



Refraction by Time and Technology

Gee, time does fly. The organization for next year's International Optical Design Conference (IODC) is well under way. It will be held next year in Jackson Hole, Wyoming, on June 13–18. The conference has a long and distinguished history going back to the International Conference on Optical Design with Large Computers in Rochester in July 1966.

It was nine years before the next conference, called the International Lens Design Conference (ILDC), took place at Haverford College in Pennsylvania in June 1975. Robert Sweet and Bennett Sherman reported [*Appl. Opt.* **15**(2), 302–303 (1976)] on the meeting. The list of issues was modest compared to later conferences:

- (a) Given some reasonably well-designed lens system, do major automatic optimization computer programs tend toward similar results and, if not, what are the differences;
- (b) Can optical engineers sit down at a computer terminal and work with these programs without detailed knowledge of the inner structure of the programs;
- (c) Can universally agreed specifications be established for various common optical systems;
- (d) What is the status of today's automatic design programs?

The format was different from current meetings. In addition to giving papers on lens design, there were three typical design problems to be solved by the participants during the conference. The thrust of the problems was finding an optimum solution with a minimum of operator intervention. Sweet and Sherman observed that:

Despite efforts to the contrary, some of the computer runs had to be coaxed along by the operators to arrive at reasonable solutions. However, all three teams reported that the work seemed to tend toward similar solutions. Differences could be identified as to cause-selection of different weighting factors in

the merit functions, restrictions applied to the back focal length, or other principal dimensions, and so on. The major differences and difficulties experienced by all were those that have plagued designers from the beginning: merit function construction and use, understanding of the metric, and identification of the optimum solution.

The more things change....

The first ILDC conference I attended was held on the campus of Mills College in Oakland, California, in the summer of 1980. It was the first time I met the late Warren Smith and Bob Hopkins along with many other designers who continue to push the caustic. In 1985 the conference moved away from a campus site to Cherry Hill, New Jersey, hard by an active Bell Labs site. By then the conference was too large for attendees to be able to work on a set of small collaborative problems like those at Haverford. This approach was replaced by devising a single problem that was published ahead of time. The results were then the topic of an evening conference session. In 1990, I served as the evaluator for a problem known as the Monochromatic Quartet, four component lenses of BK7 that were to be automatically designed as a set of specifications. As before, the better performing lenses were designed with some coaxing from their authors. Over the years, the conference problems have demonstrated that lens designers won't be replaced by automatic design programs anytime soon.

At the 1998 (retitled) IODC held in Kona, Hawaii, there were many papers on the perpetual concerns of ray tracers: initial ray sets, zoom lens designs, and measuring performance. Most of the new areas covered at the conference were driven by new optical technologies such as gradient optics and diffractive optics. But there was not much on alignment and precision engineering at the time. No LEDs; no MEMS. No sessions on micro-optics, nano-optics, or medical and bio-optics. Those had to wait for advances in the technology so that they could be addressed in 2006 in Vancouver, British Columbia.

Next year's IODC conference in Jackson Hole will reflect the continued expansion of technology. Faster computers and more sophisticated optical structures and devices have opened up entire new areas of optical engineering. The short list of issues explored at Haverford has been refracted by time and technology into a broad spectrum of topics that engages our curiosity, sending us back to our computers and our labs. The range of topics to be addressed at the 2010 IODC is so extensive that it would take an additional page to list them. Go to the conference web site at <http://www.osa.org/meetings/topicalmeetings/IODC/> to see the list. Perhaps, you can contribute to this continuing evolution of a 35-year tradition in optical engineering.

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