

SOME COMMENTS ON THE
LIFE AND PUBLICATIONS OF
JERZY K. BAKSALARY (1944–2005)¹

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Abstract

Following some biographical information on Jerzy K. Baksalary (1944–2005) and some comments by Tadeusz Caliński, Oskar Maria Baksalary, and *Image* Editors-in-Chief: Bryan L. Shader and

¹Invited paper submitted for publication in the Special Issue in Honour of Jerzy K. Baksalary (1944–2005) of *Discussiones Mathematicae–Probability and Statistics*. This paper is an updated (and shortened) version of “Some comments on the life and publications of Jerzy K. Baksalary (1944–2005)” edited by Oskar Maria Baksalary and George P.H. Styan and published in the Tenth Special Issue (Part 2) on Linear Algebra and Statistics of *Linear Algebra and its Applications* (vol. 410, pp. 3–53, 2005), in remembrance of Jerzy K. Baksalary, and “Some comments on the life and publications of Jerzy K. Baksalary (1944–2005) with several photographs and a survey of his work in block designs” edited by Oskar Maria Baksalary and George P.H. Styan, Report 2005-04 from the Dept. of Mathematics and Statistics, McGill University, 26 October 2005, 55 pp.

Hans Joachim Werner, this article continues with personal remarks on the life and publications of Jerzy K. Baksalary by Anita Dobek, R. William Farebrother, Jürgen Groß, Jan Hauke, Radosław Kala, Erkki Liski, Xiaoji Liu, Augustyn Markiewicz, Thomas Mathew, Wiesław Migdałek, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, C. Radhakrishna Rao, Dietrich von Rosen, George P.H. Styan, Tomasz Szulc, Yongge Tian, Götz Trenkler, Frank Uhlig, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang. These remarks are followed by a detailed list of Jerzy Baksalary's publications prepared by the editors of this article.

2000 Mathematics Subject Classification: 01A65, 01A70, 01A73, 15A18.

Key words and phrases: The Adam Mickiewicz University in Poznań, The August Cieszkowski Agricultural University of Poznań, authorship matrix, bibliometrics, biography, generalized inverses of matrices, history of mathematics and statistics in Poland, linear statistical models, matrix equations and inequalities, matrix partial orderings, obituary, rank of a matrix product, Tadeusz Kotarbiński Pedagogical University in Zielona Góra, Zielona Góra University.

0. INTRODUCTION

Professor Jerzy K. Baksalary passed away in Poznań, Poland, on 8 March 2005. He was 60 years old. Although suffering, he remained active in his research work to the very end. Jerzy Baksalary is survived by his wife Mirosława, son Oskar Maria, daughter Katarzyna Baksalary-Iżycka and son-in-law Dariusz Iżycki, and granddaughters Natalia, Dominika, Marianna, and Iga Iżyckie. He is also survived by his sister Grażyna Michalska and brother-in-law Maciej Michalski.

Jerzy K. Baksalary was born in Poznań on 25 June 1944. His middle name "Kazimierz" was not the name his parents wanted to give him but in 1944 the choice was limited to certain names only; Jerzy did not like this middle name and never used it.



Figure 1. Jerzy Baksalary talking about “Admissibility and sufficiency of linear estimators in the Gauss–Markov model” at the International Workshop on Linear Models, Experimental Designs & Related Matrix Theory (First International Workshop on Matrices and Statistics): Tampere, Finland, 8 August 1990. [Photograph: University of Tampere.]

For the years 1969–1988, Jerzy Baksalary worked at what is now known (in English) as the Agricultural University of Poznań² where he was associated with the Department of Mathematical and Statistical Methods from 1975 to 1988, serving as head of its Didactic Unit of Mathematics and Mathematical Statistics from 1981 to 1988. He completed his Ph. D. in 1975 and his Habilitation³ in 1984, both at the Adam Mickiewicz University in Poznań. His Ph. D. dissertation [4] in linear statistical models was written under the supervision of Tadeusz Caliński and his Habilitationsschrift, also in linear statistical models, was published as [56]. In 1990 Jerzy Baksalary received the title of Professor in Mathematical Sciences from the President of Poland.

Jerzy Baksalary joined the academic community in Zielona Góra (about 120 km. SW of Poznań) in 1988, working in the Institutes of Mathematics, first of the Tadeusz Kotarbiński Pedagogical University⁴ and then of the Zielona Góra University⁵ after it was founded on 1 September 2001 (when the Tadeusz Kotarbiński Pedagogical University merged with the Technical University of Zielona Góra⁶). He was the Rector of the Tadeusz Kotarbiński Pedagogical University in Zielona Góra from 1990 to 1996, the Dean of its Faculty of Mathematics, Physics, and Technology from 1996 to 1999, and the head of the Department of Linear Algebra and Mathematical Statistics since 2001. For the 1989–1990 academic year, he was Professor of the Finnish Academy of Sciences in the Department of Mathematical Sciences of the University of Tampere in Tampere, Finland.

²Full name: The August Cieszkowski Agricultural University of Poznań (in Polish: Akademia Rolnicza im. Augusta Cieszkowskiego w Poznaniu), so named in 1996 after the Polish philosopher and economist August Cieszkowski (1814–1894), who founded the Halina School of Agriculture in Żabikowo (near Poznań) in 1870. The University of Poznań was founded in 1919 and in 1955 was renamed the Adam Mickiewicz University after the Polish poet Adam Bernard Mickiewicz (1798–1855). In 1951 the Faculty of Agriculture–Forestry separated from the University of Poznań to establish the independent Higher School of Agriculture (in Polish: Wyższa Szkoła Rolnicza), which was renamed the Agricultural University of Poznań in 1972. [Reference: *Academy of Agriculture in Poznań: Department of Mathematical and Statistical Methods 1980–1990* edited by Jan Hauke, Idzi Siatkowski.]—*Eds.*

³“Habilitation is a term used within the university system in Poland, and in some other European countries, to describe either a qualification, the process of earning that qualification, or—incorrectly—the thesis written as part of that process (which is called Habilitationsschrift). A Habilitation qualifies for being admitted as a professor at a university.”—*Wikipedia.*

⁴ In Polish: Wyższa Szkoła Pedagogiczna im. Tadeusza Kotarbińskiego.

⁵ In Polish: Uniwersytet Zielonogórski.

⁶ In Polish: Politechnika Zielonogórska.

Jerzy Baksalary published extensively on matrix methods for statistics. He is the author or coauthor of more than 180 research publications in linear algebra and statistics, including 48 papers published and one accepted for publication in *Linear Algebra and its Applications* (LAA). The Third Special Issue on Linear Algebra and Statistics of LAA [119] was edited by Jerzy K. Baksalary and George P.H. Styan and the Tenth Special Issue (Part 2) was published in remembrance of Jerzy K. Baksalary in November 2005.

