

## Ingram Olkin (1924–2016): Some Personal Memories <sup>★</sup>

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Top left *p*<sub>11</sub> at IWMS-1990 Tampere (with Jerzy K. Baksalary & Yadolah Dodge, photograph courtesy University of Tampere); top right *p*<sub>12</sub> at IWMS-1995 Montréal (with Gene H. Golub and T. W. Anderson, photograph by Simo Puntanen); bottom left *p*<sub>21</sub> at IWMS-1995 Montréal (photograph by Simo Puntanen); bottom right *p*<sub>22</sub> at IWMS-2011 Tartu, Estonia (photograph by Jeffrey J. Hunter).

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Ingram Olkin, Professor Emeritus of Statistics and Education at Stanford, University, Master of multivariate statistical analysis, linear algebra, inequalities, majorization, and meta-analysis, passed away on 28 April 2016 at home in Palo Alto, California, after complications from colon cancer. In the words of his daughter Julia Olkin [1]

“My father, Ingram Olkin, died peacefully on Thursday evening, April 28, 2016, with his daughter Rhoda and wife Anita by his side. He had absolutely no regrets ... both personally and professionally, and led a full, wonderful life. He valued all his friendships with everyone. Thank you for being a part of his life ...”

Richard W. Cottle, Professor Emeritus of Management Science & Engineering and a close friend of Olkin, said [2]

“He was a man of remarkable intelligence and affability. His nearly boundless energy was generously used for the welfare of others. It is hard to capture in words the goodness that Ingram showed in his everyday life.”

In the conversation part of the *Olkin Festschrift* [3], Ingram described himself:

“You also know that I’m generally a people person, which is one of the reasons why I’ve enjoyed students and collaborators. Over the years, the professional contacts have merged with the personal contacts.”

We deeply miss you, a truly outstanding and unforgettable *People Person*, Ingram Olkin.

## 1 IWMS

Now let’s go back to some personal memories of Ingram and joint experiences that we shared with him. One important activity for us was his role in the International Workshop on Matrices and Statistics (IWMS) series [4]. Ingram was a frequent participant at IWMS meetings, and at the IWMS-2004 in Poland we celebrated Ingram’s 80th Birthday. On 4 June 2003 his reply to our invitation was this e-mail [Ingram usually used only lower-case letters in his e-mails]

“dear all ... wow !!!! how about celebrating my 80th but call it my 60th ... thanks so much to all of you ... would be pleased to attend.”

When Ingram learnt that the IWMS-2014 was to be held in Ljubljana, he immediately, on 22 October 2013, sent this e-mail

“... in any case next year is my 90th and what better than to visit ljubljana ... so i do hope to attend. as i see my strength at this point i should be in good shape by then. so please include me in the program.”

It was always great news for the event organizers to have Ingram around: a guarantee of lively colorful sessions, Ingram sitting in the front row and asking questions after each talk. Ingram’s role in meetings is nicely described in the Olkin-biography article [6]:

“At most statistics meetings, you will find Ingram in constant conversation – perhaps promoting a new journal, encouraging progress of a key committee, or giving advice about seeking grants or allocating funds. His public accomplishments are many and impressive, but equally important are his behind-the-scenes contributions.”

The first IWMS was held in Tampere, Finland, 6–8 August 1990. Ingram gave an invited talk entitled *Interface between statistics and linear algebra*, which was one of his favorite topics and he practically knew everything about it [9, 10]. For the IWMS-2013 in Toronto he prepared an excellent “linear algebra biography”, which was presented there as a poster; see also [11] (2015):

“I gave a brief biography of my introduction to linear algebra and my interaction with some of the linear algebraists at that time.”

At the IWMS-1990 in Tampere, Ingram also gave a talk about Gustav Elfving (1908–1984), a famous Finnish statistician, probabilist and mathematician who was a frequent visitor to Stanford. On 19 March 2013 Ingram sent this e-mail to Simo:

“i am cleaning my files and i found folder marked elfving which contains mimeographed notes entitled bayes statistics. it consists of about 40 pages ... so one possibility is that i scan these and send to you ... assuming you want this material ... please advise.”

