

## **Visit to Pacific Northwest National Laboratory (PNNL) By The University of Texas at Dallas Delegation**

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### **Prelude**

Some six months ago, one of UTD's Research Advisory Board members ([http://www.utdallas.edu/research/ext\\_advice\\_council.htm](http://www.utdallas.edu/research/ext_advice_council.htm)), Dr. Maxine Savitz (also a member of the National Academy of Engineering, and many other important national scientific and technological committees), recommended that I make contact with the new Director of PNNL, Dr. Leonard Peters. Len was formerly Vice President for Research at Virginia Polytechnic Institute, and an outstanding chemical and environmental engineer by training.

After several telephone conversations, Len and I felt that there could be sufficient synergy between PNNL and UTD. To bring this vision closer to reality, we both agreed that it would be worthwhile to organize a visit to PNNL by a UTD delegation.

Quite unbeknownst to me, several UTD's active researchers, such as Bruce Gnade, Professor of Electrical Engineering and Chemistry, and Professor Anvar Zakhidov, Deputy Director of UTD's NanoTech Institute and Professor of Physics have already initiated discussions about possible scientific collaborations with one of the senior scientists of PNNL, Dr. Paul Burrows in areas of microelectronics and nanotechnology. I also discovered during this trip that Ray Baughman, Director of UTD's NanoTech Institute, is a member of the nanotech research advisory council of PNNL. All these parallel interactions made our visit even more relevant!

Thus, on January 6, 2004, and on one of the "snowiest days" in the Pacific Northwest for at least a few years (according to a local), a UTD delegation, consisted of myself, John Ferraris, Interim Dean of Natural Science and Mathematics of UTD, Anvar Zakhidov and Bruce Gnade, visited PNNL.

The list of PNNL members we met (at least according to the list of business cards I have collected. I apologize if I have left out someone) were:

1. Dr. Len Peters, Director
2. Dr. Ken Pepion, University Program Administrator
3. Dr. Rod Quinn, Assistant Laboratory Director Environmental Technology
4. Dr. Jud W. Virden, Deputy Associate Lab Director
5. Mike Schwenk, Director of Economic Development and Communications
6. Dr. Donald R. Baer, Laboratory Fellow Interfacial Chemistry and Engineering

7. Dr. Paul Burrows, Laboratory Fellow, Manager of Nanoscience and Technology
8. Dr. Steven D. Colson, Associate Director Chemical Structure and Dynamics
9. Dr. Moe Khaleel, Laboratory Fellow and Director of Computational Sciences
10. Dr. Linda S. Sapochak, Staff Scientist, Materials Science Division

## **PNNL**

In his introductory remarks, Len emphasized that PNNL is “primarily a chemical laboratory,” with interest in molecular interactions of one form or another.

Because of time limitations, we only saw a very small part of this vast research laboratory. Here I will describe some highlights.

PNNL, which is situated in Richland in the State of Washington, is one of several United States Department of Energy (DOE) laboratories. It is operationally managed by Battelle.

Essentially, from the academic perspective, DOE has two types of laboratories which are of great interest. The first type is the “weapons laboratories,” such as Los Alamos National Laboratory and Sandia National Laboratory, in New Mexico and Lawrence Livermore National Laboratory in Livermore, California. The second type is the scientific laboratories, such as PNNL; Brookhaven National Laboratory on Long Island, New York; Argonne National Laboratory in Argonne, near Chicago; Lawrence Berkeley Laboratory in Berkeley, California, and Oak Ridge National Laboratory in Tennessee (although ORNL also has a major weapons component). All these laboratories, in one way or another, have very extensive and intensive university programs.

PNNL has over 3800 employees. There are three (at least) major research facilities which serve as “users’ facilities”, which means that outside users, such as university researches, can apply for time to utilize the equipments. The laboratories are

1. Environmental Molecular Science Laboratory (EMSL),
2. Applied Process Engineering Laboratory (APEL) and
3. Marine Science Laboratory (MSL, which is situated Sequim, which is on the State of Washington's Olympic Peninsula in the Western end of the State near Seattle).

The annual budget of PNNL is approximately \$600 million.

We had a whirlwind guided tour of EMSL by Dr. Dr. Donald R. Baer. EMSL has the following components:

- Chemistry and Physics of Complex Systems Facility
- Environmental Spectroscopy and Biogeochemistry Facility

- High-Field Magnetic Resonance Facility
- High-Performance Mass Spectrometry Facility
- Interfacial and Nanoscale Science Facility
- Instrument Development Laboratory

In a number of these laboratories (including the world's largest magnet), we saw many very sophisticated "tool boxes" (a whimsical term used by scientists nowadays in reference to their favorite equipments to carry out experiments) for characterizing advanced materials at the molecular level.

We also walked pass the high end computing facility which is open to outside users. This computing machine is one of the top 10 fastest machines in the world.

Unquestionably, PNNL is an exciting center scientifically and technologically.

### **The joint Oregon State University and PNNL Microelectronics Breakthrough Institute (MBI) at OSU**

From the University point of view, the MBI is of great interest to me and my colleagues.

According to the website, MBI

*"is a collaboration between the PNNL and OSU. This partnership was established through the [Collaborative Research & Education Program operated by PNNL and the Oregon Universities](#). Our [virtual groundbreaking](#) for MBI was in January 2003. We create small technologies that solve big problems.*

*Both PNNL and OSU are well established in microproduct development. PNNL's thrust is [Micro Chemical and Thermal Systems](#) (MICROCATS) while OSU concentrates on [Micro Energy and Chemical Systems](#) (MECS). Our partnership is driven by the common desire to develop revolutionary microproducts that serve people.*

*The MBI will build on our joint capabilities to develop advanced microproducts. We seek to successfully deploy technical advances that will lead to educational and economic benefits to the region. Finally, the MBI seeks to model the way in which technology development is conducted through the collaboration of federal laboratories and universities.*

*We are successful partners in applying R&D to solve big problems."*

Such strong and sustainable interactions between a research university, such as OSU and a national laboratory, such as PNNL, could serve as an excellent model for other academic-national laboratory interactions/collaborations.

### **Epilogue: National laboratories and universities in Texas**

From the Texas point of view, it is very interesting to note that despite of its vastness, there is not a single national laboratory in this state. Comparable States such as California has at least 2, LLNL and LBL) and New York has at least one (Brookhaven). Our neighbor New Mexico has two, Sandia National Laboratory and Los Alamos National Laboratory. The intellectual (scientific and technological) and economic impact in the surrounding regions of these laboratories cannot be sufficiently underscored.

In the 21<sup>st</sup> century, where national laboratories are transforming, and reaching out, there is no question that research universities must go the extra mile (especially for UTD, for example) to establish close sustainable and collaborative relations with these laboratories. To do so, everyone we met in PNNL agreed with us that first, the science must “make sense and of the highest quality.” From this respect, I see that the OSU-PNNL should be a model we should examine closely.

In summary, while I told myself as we were flying into snowy Pasco, one of the tri-cities where the nearest airport is situated, that I should have my head examined for organizing a visit to PNNL in January, in hindsight after it was all over, all four of us agreed that the visit was exciting and filled with potential professional rewards.