

ETOP: A retrospective study

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ABSTRACT

The ETOP (Education and Training in Optics and Photonics) meetings have been held for 26 years on a biennial basis since 1988 when the first conference was held in San Diego, California. Since that time it has been organized by various groups and held at multiple venues throughout the world. In this paper we provide a comprehensive survey of the meeting: its history, locations and participants, and will provide comprehensive data on the meetings held to date. This is the first attempt at providing quantitative metrics for this international meeting that addresses optics and photonics education at all levels (K-12, undergraduate, graduate and vocational education). It is anticipated that this data can help to inform decisions for future ETOP meetings and can guide the collection of additional data.

Keywords: ETOP, optics education, photonics education

1. INTRODUCTION

In hopes for the continuation of the ETOP meeting and in anticipation of continuous improvement of the proceedings the authors felt it was time to gather together all of the data currently available on this biennial meeting, organize it in a meaningful way and subject it to analysis. It is our intent that these efforts can set the stage for ensuring the quality of the meeting (and hence the papers presented/published), thereby insuring the success of future ETOPs and thus the meeting's continuation.

To quote one of the early contributors to ETOP, Robert E. Fischer, in the introduction to one of the very first ETOP papers, he said, "Most people would say that 'hindsight is 20-20.' We in the optics business say that 'hindsight is diffraction limited.' What of course we really mean by this cliché is that looking back always seems to make things clearer. In fact it is interesting to think about why in our society we study history. One of the really tangible reasons is that by studying the history of the past we can better prepare for, and to some extent extrapolate, into the future".¹ In this paper we examine the available data from previous ETOP conferences to help us prepare for the future of more successful education meetings.

2. HISTORY OF ETOP

Since the meeting's inception in 1988 there have been 12 iterations of the ETOP conference, usually happening every other year. There have been a few instances when the meeting did not take place but the intent has always been to hold ETOP in alternating years. The reasoning behind this schedule was that once a year was felt to be too frequent and there would be difficulty in attaining adequate participation to make the meeting viable. But it was also felt that waiting more than two years was too long and we could miss important new developments in the science and art of optics pedagogy. So an every other year schedule was agreed upon. A list of past ETOP conferences, showing their venues, dates and chair persons follows:

1988 International Conference on Education in Optics

San Diego, California (USA); 14-15 August 1988

Chair and Editor: Brij M. Khorana, Rose-Hulman Institute of Technology

Number of published papers: 24

1991 International Conference on Education in Optics

Leningrad (St.Petersburg), USSR; 28 September-1 October 1991

Co-chairs and Editors: Gregory B. Altshuler, St. Petersburg Institute; Brian J. Thompson, Univ. of Rochester

Number of published papers: 79

ICO Topical Meeting on Education & Training in Optics

Organized by the Hungarian Optical Society OPAKFI and the Janus Pannonius University for ICO
Pecs, Hungary; 16-19 August 1993
Chairs & Editors: J. Erostyak, A. Fuzessy, L. Kozma
Number of published papers: NA

1995 International Conference on Education in Optics

San Diego, California (USA), 9-10 July 1995
Chair and Editor: M. J. Soileau, CREOL/Univ. of Central Florida
Number of published papers: 83

Fifth International Topical Meeting on Education & Training in Optics

Delft, The Netherlands; 19-22 August 1997
Chair: Christiaan Velzel, Nederlandse Philips Bedrijven B.V. (Netherlands)
Number of published papers: 56

Sixth International Topical Meeting on Education & Training in Optics & Photonics

Cancun, Mexico; 27-30 July 1999
Chair: Javier Sanchez Mondragon, Inst. Nacional de Astrofisica, Optica y Electronica & Univ. Autonoma del Estado de Morelos (Mexico)
Number of published papers: 55

Seventh International Topical Meeting on Education & Training in Optics & Photonics

Singapore, 26-30 November 2001
Chairs: Tuan-Kay Lim, Nanyang Technological Univ. (Singapore); Arthur H. Guenther, Ctr. for High Technology Materials/Univ. of New Mexico
Number of published papers: 78

