor of *Nature Physics* returned the paper to the authors and, on the same day, the Physical Sciences Editor of *Nature* raised similar concerns from an anonymous reviewer regarding potential data misrepresentation in an earlier paper entitled "Atomic-resolution chemical analysis using a scanning transmission electron microscope" by N. D. Browning et al, *Nature* 366 143-146, November 1993.

The Deputy Director, Science and Technology at Oak Ridge National Laboratory (ORNL) appointed an independent Investigating Committee of scientists/research managers from universities not affiliated with ORNL to review the results surrounding these allegations, along with the results of the ORNL inquiry into the allegations and associated documentation. The Committee did not know the subject of this investigation until they received the documents mentioned below. Members of the Committee did not know who the other members of the Committee would be until arriving at the meeting at ORNL. In addition, the complainants maintained their anonymity and did not identify themselves to this Committee during the investigation; this information did not become public until after the Committee had completed its investigation. After the Committee issued its report to ORNL management, one of the complainants contacted a member of the Committee. Discussions with the complainant did not change the Committee's conclusions.

Prior to convening at ORNL, the Committee was provided with the names of the authors of the two papers in question and detailed documentation of the ORNL inquiry into the allegations noted above. This documentation included complete information about the

Nature Physics manuscript, the correspondence surrounding the 1993 *Nature* paper, and a copy of the vast majority of the data and analysis used in that paper and related publications. Each member of the Committee independently studied this material, but did not discuss the material or any aspects of the case prior to arriving at ORNL on July 11, 2006.*

The Committee was asked to determine if allegations that the original data were misrepresented to justify the scientific claims of the papers are substantiated. The Committee was given complete cooperation by the ORNL management, staff, and the scientists whose actions were being investigated and invited to ask any questions they deemed appropriate. The Committee was also asked to suggest improvements to ORNL internal practices with regard to manuscript preparation / review.

The Committee began its on-site review by meeting with the ORNL Deputy Director, Science and Technology, who reviewed the history of the case, summarized the charge to the Committee, and addressed questions from members of the Committee. The Committee then agreed upon the detailed approach it would use in its investigation. The Committee had extensive discussion with a retired scientist who was hired by the Deputy Director to perform an in-depth, third-party review of the allegations and the facts / actions surrounding the papers in question.

Three of the authors of the papers in question were interviewed by the Committee: the first author of each of the two papers and the only author common to the two papers. These interviews covered events surrounding the collection and analysis of the data, preparation of the manuscripts, correspondence with the referee (via the Physical Sciences Editor of *Nature*), and the internal review process followed by this research group. The Committee also reviewed electronic files to examine data manipulation performed by the complainants in order to better understand the complainants' concerns.

The conclusion of the Investigating Committee is that, while there were errors of judgment and selection and analysis of data, there was no fabrication or falsification of the results. The Investigating Committee found no evidence for research misconduct or fraud in either paper. Furthermore, the committee found no evidence for a pattern of scientific misconduct or misrepresentation of data as implied by the complainant. The Committee also found the primary scientific finding of the 1993 *Nature* paper, namely that the Co signal changes discretely over one atomic plane (by generally accepted criteria), to be reasonable. This conclusion is evident from the spectral data, with or without additional processing.

The Investigating Committee believes that the authors of the 1993 *Nature* paper made some incorrect statements in their response to the referee's concerns and also included a incorrect statement in the caption to Figure 3 (as the authors acknowledge). While careless, neither of these errors had any effect on the conclusions of the paper and did not involve inappropriate manipulation, fabrication or falsification of data. This behavior therefore does not constitute research misconduct.

The Committee judged the unrelated 2006 *Nature Physics* submission to be of low quality, but found nothing to indicate research misconduct. In particular, it was concluded that the failure to explain the spliced-mirrored data in Figure 3c was the result of carelessness and poor judgment, not intent to deceive. This diagram produced no further scientific insight and did not affect the facts presented in the paper.

* The Committee met in December, 2006, to consider additional concerns that had been raised with regard to this issue after it had submitted its report to ORNL management. The Committee did not change its original conclusions after deliberations in this meeting.

Independent Investigation Committee
Regarding Allegations of Research Misconduct
at Oak Ridge National Laboratory

C. Barry Carter
Head, Department of Chemical, Materials, and Biomolecular Engineering
University of Connecticut

Professor Carter was appointed Head of the Chemical, Materials, and Biomolecular Engineering Department at the University of Connecticut in July 2007. Previously, he held the 3M Heltzer Endowed Chair at the University of Minnesota. He is General Secretary of the International Federation of Societies for Microscopy, former President of the Microscopy Society of America, Co-Editor-in-Chief of the *Journal of Materials Science*, and a former Scientific Editor of *Microscopy and Microanalysis* and the *Journal of Microscopy*. His research focuses on electron microscopy studies of dislocations, surfaces, grain boundaries, and phase boundaries. He is a Humboldt Senior Awardee, Fellow of the American Ceramic Society, and author or coauthor of more that 260 refereed journal articles.

Paul S. Peercy
Dean of Engineering
University of Wisconsin–Madison

Professor Peercy is Dean of the College of Engineering and Professor of Materials Science and Engineering at the University of Wisconsin–Madison. He is a former President of SEMI-SEMATECH, a non-profit technical consortium that comprises the equipment and supplier infrastructure of the U.S. semiconductor industry. He is also the former Director of Microelectronics and Photonics at Sandia National Laboratories. Peercy is a member of the National Academy of Engineering; Fellow of the APS, IEEE, and AAAS; and Councilor of the AAAS and former Councilor of the APS and MRS. He is the author or coauthor of more than 180 technical papers.

David B. Williams
President
University of Alabama in Huntsville

Professor Williams has been President of the University of Alabama in Huntsville since July 2007. Previously, he was Harold Chambers Senior Professor and Vice Provost for Research at Lehigh University. He is a former President of the Microbeam Analysis Society and International Union of Microbeam Analysis Societies, Editor of *Acta Materialia* and the *Journal of Microscopy*, and Editorial Board Member of *Microscopy and Analysis*. His research is in the areas of microstructural and microchemical analysis using electron beams. He is a Fellow of the Royal Microscopial Society (U.K.), the American Society for Materials International, and the Minerals, Metals, and Materials Society. He is the author or coauthor of more than 220 refereed publications.