At the funeral service for Jerzy Baksalary held in Poznań on 15 March 2005, Tadeusz Caliński eulogized him (in Polish):

“Let me express our feelings particularly on behalf of those who were close to you in the early years of your academic career, in the seventies and eighties of the past century, at the Agricultural University of Poznań. At that time you were for us an encouraging example of a person full of scientific ideas and willing to work hard. Your works in the theory and applications of mathematical statistics and linear algebra drew us into the streams of worldwide scientific literature.

Your personality stimulated younger colleagues and students, for whom you soon became a master and promoter of their careers. Among our joint scientific results of those years, your achievements shine with a particular brilliance. Your contributions to the Poznań school of mathematical statistics and biometry are highly esteemed at present and will be acknowledged by future generations.”

A Special Memorial Session for Jerzy Baksalary was organized by Oskar Maria Baksalary, Simo Puntanen, George P.H. Styan, and Götz Trenkler and held on 31 March 2005 at the 14th International Workshop on Matrices and Statistics (Massey University–Albany campus, Auckland, New Zealand, 29 March–1 April 2005). For this Memorial Session a set of handouts was prepared which included a reprint of a booklet prepared for the “Session on the occasion of the 60th birthday of Jerzy K. Baksalary” held at the Mathematical Research & Conference Center, Polish Academy of Sciences, Będlewo, Poland, on 17 August 2004, just before the 13th International Workshop on Matrices and Statistics. For the Auckland Memorial Session, Oskar Baksalary wrote about his father:

“Although from the formal point of view I am a physicist and not a mathematician or statistician, with the death of JKB I have lost not only my father, but also my scientific master. On the one hand, this makes his passing away twice as hard for me to bear, but on the other hand I am very happy that for about the last four years I have been sharing with my father his great passion – mathematics.

During this period we have been spending lots of time together, for instance travelling, visiting jazz clubs and art galleries, attending Thursday seminars on linear algebra organized at the Agricultural University of Poznań, chatting, and above all... doing mathematics.

JKB really loved his subject and especially he was in love with everything having to do with matrices. This means he also loved the Workshops on Matrices and Statistics. My father and I have been participating in these Workshops since 2000, when the Workshop was held in Hyderabad, India, and thus the one organized this year in Auckland was to be the sixth which we would jointly attend⁷... JKB used to sit in the first row. Please leave an unoccupied seat for him.”

The set of handouts distributed at the Memorial Session for Jerzy K. Baksalary in Auckland (tribute T-1b in Table 0.1 below) was revised and updated into a single 24-page handout for the Southern Ontario Matrices and Statistics Days: Dedicated to Jerzy K. Baksalary (1944–2005) held in Windsor, Ontario, Canada, 9–10 June 2005 (tribute T-4a in Table 0.1). The revised version of the Windsor handout was published in the Tenth Special Issue (Part 2) on Linear Algebra and Statistics of *Linear Algebra and its Applications* (vol. 410, 2005, 3–53), in remembrance of Jerzy K. Baksalary (tribute T-6 in Table 0.1). The present article is a revised and shortened version of the tribute T-6 in Table 0.1.

Jerzy Baksalary made extensive contributions to *Image: The Bulletin of the International Linear Algebra Society*. As noted by *Image* Editors-in-Chief Bryan L. Shader and Hans Joachim Werner in *Image* issue no. 34 (Spring 2005), page 13:

⁷ Jerzy Baksalary also attended the International Workshop on Linear Models, Experimental Designs & Related Matrix Theory (First International Workshop on Matrices and Statistics), Tampere, Finland, August 1990, see Figure 1 above.

“Recently *Image* lost one of its strongest supporters, contributors, and friends. Jerzy Baksalary read and revised nearly every problem submitted to the *Image* Problem Corner. In addition, he often provided his own (always elegant and illuminating) solutions. Jerzy actively solicited lead articles, book reviews, and reports. Jerzy, we (and the readers of *Image*) will miss you.”

A list of Jerzy Baksalary’s 30 contributions to *Image* appeared in the article by Oskar Maria Baksalary and George P.H. Styan in *Image* 34 (2005), 14–15. This is tribute T–3 in Table 0.1 below.

Apart from this introduction, the present article is in two parts. In Part 1 we present further personal comments on the life and publications of Jerzy K. Baksalary by Anita Dobek, R. William Farebrother, Jürgen Groß, Jan Hauke, Radosław Kala, Erkki Liski, Xiaoji Liu, Augustyn Markiewicz, Thomas Mathew, Wiesław Migdałek, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, C. Radhakrishna Rao, Dietrich von Rosen, George P.H. Styan, Tomasz Szulc, Yongge Tian, Götz Trenkler, Frank Uhlig, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang.

In Part 2 we discuss the publications of Jerzy Baksalary, and in Table 2.1 we present an annotated list which we believe to be complete of Jerzy Baksalary’s publications in research journals and collections (conference proceedings, Festschriften, and other edited books), proposed problems and solutions to problems, and journal special issues, including references to reviews of his papers in *Mathematical Reviews* (MR) and *Zentralblatt MATH* (Zbl); for signed reviews the reviewer’s name is given in parentheses.

Table 0.1. List of tributes to Jerzy K. Baksalary.

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- T–1a Booklet entitled “Session on the occasion of the 60th birthday of Jerzy K. Baksalary: Będlewo, August 17, 2004” [compiled by Waldemar Wołyński] includes “Curriculum Vitae” (pp. 1–2), “Program” (pp. 3–12), “JKB’s Passions: Family, Paintings, Jazz, New York” (pp. 13–18 with 10 photographs), “List of Publications” (pp. 19–32), “On some [of] Baksalary’s contributions to the theory of block designs” by Tadeusz Caliński (pp. 33–43); 43 pp., 17 August 2004.
- T–1b Booklet entitled “Session on the occasion of the 60th birthday of Jerzy K. Baksalary: Będlewo, August 17, 2004” (Reprint of T–1a updated by Oskar Maria Baksalary, Augustyn Markiewicz, Simo Puntanen, George

P.H. Styan, and Waldemar Wołyński) and a set of handouts prepared for the “Jerzy K. Baksalary Memorial session” (held on 31 March 2005) at the 14th International Workshop on Matrices and Statistics held on the Albany campus of Massey University in Auckland, New Zealand (March 29–April 1, 2005); 44 pp., 31 March 2005.

