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Introduction

This conference is the fourth SPIE conference dedicated to the sharing of key optical lessons learned. Nearly all optical engineers, scientists, researchers, or managers have dealt with the unexpected. Many of these situations in hindsight are quite funny, and have buried within them key optically related lessons. The problem with simply listing lessons learned is that as a simple listing, they are hard to remember clearly. Thus, much to our collective debit, history repeats itself. This conference was configured to allow a bit of humor into the mix. By presenting a collection of small interesting stories or optical, managerial, and/or project-related parables, it helps us all remember the important takeaways. Though we allowed each presentation to be somewhat embellished by the author (within editorial limits), with names, places, and dates sometimes changed to protect those involved, this year there was also an emphasis on hard truths. Please note that even when humor is used, all presentations have a basis in truth as self-avowed by the author and "the devil's advocate" by the Chair, and all talks included at least one, if not more than one, lesson learned that have serious optical content.

Papers were specifically requested on past, current, and/or evolving optically related developments that satisfy the following criteria:

- Have been subject to surprises, anomalies, and/or unanticipated business factors which, in hindsight, are funny and which have a key optical lesson learned/takeaway
- Where (optically related) specifications went terribly wrong
- Any aspect of the build-cycle could be included be it in conceptualization, design, development, fabrication (any somewhat optically related process), test, or end-use
- Any discipline could be included if/as it ties to optics (e.g. project management, principal investigator roles, opto-mechanics, thermo-optics, electro-optics, optical-physics, etc.)
- Any personnel problem could be included if/as it relates to an optical truth (this could include hiring, training, or the lack thereof).
- Any optically related piece-parts could be included, from raw materials to heat treats, to coatings, to mechanisms, etc.
- Any optical environment was acceptable, e.g., from underwater to outer space to child-proof toys to shot-from-a-gun
- Any size was acceptable, e.g., from nano/MEMS, to deployable multi-meter optics
- Any unusual scheduling and/or financing problem was acceptable as long as it was optically driven
- Aspects that tied to IP, patents, and/or other legalities could be the subject of interest, and

- Inter-company relationships and/or relationships with clients, suppliers, and or vendors could be included—if the author so dared, and could sanitize the text to avoid liability (and as long as there was a key optically related takeaway, though these could be in an optical business-based sense).

Of special interest were stories where, despite any humor, the optically related lessons learned were serious and would help to form a body of knowledge that can grow and be used as an evolving checklist for other ongoing or future optically related adventures.

Again this year, we had some exceptional speakers that have had direct, hands-on involvement in a tremendous amount of important and diverse roles in optical history. These sessions are a chance for us to share this information and capture key takeaways that can be used by all, whether new to the industry or a seasoned veteran. Our hope is that these talks will help to keep us out of trouble, even if only to clarify our own thoughts and/or help justify budgets so that management will adequately fund our endeavors.

We won't trivialize the punch-lines by doing a simple summary here. The authors' papers deserve serious attention and a set of crib-notes doesn't do these sometimes complex subjects justice. It's not so much that the concepts are so terribly complex; it's that the situations that lead to some of the lessons learned have slippery-slope contextual aspects that are relatively subtle, or there are logical short circuits that come into play. Just one past example would be from HST. End-to-end testing was eliminated to save money. The presumption was that as long as two totally different piece-part tests agreed, all would eventually be well. But then schedules got tight, and logic gave way to what folks knew in their hearts was right—that the reflecting null corrector used to finalize the primary mirror was all that really mattered, and that the supposedly less accurate refracting null could be ignored (not!). Of course in ignoring the refracting null's test results the initial premise was violated that required two different tests which had to agree, and agreement should mean quantitatively match-up accounting for the respective tests' tolerance bands. (As we know, although on paper the reflecting null corrector was better than the refractive null corrector which was used to rough-in the primary mMirror, the reflecting null corrector was not built to specifications.)

By not shorting out your need to examine the papers presented, we're actually invoking a lesson learned. Simple summary charts often can lead to a false sense of understanding. But with that stated, we do intend to keep tabs on the various lessons learned, and this may well become a future rolling scorecard, albeit with a somewhat intentional time delay to encourage the real-time readers to delve into the details and find the devil that's hiding in wait for them.

The Chair would like to provide a special thank you to all the speakers, as well as the advice of his Committee Members. All the talks were truly exceptional!

For those speakers who wish to be "judged" (and where no 2nd place finishers are noted), we sometimes give a technical or a management award. Award ceremonies, if any, are held in an appropriate following year. This year, so many talks were judged to be 10s on a 10-point scale that there were both technical and managerial ties. The chair will sort this out with the help of the presenters and the members of his committee, and report the results at the next Lesson's Learned session, whenever that may be, though it's possible that at some point additional information will also be released in SPIE's Members News. (Don't worry if you were a speaker; you won't be surprised. We'll close the loop with all involved ahead of time. For those of you who participated last year, please be patient, and we'll announce more information when logistics allows.)

After the conference cut-off date, and thus after conference rooms had been assigned and the overall timing of all the SPIE sessions had been established, several (nearly 60!) speakers inquired about presenting in 2015. Of course it was too late to accommodate these requests, but because of this apparent (TBD, I'll believe it when it comes true) pent-up demand/desire to continue in the regular sharing of this type of information, we are releasing an out-of-cycle call for papers for 2016. The response to this call will determine if we hold our next Lessons Learned session in 2016 or revert back to the alternate year schedule that we have used to date.

Thanks also to the audience for engaging questions and discussion, and to the SPIE staff for their help.

Mark Kahan