Eighth International Topical Meeting on Education & Training in Optics & Photonics

Tucson, Arizona (USA), 6-9 October 2003
Chairs: Barry Shoop, US Military Academy; Grover Swartzlander, Worcester Polytechnic Institute
Number of published papers: 104

Ninth International Topical Meeting on Education & Training in Optics and Photonics

Marseille, France, 24-27 October 2005
Chair: Francois Flory, Institut Fresnel, France
Number of published papers: 101

Tenth International Topical Meeting on Education & Training in Optics & Photonics

Ottawa, Ontario (Canada), 3-5 June 2007
Chair: Marc Nantel, Ontario Centres of Excellence
Number of papers: 74

Eleventh International Topical Meeting on Education & Training in Optics and Photonics

St. Asaph, North Wales, United Kingdom, 5-7 June 2009
Chair: Alan Shore, Photonics Academy for Wales and Bangor University, United Kingdom
Vice Chair: Deb Kane, Macquarie University, Australia
Number of papers: 66

Twelfth International Topical Meeting on Education & Training in Optics and Photonics

Porto, Portugal, 23 - 26 July, 2013

Chairs: Manuel Filipe P. C. Martins Costa, Universidade do Minho, Portugal and Mourad Zghal, Université de Carthage, Tunisia. Honorary co-chairs: Zhora Ben Lakhdar and Vasudevan Lakshminarayanan
Number of papers: 104

The first ETOP conference (the 1988 International Conference on Education in Optics) was organized at the initiation of the Academic Advisory Committee of SPIE. It was held in conjunction with SPIE's annual meeting in San Diego, California and was co-sponsored by the OSA. The leadership of both societies had indicated that education was a natural area for cooperation and ETOP was one of the vehicles for this. The focus of the first conference was on undergraduate and M.S. level educational programs in optics or optics-related fields, the supply of and demand for such graduates, and interaction between academia and industry. The first ETOP resulted in 24 papers with participants mostly from North America.

The second conference was held in 1991 in St. Petersburg, Russia and in addition to SPIE and OSA, ICO (the International Commission on Optics) joined the team as a co-sponsor of the event. This conference resulted in 79 published papers with a large portion of the authors (33%) being from Russia.

The 1993 ETOP meeting was held in Pecs, Hungary but we found very little information about this iteration of ETOP. No papers were received for publication nor were there any reports available indicating attendance numbers or program content.

In subsequent years, the ETOP paper count ranges from a low of 55 papers (Cancun, Mexico in 1999) to a high of 104 (in both Tucson, AZ, 2003 in North America and in Porto, Portugal, 2013 in Europe) with an average of 80 papers. Normally the event attracts about 125 registered attendees.

In 2006, the IEEE came on board as the 4th permanent co-sponsor of ETOP. Various other sponsors have been solicited for each conference by ETOP's local organizers and have made contributions to the meeting. A major funder for American participation was the National Academies which provided complete travel support for US participants for a number of the meetings. In addition, the National Science Foundation of the United States has at times provided travel funds for participants from nations with developing economies.

ETOP 2011 had been scheduled to take place in Tunis, Tunisia (for the first time in Africa), but was postponed twice and then eventually cancelled because of concern over political unrest during the "Arab spring" time period. This was a difficult decision for the Long Range Advisory committee to make. But in the interest of the safety of participants and concerns about lack of attendance the committee decided it was prudent to cancel.

3. THE ORGANIZATIONAL STRUCTURE OF ETOP

The four permanent sponsors of ETOP (SPIE, OSA, ICO and IEEE) provide representatives on the Long Range Advisory Committee (LRAC), one representative from each society, plus non-voting staff representatives from both SPIE and OSA. These permanent sponsors provide seed money for the conference, and their representatives on the LRAC solicit and review host applications for future ETOP meetings, selecting the local organizer and venue. This role is acknowledged in a 2013 article by Karen Newman published in *Photonics Spectra*, stating, "Today, the Long Range Advisory Committee provides leadership and vision for the future of the conference."²

4. DATA ORGANIZATION

The authors assembled 828 records, one for each paper that has been published as part of an ETOP proceedings. Each record included: the year of the conference, paper code, paper title, first author name, first author gender, first author

country of residence, first author geo-region of residence based on the United Nations geoscheme (developed by the United Nations Statistical Division), first author employer, level of paper, number of pages of paper.