- T-2 Audio-visual tape [prepared by Stephen Ford and copied onto DVD] of “A Special Memorial Session for Jerzy Baksalary” organized by Oskar Maria Baksalary, Simo Puntanen, George P.H. Styan, and Götz Trenkler (held on March 31, 2005) at the 14th International Workshop on Matrices and Statistics held on the Albany campus of Massey University in Auckland, New Zealand (March 29–April 1, 2005). Presentations by Simo Puntanen, C. Radhakrishna Rao, George P.H. Styan, and Götz Trenkler; 1.3gb, 31 March 2005.
- T-3 “Jerzy K. Baksalary (1944–2005) and his contributions to *Image*” by Oskar Maria Baksalary and George P.H. Styan, *Image: The Bulletin of the International Linear Algebra Society* (ISSN 1553-8991, newsletter published by the International Linear Algebra Society): no. 34 (Spring 2005), pp. 14–15: www.uwo.edu/bshader/IMAGE34screen.pdf published July 2005.
- T-4a Booklet entitled “Some comments on the life and work of Jerzy K. Baksalary (1944–2005)” edited by Oskar Maria Baksalary and George P.H. Styan, prepared for the Southern Ontario Matrices and Statistics Days: Dedicated to Jerzy K. Baksalary (1944–2005) held in Windsor, Ontario, Canada, June 9–10, 2005. This tribute includes 8 photographs (pp. 1 & 24), comments by Oskar Maria Baksalary, Tadeusz Caliński, R. William Farebrother, Jürgen Groß, Jan Hauke, Erkki Liski, Augustyn Markiewicz, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, Tomasz Szulc, Yongge Tian, Götz Trenkler, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang; “On some of Baksalary’s contributions to the theory of block designs” by Tadeusz Caliński (pp. 18–22) and “the $A'A$ matrix” (page 23); 24 pp., 9 June 2005.
- T-4b Program for the Southern Ontario Matrices and Statistics Days: Dedicated to Jerzy K. Baksalary (1944–2005) held in Windsor, Ontario, Canada, June 9–10, 2005. This tribute includes abstract of T-4a (page 16); 20 pp., 9–10 June 2005.
- T-5 “Some comments on the life and work of Jerzy K. Baksalary (1944–2005)” by Oskar Maria Baksalary and George P.H. Styan, *Research Letters in the Information and Mathematical Sciences*

(ISSN 1175–2777, preprint series published by the Institute of Information and Mathematical Sciences, Albany Campus, Massey University, Auckland, New Zealand): vol. 8 (2005), pp. 1–43: www-ub.massey.ac.nz/~wwiims/research/letters/volume8/ This tribute (which follows up on T-1b and T-4a) includes comments by Oskar Maria Baksalary, Tadeusz Caliński, R. William Farebrother, Jürgen Groß, Jan Hauke, Erkki Liski, Augustyn Markiewicz, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, Tomasz Szulc, Yongge Tian, Götz Trenkler, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang, the survey entitled “On some of Baksalary’s contributions to the theory of block designs” by Tadeusz Caliński (pp. 32–40), and 6 photographs (pp. 41–42); 43 pp., July 2005.

- T-6 “Some comments on the life and publications of Jerzy K. Baksalary (1944–2005)” edited by Oskar Maria Baksalary and George P.H. Styan, published in the Tenth Special Issue (Part 2) on Linear Algebra and Statistics of *Linear Algebra and its Applications* (vol. 410, 2005, 3–53), in remembrance of Jerzy K. Baksalary. This tribute (which follows up on T-5) includes comments by Oskar Maria Baksalary, Tadeusz Caliński, R. William Farebrother, Jürgen Groß, Jan Hauke, Radosław Kala, Erkki Liski, Xiaoji Liu, Augustyn Markiewicz, Wiesław Migdałek, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, C. Radhakrishna Rao, George P.H. Styan, Tomasz Szulc, Yongge Tian, Götz Trenkler, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang, and 4 photographs.
- T-7 “On some of Baksalary’s contributions to the theory of block designs” by Tadeusz Caliński, published in the Tenth Special Issue (Part 2) on Linear Algebra and Statistics of *Linear Algebra and its Applications* (vol. 410, 2005, 54–63), in remembrance of Jerzy K. Baksalary. Earlier versions of this tribute appeared in T-1a, T-1b, T-4a, and T-5.
- T-8 “Jerzy K. Baksalary” compiled by Jan Berdyszak, *Uniwersytet Zielonogórski/Monthly Journal of the Academic Community*, vol. 9 (173) (2005), insert, pp. II-III. In Polish. (A part of this tribute was preprinted in *Gazeta Wyborcza Zielona Góra*, no. 254, 31 October/1 November 2005, p. 6.)
- T-9 “Żałobna karta – Prof. dr hab. Jerzy K. Baksalary” by Tadeusz Caliński, *Więści Akademickie/The Bulletin of the Agricultural University of Poznań* 4 (91) (2005), p. 17. In Polish; English translation of a title: “The mourning card – Professor Jerzy K. Baksalary”.

- T-10 “Moje wspomnienie” by Aleksander Grytczuk, *Uniwersytet Zielonogórski/Monthly Journal of the Academic Community*, vol. 4-5 (132-133) (2005), pp. 9-10. In Polish; English translation of a title: “My recollection”.
- T-11 “Rektor Baks” by Ewa Narkiewicz-Niedbalec, *Uniwersytet Zielonogórski/Monthly Journal of the Academic Community*, vol. 9 (173) (2005), insert, pp. III-IV. In Polish; English translation of a title: “Rector Baks”.
- T-12 “Uniwersytet żegna Profesora” eulogy given by Marian Nowak at the funeral service for Jerzy K. Baksalary held in Poznań on 15 March 2005, *Uniwersytet Zielonogórski/Monthly Journal of the Academic Community*, vol. 4-5 (132-133) (2005), p. 8. In Polish; English translation of a title: “The University farewells the Professor”.
- T-13 “Rocznicowe wspomnienia” by Tadeusz Ostrowski, *Biuletyn Państwowej Wyższej Szkoły Zawodowej w Gorzowie Wielkopolskim/Bulletin of The State Vocational University in Gorzów Wielkopolski*, 14 (2006), pp. 5-6. In Polish; English translation of a title: “Annual recollections”.
- T-14 “Z żałobnej karty – Jerzy K. Baksalary (1944-2005)” by Tomasz Szulc, *Wiadomości Matematyczne/Annals of the Polish Mathematical Society* Ser. II, XLI (2005), pp. 189-205. In Polish; English translation of a title: “Out of a mourning card – Jerzy K. Baksalary (1944-2005)”.
- T-15 “Zmarł prof. Jerzy Baksalary”, *Gazeta Wyborcza Zielona Góra*, no. 58, 10 March 2005, p. 1; reprinted in *Uniwersytet Zielonogórski/Monthly Journal of the Academic Community*, vol. 4-5 (132-133) (2005), p. 48. In Polish; English translation of a title: “Professor Jerzy Baksalary has passed away”.
- T-16 Obituary for Jerzy K. Baksalary at pl.wikipedia.org/wiki/JerzyBaksalary. In Polish.

1. PERSONAL COMMENTS ON THE LIFE AND PUBLICATIONS OF JERZY K. BAKSALARY

It is rather easy to describe Jerzy's scientific achievements. In fact his list of publications (see Table 2.1) is the best image of his scientific abilities, activities, and interests. I have read many of the following personal comments on the life and work of Jerzy and I see how difficult it is to describe him as

a person. Of course every man is in some way exceptional, but most people you meet on your way you forget sooner or later. Jerzy has had a very strong personality which will remain in the memory of all of us who had the chance to meet him. I can find no words to describe it.

Anita Dobek, Agricultural University of Poznań

I have known Jerzy Baksalary in various guises for more than thirty years. In the 1970s and early 1980s I received a steady stream of postcards from him requesting copies of my published and unpublished papers.

