ASPE Meetings

- 27th ASPE Annual Meeting
- Summer Topical Meeting - Precision Engineering and Mechatronics Supporting the Semiconductor Industry

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Dear Colleague:

We ended 2011 with a very successful Annual Meeting in Denver. The Denver hotel was in the heart of the city with lots to do and very nice weather. There were 20 tutorials, nearly 40 oral presentations, 110 posters, 34 exhibitors, over 330 attendees and even a micro-brewery within walking distance. Now we turn our attention to 2012 with a Summer Meeting on Precision Engineering and Mechatronics for the Semiconductor Industry in Berkeley from June 24-27, and the Annual Meeting in San Diego from October 21-26.

The Berkeley meeting is the second in a planned series on precision engineering supporting the semiconductor industry. The 2008 meeting brought together over 100 attendees from Europe, the Americas, and Asia. The organizing committee has a call for papers on the ASPE website, and we encourage you to submit an abstract and visit Berkeley in June.

The 2012 Annual Meeting will be in La Jolla, CA, just north of San Diego, and offers you the opportunity to learn, grow professionally, expand your network, and rejuvenate in the many recreational activities within and near the city.

I look forward to seeing you again at an ASPE Meeting in 2012.

Tom Dow, Executive Director

PATTERN #7: STRUCTURAL LOOP*

The concept of a structural loop is widely used, and is generally well understood in the precision engineering community. That is not to say that there is a concise definition at everyone's fingertips nor is a stiff design easy to do. We do not propose to provide such a definition, merely to observe that the tool/probe and workpiece have to be positioned relative to one another. Expressed in terms of a machine tool, the workpiece is generally held in a fixture, mounted on a spindle in a headstock bolted to a base carrying a slide as in - the hip bone’s connected to the knee bone and the, etc.

The structural loop is closed by, and its dynamics sometimes driven by, tool/probe-workpiece interactions. Instrument/machine dynamic and its thermal performance is dominated by the structural loop. The design of this interface has an important impact on the operation of the machine.

PATTERN #7:
Maximize the resistance of the instrument to vibrational and thermal influences by

- Making the path from the test probe to the workpiece as short as possible and
- Making that path contain a minimum number of joints.

Model the structure to determine its static and dynamic mechanical properties.

An example is the difference between the Talysurf and Talystep profilometers. The Talysurf has a large operating range (>100 mm) with linear slides to control the motion of the contacting diamond stylus and a vertical slide to raise its height. The Talystep uses a stiff, short range flexure to move the tool with a range of motion of only a couple of millimeters. However, this short, stiff structural loop leads to a noise floor for the Talystep on the order of 1 Å as shown in Jean Bennett’s work** at China Lake. This is orders of magnitude better than the Talysurf but the price one pays is a limited range of motion.

Next pattern: **KINEMATIC DRIVES**

*Based on "Patterns for Precision Instrument Design," a classic ASPE tutorial by C. Teague, C. Evans (and later D. Swyt) that identifies 12 mechanical concepts or patterns that drive precision in fabrication, assembly and metrology.

**"Stylus profiling instrument for measuring statistical properties of smooth optical surfaces," by Bennett, J.M. and Dancy, J.H., Applied Optics, Vol 20, pg 1785, May 15, 1981.

The **American Society for Precision Engineering** promotes the future of manufacturing in America by advancing precision engineering though supporting education and encouraging the development and application of precision principles.

ASPE, founded in 1986, is a non-profit organization.

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