Figure 1 below is a map illustrating the United Nations geoscheme³ and showing where ETOP conferences have taken place. Note: Northern, Southern, Eastern and Western Europe were combined to form Europe in our data analysis. Central, Eastern, Western, Southern and Southeastern Asia were combined to form Asia.



Figure 1

The choices for Employer of the first author were: Academia, Industry, Government and Consultant. The choices for Level of paper were: K-12, Undergraduate, Graduate, Undergraduate/Graduate, Technician, Continuing Education and General.

5. ETOP PUBLICATIONS SUMMARY DATA

Overall a total of 821 papers have been published in the ETOP proceedings and they can all be accessed at the website (<http://spie.org/x95260.xml>). Using this as our base, we organized and analyzed the data.

First we show the meeting venue and the number of papers published in Figure 2. The largest number of papers were published in the Tucson meeting (2003) and the Porto meeting (2013). A possible explanation for the strong numbers in 2003 is the fact that this meeting was co-located with the Frontiers in Optics meeting of the OSA. It has long been the strategy of the LRAC to require that ETOP be co-located with a strong technical meeting to ensure participation and meeting success. The meeting in Marseilles (2005) also had more than 100 papers. The Marseilles meeting was during the International Year of Physics and took place just before the UN conference on physics for development held in Durban, South Africa so this may have contributed to its success. And to explain the strong numbers in 2013 it is important to remember that there was no meeting in 2011 (vide supra) and many of the papers submitted to the planned Tunis meeting were automatically accepted for the Porto meeting.

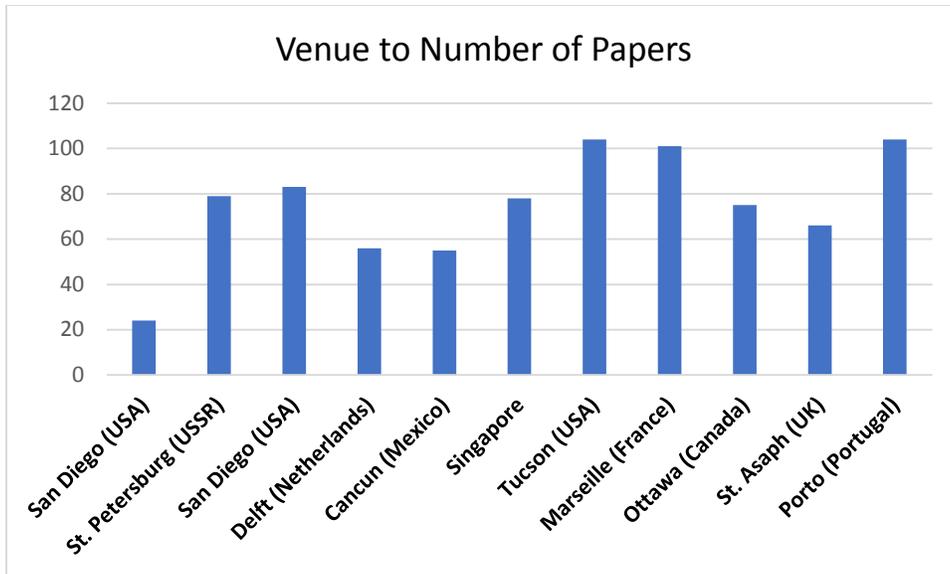


Figure 2

Figure 3a below shows the distribution of first authors by country of residence and it is clear from the chart that the majority of papers have come from authors residing in either North America or Europe. We attribute this to two factors: 1) the meeting has been held 4 times in North America and 5 times in Europe and there is a tendency for the meeting to attract local educators; 2) those geo-regions have strong economies and authors residing in them have the resources available to allow conference participation.