Unfortunately, Jerzy was not able to attend the 1983 Tampere Seminar on Linear Statistical Models. Thus I met him for the first time at a Multivariate Statistics Conference in Łódź (Poland) in 1986. At the Voorburg Workshop on Matrices and Statistics in 2001, Jerzy reminded me that Heinz Neudecker had reprimanded me in Tampere for not speaking proper ‘Continental English’ which has a different stress pattern from ordinary Received Pronunciation (e.g., *CE: ana-l̄ysis* rather than *RP: a-nal̄ysis*).

Jerzy and I met again at the 1987 Tampere Meeting and I recollect having prompted him to express the difficulty that Eastern Europeans then experienced in obtaining academic books and journals. The situation is only gradually being remedied following the accession of Poland and other Eastern European countries to the European Union. [As a continuing tribute to Jerzy’s memory, may I urge anyone thinking of disposing of their surplus academic books and journals to send them to any of the numerous universities around the world that are still in urgent need of such donations.]

In Jerzy’s review in *Mathematical Reviews* [MR567938 (82e:62097)] of my paper entitled “Estimation with aggregated data” [*Journal of Econometrics* 10 (1979), 43–55] and in a subsequent paper [46] of his, Jerzy pointed out that the procedures I employed are formally invariant to the choice of a grouping matrix so that the distinct numerical results associated with the various choices of a generalised inverse are due to the presence of rounding errors. But for the fact that I had already done so, this observation may have prompted me to move on to other areas of research.

I do not recollect having cited Jerzy’s work in any of my research papers, but in [144] he certainly helped me in generalising the solution to my problem entitled ‘A class of square roots of involutory matrices’ which I had proposed in *Image* [Problem 27–1 (2001), page 36] from the set of real nonsingular matrices to the set of nonzero complex matrices with group inverses. Despite

the fact that my principal fields of interest were distinct from his own, I have always found Jerzy to be very kind and considerate. What proved to be our final farewell after the Dortmund Workshop in 2003 was particularly touching.

R. William Farebrother, University of Manchester

I came across the papers of Jerzy K. Baksalary written together with numerous coauthors when I was working on my Ph.D. thesis on mixed linear models, trying to adapt approaches in linear estimation to the estimation of fixed and random effects. Being myself inclined to linear algebra and matrix theory, I was intrigued by the statistical concepts such as linear sufficiency, linear admissibility, or minimum biased estimation, and their connection with linear matrix algebra. The papers by Jerzy that I read had a clarity and aesthetic appeal in both the presentation and the way proofs were carried out which I had not encountered before. Therefore I tried to learn as much as possible, still today admiring the unrivalled ingenuity of the “Baksalarian way of thinking”. Only later did I discover numerous papers by Jerzy and his coauthors concerned with topics more in linear algebra than statistics, which then strongly influenced and stimulated the direction of my own research. Since Jerzy Baksalary has restarted to publish papers in recent years, I was eager to open a new file containing a collection of these. It is very sad, indeed tragic, that this file must now be closed so soon just when it seemed that a lot more fruitful research was to be expected.

Jürgen Groß, Universität Dortmund

In 1976 when I started to work at the Department of Mathematical and Statistical Methods of the Agricultural University of Poznań there was a group of people there who were highly active scientists. Jerzy stood out among them for the clarity of presentation of his results and the precision of his questions at regularly held seminars. In 1978 Jerzy accepted me as a member of his team of collaborators and two years later I coauthored with Jerzy (and Radosław Kala) an article [32] published in 1980.

During the first Solidarity period (1980–1981) Jerzy was engrossed in the union’s activity at the Agricultural University of Poznań, and even outside it. Still, he was able to find time for scientific work. After the imposition of martial law, Jerzy was harassed by the secret police. This delayed the publication of his Habilitationsschrift in *Mathematische Operationsforschung und*

Statistik, Series Statistics [56] (published in former East Germany) and hence he could not be the supervisor of my Ph.D. dissertation, whose postulates were the results I had obtained in cooperation with him. Radosław Kala, his principal coauthor, was chosen to act as supervisor. This was no obstacle to my further cooperation with Jerzy and our next joint papers [57, 70, 90, 124] were published, respectively, in 1984, 1987, 1990, and 1994.

In the 1990s Jerzy was involved in administrative work at the Tadeusz Kotarbiński Pedagogical University in Zielona Góra (serving two terms as the Rector and one as Dean), which forced a break in our cooperation. We started to work together again in 2002, and the effect was another three papers [145, 146, 158]. Two projects have been left unfinished because of his death. Work with Jerzy, consisting of hours of scientific discussion interwoven with discussion of the political and economic changes occurring in Poland, will always be one of my fondest memories of those years.

Jan Hauke, Adam Mickiewicz University, Poznań

I met Jerzy for the first time in the early 1970s. I don't remember the exact date, but it was on a Friday, probably in the spring of 1972. Every Friday morning starting at 9:00 there was a seminar on mathematical statistics and its applications, which was conducted by Professor Tadeusz Caliński, who was then the head of the Department of Mathematical and Statistical Methods at the Agricultural University of Poznań. This seminar has a long tradition and of course a complicated history which is ongoing. It is worth noting that this seminar was initiated in 1963 by Regina Elandt⁸.

⁸ Born in Poland (in Nowogród Łomżyński, near Łomża, about 130 km. NE of Warsaw) in 1918, Regina Cecylia Elandt joined the Department of Agricultural Experimentation and Biometry at the University of Poznań as a research assistant in 1946 and in 1955 received a Ph.D. degree from the Higher School of Agriculture for the dissertation (in Polish) "On certain interaction tests in serial experiments. The problem of stratification" [published in *Zastosowania Matematyki* 3 (1956) 8–45]. In 1963 the Department of Mathematical Statistics was formally established at the Higher School of Agriculture with Regina Elandt as its head. In 1964 she married the statistician Norman Lloyd Johnson (1917–2004) and joined the Department of Biostatistics at The University of North Carolina at Chapel Hill and then published under the name Regina C. Elandt-Johnson; the 1980 Wiley book *Survival Models and Data Analysis* by Regina C. Elandt-Johnson and Norman L. Johnson was reprinted in the Wiley classics library in 1999. In 2001 Regina C. Elandt-Johnson received an honorary doctorate from the Agricultural University of Poznań "in view of her invaluable contributions, both scientific and didactic", and she is now Professor Emerita of Biostatistics at The University of North Carolina at Chapel Hill. [References: Zbigniew Broda, Tadeusz Caliński: *Więści Akademickie/The Bulletin*

During the aforementioned seminar someone (I don't remember his name) was presenting the analysis of a complex nonorthogonal experiment and posed the problem, how to locate the columns of the design matrix which form a basis for its range. The next week at the seminar both of us, Jerzy and I, proposed almost exactly the same algorithm for solving that problem.

This solution was published in 1973 in the paper [1] in Polish, which is Jerzy's first and also our first joint publication; see also [10] with Anita Dobek, published in English in 1977. On that day, our close scientific cooperation started. It was focused on statistical inference and matrix algebra. We were doing almost everything in parallel. We spent many hours studying papers and books, discussing unsolved problems, and preparing joint papers.