As for Elfving, on 20 May 2011 Ingram wrote the following:

“... my only concern is how to handle the mixture of beer and aquavit. I don’t have the right DNA. I once visited gustav elfving and he took me to a meeting of students where they drank beer and aquavit and talked and drank and sang and drank ... i barely made it back to the hotel. So Finland can be a very dangerous country ... but i am willing to take a chance.”

Ingram’s performances in Tampere in 1990 can be seen in videos online at YouTube [16]. When we asked for Ingram’s permission to show these videos, he replied:

“these are wonderful . . . an absolutely great addition to the conference archives. however, you ask for me to give permission to make these public. the answer is in the negative unless you can add some hair and make me look more like james bond. of course, if you do that then i would be glad to grant permission !!!!!”

This e-mail is part of the communication between Ingram, Michael Greenacre and Kimmo Vehkalahti. Kimmo had agreed to host Ingram and Michael Greenacre in Helsinki, 1–3 July 2011, directly after the IWMS-2011 in Tartu, Estonia. With the kind courtesy of Kimmo, we copy here part of Ingram’s travelling protocol.

“dear kimmo: on the basis of my previous experiences in finland I suggest that we just go to a Sauna, drink some beer and listen to michael [Greenacre] sing some of his compositions. . . . meanwhile my very best, ingram.  
ps. michael . . . why don’t you write a song with the first three words: sauna, sauna, sauna.”

The IWMS-2008 was held in Tomar, Portugal (22–26 July 2008) in celebration of the 90th birthday of T. W. Anderson, mentor of George and grand-mentor of Simo, and a long-time Stanford colleague of Ingram’s. We invited Ingram as an after-dinner speaker. On 8 April 2008 he wrote:

“i replied that i didn’t want to give an after-dinner talk. i was going over my files and i found the after-dinner talk that i gave in 1998 in florida . . . so what would you think if i gave the same talk . . . maybe with some modest updates. i also kept the photos on transparencies which are different from what simo has.”

Unfortunately Ingram was unable to attend the IWMS-2008 in Tomar. On 7 July 2008 he wrote to the IWMS organizers:

“i think that it may make it easier for everyone if i send you the after-dinner speech that i had in mind. simo is pretty [serious a guy compared with the others]<sup>1</sup> so he may be a good choice [to present this after-dinner speech].”

Let us borrow a paragraph from Ingram’s after-dinner speech:

“I was once interviewed and asked who makes the decisions in our family. I knew the answer in a flash—I make all the big decisions, Anita makes all the small decisions. The only problem is that we haven’t had a big decision yet in my 63 years of marriage.”

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<sup>1</sup> wording changed

Section 20.5 in our 2011 *Matrix Tricks* book [12] deals with *How Deviant Can You Be?* — the deviation of any particular observation from the mean, building on Ingram’s paper [13, (1992)] and Jensen & Styan [15].

In December 2011 we (Simo & George) had an interesting and pleasant task: we were to prepare a supporting letter to nominate Ingram Olkin for the Hans Schneider Prize in Linear Algebra. For additional support, we contacted Grace Wahba, Professor of Statistics at the University of Wisconsin–Madison, and on 31 December 2011 she wrote us:

“I wholeheartedly support the proposal that Ingram Olkin be considered for the Prize in Linear Algebra. Absolutely he has to get it!”

Though Ingram did not ultimately receive this particular Prize, on 2 August 2012, he kindly sent us a thank-you e-mail:

“simo: thanks for your message and in particular i forgot about the award ... however, i am signing George up to write my obituary (assuming he outlives me !!!!!!!) ... I can always count on him. my best, ingram.”

## 2 Inequalities: Theory of Majorization

In our supporting letter for the Hans Schneider Prize we pointed out that in our view Ingram’s most significant contribution in linear algebra was the book *Inequalities: Theory of Majorization and Its Applications*, with Albert W. Marshall, first published in 1979 [7]. We now have the second edition, with Barry Arnold [8], of the highly-praised classic, without which we know that some people never leave home: now these faithful ones must take into account that the second edition has 909 pages (vs. 569) and its shipping weight is 3.2 pounds (vs. 2.2).