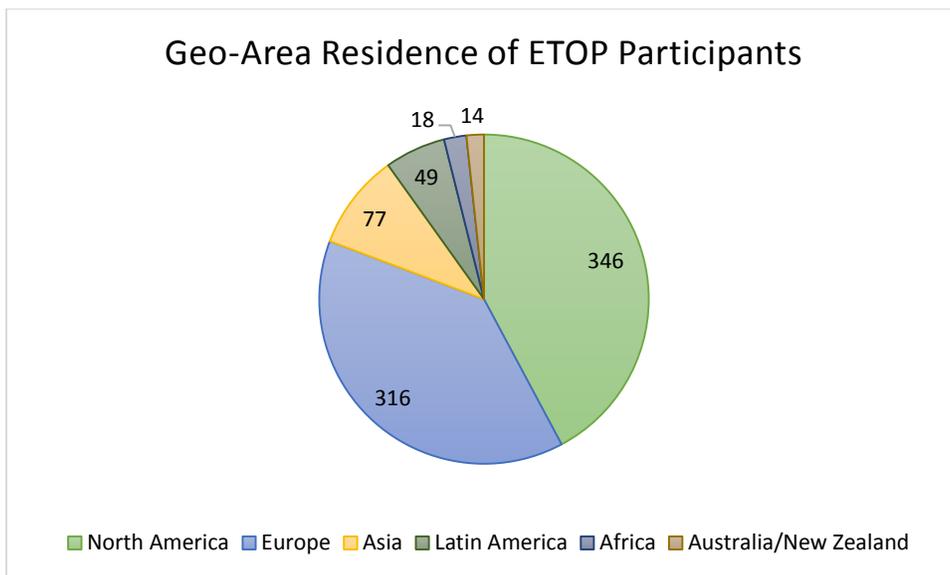


Figure 3a

Figure 3b shows the gender breakdown. Women constitute approximately 16% of the total number of primary authorships in the proceedings. This appears to follow the results found for global gender disparities in science publications⁴

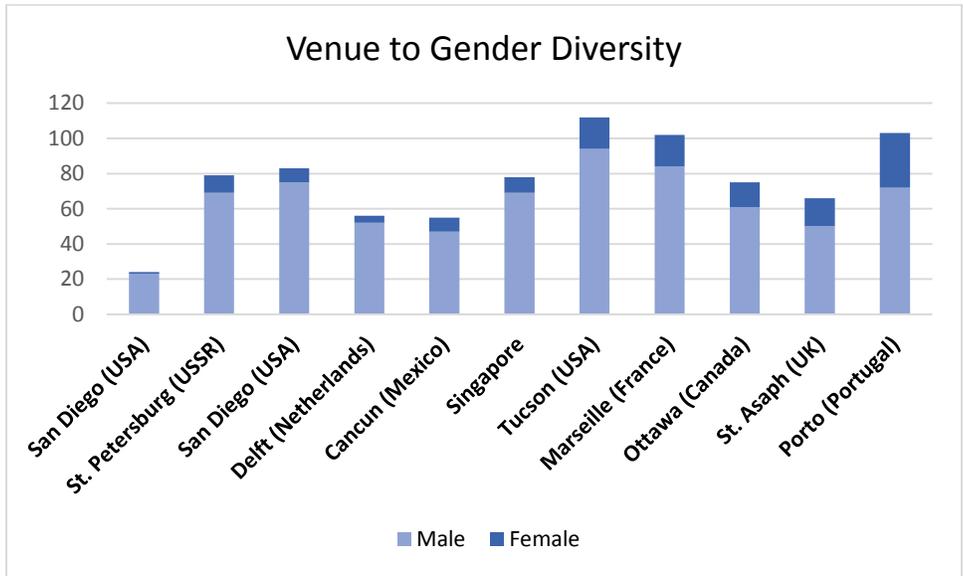


Figure 3b

In terms of industry and academia participation, we plot in figure 4 the ratio of first authors from academia versus industry as a function of the meetings. As expected there is a preponderance of academicians participating in the meeting. Obviously very few industries encourage direct participation of their employees in educational activities. Anecdotally we know that the industry participants do so out of their own initiative and often as a result of their involvement with local chapters of the societies and regional clusters. There were 24 contributions from governmental organizations (ministries, government laboratories, military, etc.) and approximately 6 publications were from professional societies or non-profit organizations. A few were either private consultants or not-noted.