Jerzy defended his Ph.D. dissertation on exactly the same day – 29 September 1975 – that I defended mine, and after that we continued our cooperation with a new energy for the next ten years. In all these activities Jerzy was very imaginative, extremely precise, and persistent in finding new problems and their solutions. His standard question was, when the “if” word can be supplemented by the second “f”. In all we published 50 papers together from 1973 to 1986 (see Table 2.1 below).

At the beginning of the 1980s Jerzy started his activity in the Solidarity movement. Simultaneously he completed his Habilitation at the Faculty of Mathematics and Physics of the Adam Mickiewicz University in Poznań, and intensified cooperation with a group of younger members of the Department. In 1988 he moved to Zielona Góra, where he took a position of associate professor at the Tadeusz Kotarbiński Pedagogical University. Two years later, he was elected the Rector (President) there. The last time I met Jerzy was in Będlewo at the 13th International Workshop on Matrices and Statistics in August 2004.

Radosław Kala, Agricultural University of Poznań

The first time I met Jerzy in person was in June 1984 when I attended, with Simo Puntanen, the International Conference on Linear Statistical Inference in Poznań⁹. The party organized by Jan Hauke (on Thursday, 7 June 1984)

of the Agricultural University of Poznań, vol. 5, no. 44 (2001), pp. 2–3; Zofia Hanusz: *Biometric Bulletin*, vol. 19, no. 1 (January–March 2002), page 14; and “A conversation with Norman L. Johnson” by Campbell B. Read, *Statistical Science*, vol. 19 (2004), pp. 544–560.]—Eds.

⁹ Proceedings published as *Linear Statistical Inference: Proceedings of the International Conference held at Poznań, Poland, June 4–8, 1984* edited by T. Caliński and W. Klonecki,

was memorable and Jerzy was a leading figure there. For example, discussions on Poland's political situation were very fascinating. Jerzy was an activist in the free non-communist Solidarity labour union and had taken part in many actions. He was kept under surveillance by the state security service and sometimes detained. His vivid descriptions and his strong personal opinions about these historical events were unforgettable. I also remember his personal way of proposing a toast to empty sets. I feel that the four papers [15, 54, 61, 67] by Jerzy have influenced my research work the most.

Erkki Liski, University of Tampere

In pursuing my doctor degree, I was lucky enough to obtain supervision by Prof. Jerzy. I never met Prof. Jerzy in person, but in the last three years we were in close contact using e-mail. When we were preparing the papers [153, 154, 155, 156], we discussed the problems every day at that time. From his e-mail letters, I learned how to do scientific research and how to write papers, and with his encouragement and guidance, we proceeded to do some work on generalized projectors [170, 177]. Although not so formally, Prof. Jerzy was really my Ph.D. supervisor. I'm very sorrowful to know of his passing away. I have lost the best teacher in my research and I will remember him forever.

Xiaoji Liu, Guangxi University for Nationalities, Nanning

I first met Jerzy K. Baksalary in the late 1970s when I was looking for a topic for my M. Sc. thesis. Jerzy proposed a topic and helped me substantially with my work on it. I could come to his office at any time, ask him questions and discuss any research problem we were working on. I was especially welcome with solutions and new results. In such a case, he would postpone everything else to ask me for details and to study my results very carefully and most critically. Many of my conjectures were quickly rejected by him: he was a real master at constructing counterexamples!

At about this time I started to attend a seminar on linear models guided by Jerzy and Radosław "Radek" Kala. Jerzy's clear and precise talks accompanied with beautiful handwritten and well-organized presentations on the blackboard allowed us all to follow his lectures easily. His very good knowledge of almost all possible papers in his research area was extremely helpful

in our discussions. He used to give from memory precise references to cited results. I had the opportunity to continue my research with Jerzy as the adviser for my Ph. D. dissertation, publishing the results in six joint papers [61, 67, 78, 83, 91, 127] and [117, 126].

Our collaboration stopped in 1990 when Jerzy moved to Zielona Góra. A few years ago he started to attend a seminar on linear algebra and its applications guided by Tomasz Szulc and me in the Department of Mathematical and Statistical Methods of the Agricultural University of Poznań. His participation was warmly welcomed by everybody but especially by our Ph. D. students, who were impressed by his talks, activity in discussions, presentations of open problems (often from *Image*) and proposals for their solutions. We all learnt a lot from our common work on these problems. A result of one such meeting is my joint paper [175] with Jerzy and his Ph. D. student Paulina Kik.

After 1990, I continued my research on admissible estimation in the linear model, the main topic of my M. Sc. thesis and Ph. D. dissertation. This research was based on my papers with Jerzy as well as his papers: [38] and [66] with Radek Kala, [68] and [79] with Thomas Mathew, and [108] with Götz Trenkler. Also another direction of my research - matrix orderings - was inspired by Jerzy's work and based on his papers: [85] with Friedrich Pukelsheim and George P.H. Styan, [104] with Sujit Kumar Mitra, [105] with Friedrich Pukelsheim, [124] with Jan Hauke and George P.H. Styan, and many others. Studying experimental design theory with my Ph. D. students, I used to recommend the paper [56] to them; in [56] Jerzy compared, in a very nice and clear way, a linear model with its augmentation by nuisance parameters.

Augustyn Markiewicz, Agricultural University of Poznań

I first met Jerzy Baksalary in 1984 while I was visiting the Department of Mathematical and Statistical Methods at the Agricultural University of Poznań. I had just completed my doctoral work in linear models at the Indian Statistical Institute–Calcutta, and I had already read several of Jerzy's papers while I was a doctoral student. Jerzy's work was very helpful and influential in my doctoral work, and I found his matrix-algebraic skills extremely impressive. Thus I was quite excited to meet him in Poznań. By then he was already an established researcher, actively working on several problems in linear algebra and linear models, and collaborating with several people. In spite of his very busy work schedule, Jerzy devoted a significant

amount of time to me, suggesting two problems: one on linear sufficiency, and a second one on admissibility.

The fast thinker (and worker) that he was, I had to work very hard to keep up with him, and this was a real learning experience for me. In a rather short time, our collaboration resulted in two papers: one [68] published in *Sankhyā* in 1986, and a second one [79] published in the *Journal of Multivariate Analysis* in 1988. As a beginner, this was a real boost for my research career. Later I moved to the United States, and we would collaborate on only one more paper [92], which appeared in *Linear Algebra and its Applications* in 1990. This work was also finished in a short time.

I was always amazed at the pace at which Jerzy worked; a pace that continued until the end. And I have never seen anyone with such a single-minded devotion to research. Both the statistics community and the linear algebra community have lost a remarkable academician.

Thomas Mathew, University of Maryland–Baltimore County

In 1988, having behind me a two-year-long work experience and army service, I was about to start my studies at the Tadeusz Kotarbiński Pedagogical University (TKPU) in Zielona Góra. After a decent break in my education, I was very eager to restart my studies and, moreover, I was very curious as to who will teach and guide me throughout the next five years. On the other hand, I also had doubts as to whether I had chosen the right university, for TKPU was commonly thought of more as a secondary school than a university.