At the end of the first edition of *Inequalities: Theory of Majorization and Its Applications* [7] there is a section on “Biographies” with a photograph of Issai Schur (1875–1941) on page 525. This was the first photograph of Schur that we found and George used it, with the permission of the “publisher and the authors” of [7], in his article on “Schur complements and linear statistical models” [17, (1983/1985)]; see also [18, 19].

Fuzhen Zhang wrote us on 11 May 2016:

“Dating back to 1984, I went to Beijing Normal University as a graduate student. The first math book in English we used as a text was Ingram’s (with Marshall), the 1st edition. I learned and benefited so much from the book. The book has become classical, famous and standard as a reference in this area of research. In 2012, I had the privilege of writing a review for the 2nd edition of the book (published in [20]).”

Ingram had a number of Chinese connections, among them was Kai-Tai Fang who in [21, p. 16] tells the following, which is a nice example of Ingram's organizational generosity!

“During my visit to Stanford University (1981–1982), Professor Ingram Olkin organized a small seminar group on ‘multivariate multiple comparisons’ which met every week. The participants included T. W. Anderson, Mary Ellen Bock, Zhongguo Cheng and me. . . . Then in 1985–1986, upon Professor Ingram Olkin's recommendation, I taught two subjects in the Swiss Federal Institute (ETH, Zürich) as a Guest Professor.”

George thinks that he first met Ingram at a colloquium in the Department of Mathematical Statistics at Columbia University in the mid-1960s and at that time may well have served Ingram a cup of tea! Ingram then introduced George to “correlation structure”, such as when all the correlation coefficients are equal (intraclass correlation) but the variances are not necessarily all equal. This led to George's Ph.D. thesis [23, (1969)]. See also Ingram's paper on “correlations revisited” (with discussion) [22].

George spent the summer of 1970 at Stanford and he believes it was probably there that Ingram introduced him to the seminal paper by Fan & Hoffman [24, (1955)] in which it is proved that for any  $n \times n$  matrix  $\mathbf{A}$

$$\text{ch}_j(\mathbf{A} + \mathbf{A}^*)/2 \leq \text{ch}_j^{1/2}(\mathbf{A}\mathbf{A}^*), \quad j = 1, 2, \dots, n. \quad (1)$$

Here  $\text{ch}_j$  denotes the  $j$ th largest eigenvalue. See also Marshall & Olkin [7, p. 240, eq. 4]. The inequalities (1) were then used by Grossman & Styan in their article on Theil's BLUS residuals [25, (1972)]. And last, but not least, George is most grateful to Ingram for supporting George's appointment as Editor of *The IMS Bulletin*, 1987–1992 [26].

In the “Biographies” section (pp. 528–529) of *Inequalities: Theory of Majorization and Its Applications* [7] there are three photographs of Godfrey Harold Hardy (1877–1947), who with John Edensor Littlewood (1885–1977) and George Pólya (1887–1985) wrote the seminal book *Inequalities* [27], first published in 1934. G. H. Hardy is featured in *The Man Who Knew Infinity* [28], a recent British biographical drama film based on the book [30, (1991)] by Robert Kanigel. The film stars Dev Patel as Srinivasa Ramanujan (1887–1920) and Jeremy Irons as G. H. Hardy. In his movie review, Allan Hunter [29] wrote

“It tells such a good story that it is hard to resist”.

Would a movie about Ingram, *The Man Who Knew Inequalities: Theory of Majorization*, similarly make a good story, hard to resist?

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Photographs: Top left  $p_{11}$  at IWMS-1990 Tampere (with Jerzy K. Baksalary & Yadolah Dodge, photograph courtesy University of Tampere); top right  $p_{12}$  at IWMS-1995 Montréal (with Gene H. Golub and T. W. Anderson, photograph by Simo Puntanen); bottom left  $p_{21}$  at IWMS-1995 Montréal (photograph by Simo Puntanen); bottom right  $p_{22}$  at IWMS-2011 Tartu, Estonia (photograph by Jeffrey J. Hunter).

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