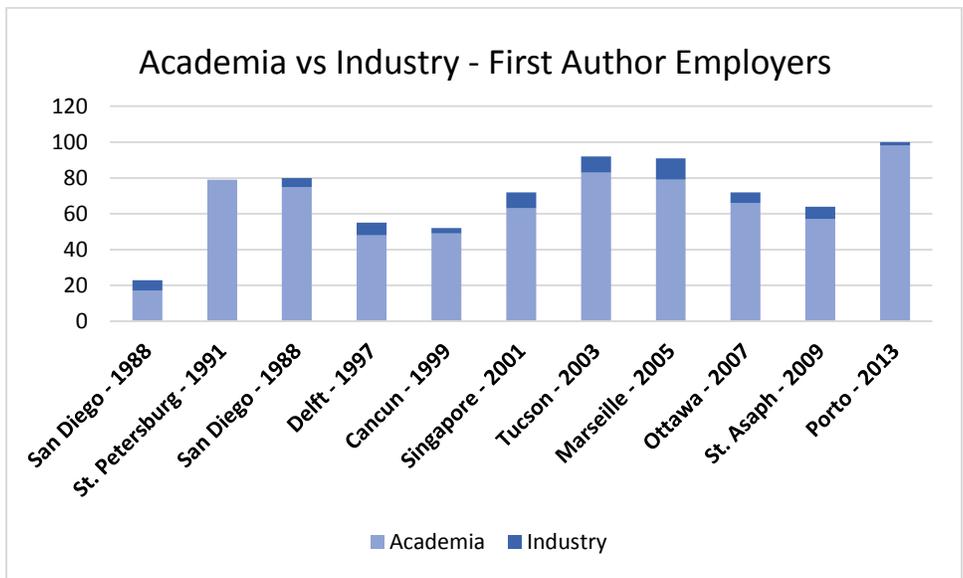


Figure 4

Since part of the mission of ETOP is to provide assistance to educators in developing nations we looked at the proportion of first authors that came from developing or transitional economies, as defined by the United Nations World Economic Situation Prospects (WESC)⁵. The results of this comparison can be seen in Figure 5 below. Generally the meetings held in Europe and Asia have been slightly more effective at getting participation from educators in developing nations. The one exception appears to be San Diego in 1995 but that can be explained by a National Science Foundation Grant that provided travel support for more than 15 authors from the former Soviet Union. It is also noted that there is a general tendency for the ETOP meeting to attract educators from the local area where the meeting is held.