So the first days of my studies were filled with a mixture of hope and fears. And then it happened – we had the first lecture on linear algebra and we met Him for the very first time. Already at first glance professor Jerzy Baksalary seemed to be different than his colleagues. He had long hair and he had this unique friendly attitude towards the students. We had called him “Baks” and it was that way to the end.

He disappeared for a year to Finland and returned in September 1990. This was an important year in the history of TKPU, for this was a year when the new rector was to be elected. And the votes of the students counted. There were three candidates and Baks was one of them. We had talks and negotiations with each of the candidates. We were interested in their programs, how they were going to improve the academic stature of TKPU, and what they each had to offer us.

What did we expect? Having in mind a strike at TKPU in 1988, we wanted to have more freedom and independence to make the decisions that concerned us. According to Polish law at that time, the students had rights to decide on various social matters such as distribution of the places at dormitories (the number of which was always too small), to whom the university should provide support, and so on.

Baks was reliable. He had a vision on how to guide TKPU to a better future and ideas as to how to solve our problems. He won the election and became the Rector of our university. Then the hard work began, for Baks wasn't giving anything away for free. Do you want to have a computer lab in the dorm? – no problem, just find a safe place to house the computers. Do you want to earn some money? – no problem, just teach the administration of the university how to use computers. Do you want to take over the distribution of the financial support that TKPU provides to the students? – no problem, just write the computer programs to deal with it. This is the way he was – Baks manager.

We discussed with him various matters concerning students. We had influence on certain expenses from the TKPU budget – it was up to us what fraction of the amount of money available would be spent to run dorms, what fraction to run the campus restaurant, and so on. Baks rearranged the administration of TKPU in such a way that every single penny was under control. We also had influence on the study programs – we got rid of some useless subjects replacing them with new ones. Baks did not forget what he had promised us – we had freedom and independence to make the decisions that concerned us.

At that time many of the student councils in Poland were truly envious of what we had achieved at TKPU. But it was all due to Baks. If it had not been for him and his friendly attitude towards the students, I would not write this text today. I am glad that in 1990 we elected the right person and thus we managed to solve some very important student problems.

Wiesław Migdałek, Zielona Góra

It is with great sadness that I have learnt of Jerzy's death. I have had the great privilege of being a quadruple coauthor of his [63, 85, 105, 113]. Our cooperation was started in 1985 by what I later came to view as a typical characteristic of Jerzy: the quest for mathematical completeness and elegance. At the International Conference on Linear Statistical Inference held in Poznań in June 1984 I presented a joint paper with my colleague Karin

Christof, who was my student then, presenting a sufficient condition for two matrices originating in the design of experiments to be Löwner comparable. Jerzy instantly asked whether our condition was also necessary. This gave rise to our first joint publication [63] in 1985, which did sharpen the condition to become indeed necessary and sufficient.

Jerzy insisted on a meticulous line-up of arguments to provide not just some answer to a question asked, but a complete answer which, in addition, could claim the maximum possible degree of mathematical elegance, and this prevailed throughout our further collaboration.

I'll certainly remember Jerzy as one of the Kings of Matrices that I had the pleasure to count among my coauthors.

Friedrich Pukelsheim, Universität Augsburg

Science is the area of human life that should show and open new avenues for the future. Therefore science also needs pioneers who have a vision on the future and who have the capability and energy to open new paths. Professor Jerzy K. Baksalary was such a person. His scientific contributions are great.

Professor Baksalary, besides being a great scientist, was also an administrator. He served several years as the university rector. After the rectorship he returned to his scientific career, which evidently is not so common in the scientific community. This describes Jerzy K. Baksalary's versatile mental capabilities.

As the Rector of the University of Tampere, I had the pleasure and great honour to have Jerzy K. Baksalary as a visiting professor. During the year he spent in our Department of Mathematical Sciences he wrote some 40 articles later published in top journals. This is a convincing indication on his scientific productivity.

Jerzy K. Baksalary was very interested in social questions and especially in the events which had important consequences for Poland during the last decades. I am convinced that he was happy to live in the middle of the events which have also had an impact worldwide and which have led to deep changes in the Polish society.

*Tarmo Pukkila, Ministry of Social Affairs and Health, Helsinki
former Professor and Rector of the University of Tampere*

Jerzy was a unique person and he was one of the most important people in my academic career. I am a keen photographer, and I value having a

substantial collection of photos of Jerzy. At the same time I also have a remarkable set of memories of events that involve him in a very colourful way.

In 1981 Erkki Liski and I jointly wrote a letter to Jerzy (and to his coauthor Radosław Kala) expressing our interest in their research. Indeed Jerzy's research interests and his style of writing papers were so surprisingly similar to mine that I would often enthusiastically photocopy a paper of his whenever I saw one ... and I saw many!

Jerzy was invited to the Tampere Seminar on Linear Statistical Models in 1983 but, unfortunately, he could not come. The first time I met him face to face was at the International Conference on Linear Statistical Inference held in Poznań in June 1984. In particular, Erkki and I enjoyed enormously a party held at Jan Hauke's home (on Thursday, 7 June 1984). Since then, I have had many good laughs with Jerzy and written several Baksalarian-style joint papers with him.



Figure 2. Jerzy Baksalary (second from left) with Hans Joachim Werner (left), George Styan, Yongge Tian, and Simo Puntanen (right) putting the final touches on *Image* no. 30 at the annual meeting of the Statistical Society of Canada: Halifax, Nova Scotia, Canada, June 2003. [Photograph: Oskar Maria Baksalary.]

The important factors between Jerzy and me over the years: research and sense of humour. One of the highlights was meeting him again at the

Workshop on Matrices and Statistics in Hyderabad, India, December 2000, after a ten years' break (Jerzy's rectorship period): hugging took place immediately once we recognised each other, and there was Oskar also 10 years older!

Our society has lost a unique person but will not forget him.

