

First International Conference on Molecular Electronics and Bioelectronics (M&BE1)

March 5-7, 2001

Awaji Yumebutai International Conference Center, Hyogo, Japan

The First International Conference on Molecular Electronics and Bioelectronics (M&BE1), a commemorative event for the 10th anniversary of the division of Organic Molecular Electronics and Bioelectronics in the Japan Society of Applied Physics, was held on March 5-7 (Mon.-Wed.) at the Awaji Yumebutai international conference center in Hyogo under the auspices of the Communications Research Laboratory and the National Research Institute for Metals. The scope of this conference covered *Molecular Nanoelectronics, Fabrication and Characterizations of Organic Thin Films, Optoelectronics and EL Devices, Bioelectronics, and Single Molecular Electronics*.

The number of participants, more than 250, was far greater than the organizers had estimated when they planned the conference. This is probably because interest in the conference topics directly related to nanotechnology has been growing rapidly recently. Professor Shirakawa's Nobel Prize for chemistry this year for his pioneering work in conductive polymers must have made the research field of the conference even more attractive.

There were 147 presentations, including 20 invited talks by internationally distinguished researchers, displaying remarkable activities at the frontiers of research. Because of the limited period of the conference, the other presentations were posters-apart from seven talks in the special contest session. Since the sessions were scheduled in series, the participants could concentrate on every presentation.

Location

The conference site was near the northern end of Awaji Island in the Seto Inland Sea. This island is connected to Honshu, the main island of Japan, by the world's longest suspension bridge, the Akashi Kaikyo Bridge, which opened in 1998. The bridge offers quick road access: about 30 minutes from downtown Kobe and about 60 minutes from Osaka. The site is close to the epicenter of the Hanshin-Awaji earthquake that struck 6 years ago, but the area has been completely restored and there are no visible signs of that tragic event.

The Awaji Yumebutai international conference center has the latest equipment and is located in a beautifully natural environment. The conference hotel, the Westin Awaji Island, has a fine view of the Inland Sea and is connected to the conference center by corridor so that most of the participants had plenty of opportunities to talk with each other in a relaxing environment without worrying about transportation.

Plenary Lectures

The conference started with two plenary lectures on the Monday afternoon. The first, "Do we need Molecular Computers?" was given by Dr. Ari Aviram (IBM), who has made tremendous contributions to the development of molecular electronics since the early days of the field. The lecture covered the historical background, present developments, and the

future of molecular electronic devices.

The second lecture, "Organic Thin Films and the Path to Molecular Optoelectronics," was given by Professor S. R. Forrest (Princeton Univ.). The lecture covered not only the state-of-the-art technologies in molecular optoelectronic devices, such as organic light-emitting devices, but also the fundamental mechanisms of several photoprocesses in organic thin films.

Presentations

Following the plenary session, the "Molecular Nanoelectronics" session with five invited talks focused on the latest research on single molecular functions, a research area directly related to single molecular electronics. Doctor Y. Okawa (Riken) demonstrated that a single chain polymerization of diacetylene compounds could be precisely controlled and visualized by scanning tunneling microscopy. In work described in other talks, scanning probe microscopy was also used as a fundamental tool for access to single molecules.

Two sessions on Tuesday addressed the "Fabrication and Characterizations of Organic Thin Films" and "Optoelectronics and EL Devices." In the first session, with four invited talks, were demonstrated various methods for characterizing organic thin films, including scanning probe microscopy, noise analysis, dynamic laser analysis, and angle-resolved ultraviolet photoelectron spectroscopy (UPS). The following session, also with four invited speakers, focused on organic light-emitting devices and related optoelectronic materials. Great progress has been made in this field recently because of its practical applications to display devices.

The session with five invited talks on Wednesday focused on "Bioelectronics." Each talk described a unique approach to the use in electronics of biological materials such as DNA or proteins. Professor T. A. Winningham (Univ. of Colorado) showed his remarkable results: that naturally occurring protein crystals with nanometer-scale features can be used as masks (bionanomasks) for dry etching.

After 16:00 on Tuesday, 117 contributed papers were presented in a poster session in the corridor connecting the conference center to the hotel. The presentations were categorized into the four fields covered in the invited talks. The friendly environment of the poster session gave all the participants opportunities for stimulating, creative discussions on various issues ranging from fundamental principles to the details of experiments.

Special Contest

A special contest for proposals on "Single Molecular Electronics" was held after the oral sessions on Tuesday. Seven proposals were presented, each in a 15-minute talk, and the finalists were selected by



the vote of the conference participants. The winner, determined by the organizing committee, was Dr. M. Nakamura (Chiba University), for his proposal "Self Assembled Molecular Nano-Transistor."

Social Program

One of the greatest pleasures in the conference lay in the social program. The Welcome Party on Monday night was preceded by a Bunraku Puppet Drama (Ningyō Joruri) performed by junior-high-school students from Awaji. The language spoken in traditional Bunraku Puppet Drama is classical Japanese, which is sometimes difficult even for native speakers of Japanese to understand. But the English explanation given throughout the drama was so helpful that the conference participants must surely have been amused. The students' skillful manipulation of the puppets was so impressive that some of the audience must have wished they were equally skillful in the manipulation of molecules.

Poster Awards

Several awards, totaling 500,000 yen in value, were bestowed with the intention of encouraging the work of young researchers. The winners were selected in the same way that the winner of the Special Contest. The Best Poster Award went to Dr. S. Yokoyama (Communications Research Laboratory), and the Outstanding Young Scientist Award went to Dr. J. Perkins (University of California). Six other participants, including five young students, also received poster awards.

This conference has succeeded in providing all the participants in various scientific fields with an enthusiastic, fantastic atmosphere, which was surely created by themselves. The people could thus have interdisciplinary interactions with each other. It laid a firm foundation for the molecular-scale electronics.

*Do we need Molecular Computers?
Yes, we do!*

JSAP