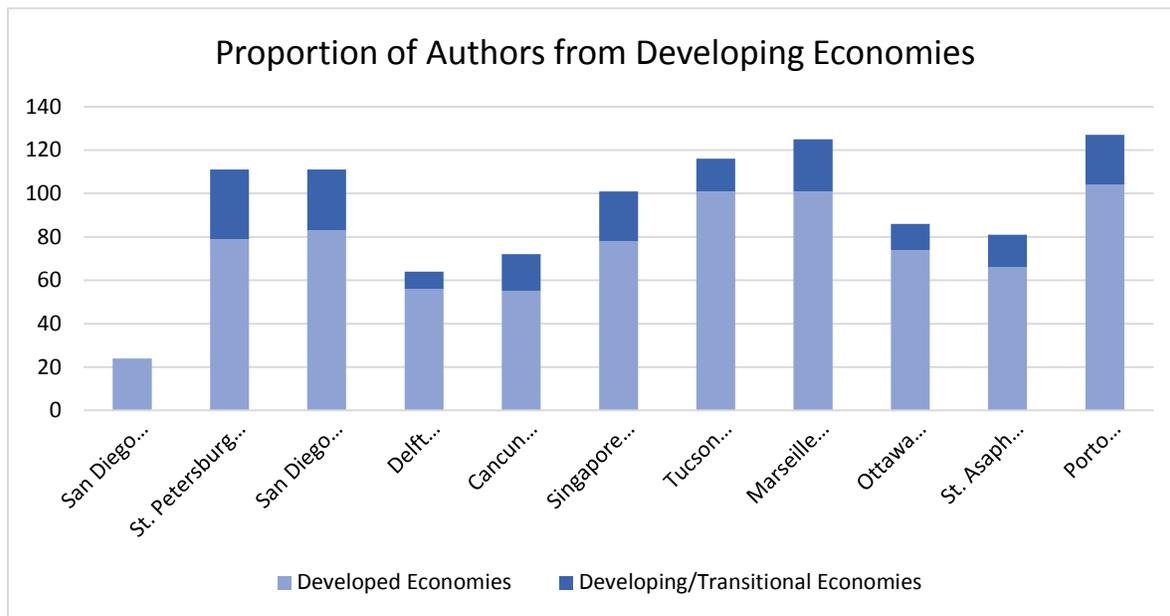


Figure 5

We have further classified the submitted papers as to the level of: K-12 (school – primary, middle and high school), undergraduate, graduate (or post-graduate for some countries), technician/vocational, continuing education and general. These classifications were based on a reading of the title and abstract of the proceedings papers. Of course, some of these papers could easily be classified in one or more categories. Of the more than 800 papers that have been published in the ETOP proceedings there were a total of 42 papers in the technician/vocational category, and 94 papers on the K-12 category. The continuing education category had a total of 28 contributions and the remaining 650+ papers pertained to either undergraduate or graduate education or both. It should also be pointed out that although not all the meeting proceedings were originally published as part of the SPIE Proceedings series all have been made available on the ETOP website maintained by SPIE. The ETOP papers from the 2003 meeting are published as part of OSA Publishing on the OSA website.

We also did a quick search on the web of science (<http://wokinfo.com/>) for the citations of papers from the ETOP proceedings. Much to our disappointment, we could only find an H-index of 3! However, it should be noted that the Web of Science does not cover all papers (proceedings are not properly covered). Also, we do know that other forms of citations such as downloads, and mention in social media are not adequately considered by the Web of Science. For example, again anecdotally, a paper by one of us has been downloaded 53 times according to the science social media site, Research Gate⁵. Therefore additional more sophisticated methods of bibliometry will need to be employed in order to properly assess the impact of ETOP papers.

From the data available we could discern no direct correlation between the time of year the meeting is held and the number of papers submitted.

6. CONCLUSIONS

The ETOP meetings have been a series of biennial meetings devoted to exploring the best practices in the teaching of optics and photonics. This has drawn educators and educational innovators from all over the world and has resulted in over 821 conference publications. There has been participation from members of academia, industry and government amongst others. And while we acknowledge the success of these conferences and their value to the community, there are some shortcomings.

First, though participants have come from all over the world to participate in the ETOP the meeting, it cannot truly be called international because of where it has been held. The sites of the meeting to date have been Europe (6 times), North America (4 times), once in Asia and once in Latin America. The meeting has never taken place in South America or in Africa (even though one had been planned for North Africa, it had to be cancelled due to the political situation). The meeting has occurred once in Russia and the authors suggest that it could be beneficial for future venues to include the other so-called BRICS nations (Brazil, India, China and South Africa).

Second, in terms of the impact of the meeting, we need to get better metrics on the success (or failure) of these meetings. In addition to data like the number of papers or percentage of authors from a particular geo-region we would like to point out the need for qualitative measures. Relevant questions to ask include, for example, has this meeting resulted in significant collaborations between researchers, have some of the pedagogical methods been incorporated in the courses taught by the participants who have attended this meeting, has there been a significant difference in student understanding and achievement, and has this meeting acted as a catalyst for change? Some of these issues are hard to answer; however for the health of the conference and our discipline we do need to pursue these goals.

This science and technology that we deal with is an enabling science and we are a critical part of the century of photonics. Therefore it is imperative that our students get the very best, most effective education in the field. It is our sincere hope that this series of meetings has had an impact on teaching and knowledge transfer in the field of optics and photonics and will continue to do so. Hopefully this brief look back has helped us to see ETOP a little more clearly and to plan for the way ahead.

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