Simo Puntanen, University of Tampere

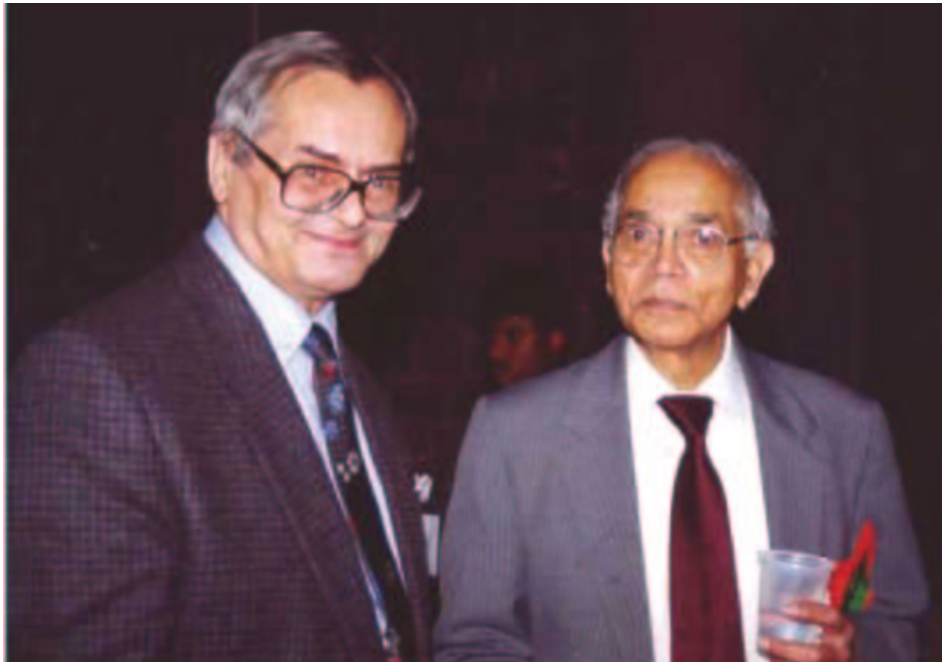


Figure 3. Jerzy Baksalary (left) with C. Radhakrishna Rao at the Ninth International Workshop and Short Course on Matrices and Statistics (in celebration of C.R. Rao's 80th birthday): Hyderabad, India, December 2000. [Photograph: Oskar Maria Baksalary.]

I was shocked to learn about the passing away of Professor Jerzy K. Baksalary when he was still active in research and making fundamental contributions to matrix theory and its applications to statistics. I was glad to see him with his son at the workshop held in Hyderabad in 2000 and was looking forward to his visit to Hyderabad in December 2004 to attend the International

Conference on Statistics I was organizing. We missed his presence due to his poor health.

Professor Baksalary used to visit the Center for Multivariate Analysis at the Pennsylvania State University to work with me. I am one of his co-authors having written two papers [117, 126] jointly with him. I remember one day, after I left him in his office after discussing a problem with him, his roommate in State College called me to say that Professor Baksalary was missing. Next day in the morning when I went to his office, I found him sleeping on the table. When I woke him up, he said that he was working all night and fell asleep in the early hours of the morning after solving the problem we were discussing. Such was his devotion to research.

I had an opportunity to visit him in Zielona Góra when he was the Rector of the Tadeusz Kotarbiński Pedagogical University. He was doing a wonderful job in trying to develop the University as a first rate research center. I also remember the notices he posted all over university buildings banning smoking within the university campus to safeguard the health of students.

Besides being a scholar of great depth with massive achievements, he was a kind and friendly person and all those who worked with him enjoyed his company. His death is indeed a great loss to the statistical community.

C. Radhakrishna Rao, Pennsylvania State University

It was a sad day when I heard about Jerzy Baksalary's death. As others have done, I first met him in Poznań at the International Conference on Linear Statistical Inference held in Poznań in June 1984. At that time I was still a student. There were several participants who made a strong impression on me and Baksalary was one of them. His deep knowledge and clear understanding of the work of other people was very impressive and significant to me. One evening (Thursday, 7 June 1984) Scandinavian participants were invited to Jan Hauke's apartment for a party and I remember many comments and suggestions made by Baksalary at this party during lively discussions about science, in particular linear models, and politics. Marked by Polish hospitality, this became an evening which I will always remember. It is obvious that Baksalary was unique and I am happy that I met him. I have looked into several of his papers and the most cited by me are [23, 38, 44] connected with linear matrix equations. We once had an idea to write a joint paper on decomposing linear spaces but for several reasons

that plan was never realized. A great dedicated scientist has left us, but his contributions to science and society no one can take away.

Dietrich von Rosen
Swedish University of Agricultural Sciences, Uppsala

I think that the first paper by Jerzy Baksalary I read was [12] joint with Radosław “Radek” Kala, published in 1977, which I reviewed for *Mathematical Reviews*. In [12] it is shown that in the linear model $E\mathbf{y} = \mathbf{X}\boldsymbol{\beta}$ with dispersion matrix $D\mathbf{y} = \mathbf{V}$, the Markov or best linear unbiased estimator (BLUE) of $\mathbf{X}\boldsymbol{\beta}$ equals the ordinary least-squares estimator (OLSE) if and only if $\sum_{i=0}^h \text{rank}(\mathbf{X}'\mathbf{P}_i) = \text{rank}(\mathbf{X})$, where \mathbf{V} has $h + 1$ distinct eigenvalues and $\mathbf{P}_0, \mathbf{P}_1, \dots, \mathbf{P}_h$ are matrices of corresponding orthonormalized eigenvectors. Here \mathbf{X} may be of less than full column rank and \mathbf{V} may be singular. The result for \mathbf{X} possibly of less than full column rank but with \mathbf{V} positive definite was established by me [*Multivariate Statistical Inference* (D.G. Kabe & R.P. Gupta, eds.), North-Holland, pp. 241–246 (1973)] extending the earlier result with \mathbf{X} of full column rank and \mathbf{V} positive definite due to T.W. Anderson [Th. 10.2.1 (p. 561) in *The Statistical Analysis of Time Series*, Wiley, 1971].

The paper [12] prompted me to read further papers by Baksalary and Kala, and by the end of 1979 they had published 28 papers together, see Table 2.1. In 1980 I was invited by Andrzej Kozek to visit Poland and to give a lecture at the Institute of Mathematics of the Polish Academy of Sciences in Wrocław and Andrzej arranged for me, with help from Baksalary and Kala, also to give a lecture at the Agricultural University of Poznań.

Both Jerzy Baksalary and Radek Kala met me at the main railway station in Poznań on Wednesday, 27 August 1980 (and saw me off there on Friday 29 August). On Thursday 28 August, Poznań’s public transit went on strike (this was the beginning of the Solidarity movement) and everybody ended up walking to attend my talk. In Poznań during this visit, I also met Jan Hauke, Augustyn Markiewicz, and Paweł Pordzik for the first time.

I began a correspondence with Jerzy and then met him again in June 1987 at The Second International Tampere Conference on Statistics in Tampere, Finland. The paper [69] on algebraic characterizations and statistical implications of the commutativity of orthogonal projectors that Jerzy presented at this conference remains today, in my opinion, to be the best survey on this subject.

I invited Jerzy to Montréal in May 1988. During this visit Jerzy had “lobstairs” (as he would say) for the first time. We then went together (with Markku Nurhonen, Tapio Nummi and Simo Puntanen) to the 3rd SIAM Conference on Applied Linear Algebra in Madison, Wisconsin, where Ingram Olkin and I gave a Short Course on Linear Algebra and Statistics. My first joint publication with Jerzy was [85] (also with Friedrich Pukelsheim); this survey paper, published in 1989, concerned properties of three types of matrix partial orderings in the set of complex matrices: the Drazin ordering, the minus or rank subtractivity ordering, and the Löwner ordering.

We next met in Neuchâtel, Switzerland, in August 1989 at the International Conference on Recent Developments in Statistical Data Analysis and Inference (in Honor of C. Radhakrishna Rao), where he gave me a hat associated with the Solidarity movement. For the 1989–1990 academic year, Jerzy was a Professor of the Finnish Academy of Sciences in the Department of Mathematical Sciences of the University of Tampere. And during this academic year he produced 31 research reports in the departmental A series of which at least 26 were later published in research journals.

Jerzy and I published two joint research papers [99, 100] (both also with Simo Puntanen) in 1990: in [99] we examined T.W. Anderson’s contributions to solving the problem of when the ordinary least-squares (OLS) estimator is best linear unbiased (BLU) and to characterizing the rank additivity of matrices. This paper is built in part on the key result by Baksalary and Kala in [12], mentioned above. In [100] solutions are derived for three different versions of the problem of when the dispersion matrix of the best linear unbiased estimator of the expectation vector in the general Gauss-Markov model can be expressed in a form characteristic for the usual least-squares theory.

Jerzy joined me at the conference on “Directions in Matrix Theory” held in Auburn, Alabama, March 1990, and we drove there (from Atlanta, Georgia) with Kenneth Nordström. The three of us worked on Löwner-ordering antitonicity of generalized inverses of Hermitian matrices, which resulted in the paper [93] published in 1990. This paper formed part of Kenneth’s Ph.D. dissertation, and both Jerzy and I were at the thesis defense in August 1990, with Friedrich Pukelsheim as the opponent.

In Auburn Jerzy and I worked together on the paper [122] in which we give a new proof (obtained while we were in Auburn) of the rank formula

$$\text{rank}(\mathbf{A}^*\mathbf{B}) = \text{rank}(\mathbf{A}) + \text{rank}(\mathbf{B}) - \text{rank}(\mathbf{A} : \mathbf{B}) + \text{rank}(\mathbf{A}^*\mathbf{Q}_B\mathbf{Q}_A\mathbf{B}),$$

where Q_A and Q_B are the orthogonal projectors on the orthocomplements of the ranges, respectively, of A and B , and $(A : B)$ is the partitioned (block) matrix with B placed next to A . The matrices are complex with the superscript $*$ indicating conjugate transpose. I remember with great pleasure our working together on this proof in Auburn and then later with Jerzy (who was then on leave in Tampere, Finland) communicating by e-mail (with a seven-hours time difference between Tampere and Montréal) while we completed [122] for publication.

We then met in August 1990 in Tampere, Finland, at the International Workshop on Linear Models, Experimental Designs & Related Matrix Theory (First International Workshop on Matrices and Statistics) and collaborated together in editing its proceedings in two journal special issues [119, 123]. The special issue [123] was completed while I visited Jerzy in Zielona Góra in April 1991. He was by then the Rector of the Tadeusz Kotarbiński Pedagogical University in Zielona Góra and we worked together in a huge council room. With Jan Hauke we studied distributional properties of quadratic forms in normal variables and some associated matrix partial orderings which was published as [124] in 1994. In [128] with Peter Šemrl, published in 1996, we extended some rank-additivity results for matrices to range-additivity results for three bounded linear operators acting on an infinite-dimensional Hilbert space.

For most of the 1990s, however, Jerzy's focus was on university administration. But by June 2000 when I visited the Agricultural University of Poznań and met Jerzy again (for the first time in almost ten years), he was back into mathematical research. I introduced him to the linear algebra newsletter *Image*, which I then edited, and in particular to its Problem Corner. During the next few years Jerzy published 28 solutions in the *Image* Problem Corner and two research problems. My collaboration (as editor) with Jerzy (as problem solver) was considerable and every moment a pleasure.

I invited Jerzy to the Ninth International Workshop and Short Course on Matrices and Statistics, in celebration of C. R. Rao's 80th birthday, Hyderabad, India, December 2000, and we met again at the Workshops in Voorburg, The Netherlands (August 2001), Lyngby, Denmark (August 2002), and Dortmund, Germany (August 2003).

My joint research with Jerzy started again in 2000. In [147] we studied the problem of developing conditions under which generalized inverses of a partitioned matrix can be expressed in Banachiewicz–Schur form. This

strengthened a theorem of mine with George Marsaglia [*Sankhyā Series A* 36 (1974), 437–442]. In [140] with Jerzy’s son Oskar, we studied the idempotency of linear combinations of an idempotent matrix and a tripotent matrix.

I was delighted when Jerzy invited me to give a talk at the “Session on the occasion of the 60th birthday of Jerzy K. Baksalary” held in Będlewo, Poland, 17 August 2004 (just before the 13th International Workshop on Matrices and Statistics, 18–21 August 2004), and sadly this was to be the last time we met. In the booklet published for this 60th birthday session, Jerzy’s passions are given as: Family, Paintings (especially Vermeer), Jazz (especially Sir Miles Davis¹⁰), New York, and ... Mathematics. Jerzy was one of the most talented, hard-working and meticulous mathematicians with whom I have collaborated and it was a great pleasure for me to have been able to work with him. His marked enthusiasm for mathematics seemed also to spill over into other aspects of his daily life, especially to subjects such as politics and language usage. His untimely death at age 60 creates an unexpected void. I join those who will miss him tremendously.

George P.H. Styan, McGill University, Montréal

I was deeply saddened to learn that Jerzy has passed away. For the very last time we saw each other in mid-February at the seminar held at the Agricultural University of Poznań. This was a consecutive meeting in a series of seminars organized since 1999 every second Thursday. Participants of these seminars were: Jerzy K. Baksalary, Oskar Maria Baksalary, Jan Hauke, Augustyn Markiewicz, Tomasz Szulc and a group of Ph. D. students – our group was called by Jerzy: PLAG, which is an acronym for the Poznań Linear Algebra Group. Our meetings were instructive and fruitful, and without any doubt, this was mainly due to Jerzy.

The activities of PLAG are well reflected in the problems and solutions in subsequent *Image Problem Corners*, for the problems proposed therein were extensively discussed and analyzed during our seminars. The fruit of the cooperation between Jerzy and myself within the PLAG meetings resulted in two joint papers [143, 172] published in *Linear Algebra and its Applications*.

¹⁰ Although the famed trumpeter was inducted into the Knights of Malta in 1988, three years before his death, most members of the order rarely use the honorific ‘Sir’. Davis’s family, however, chose to inscribe ‘Sir’ on the headstone so he wouldn’t be outdone by Duke Ellington, who’s buried across the road [in the Woodlawn Cemetery].”–
<http://www.birdhop.net/content/view/25/1/>

Jerzy Baksalary was a referee of my Habilitationsschrift. He was known to be demanding and I was pleased that my scientific achievements were appreciated by him. With the death of Jerzy Baksalary, the linear algebra community has lost a truly great specialist in matrix analysis and PLAG has lost its leader.

Tomasz Szulc, Adam Mickiewicz University, Poznań

Some of Baksalary's work is concerned with solving linear matrix equations using generalized inverses of matrices; this work started in the late 1970s. Using generalized inverses, Penrose [*Proceedings of the Cambridge Philosophical Society* 51 (1955), 406–413] had shown that the matrix equation $AX = B$ is solvable for X iff $AA^-B = B$, and then the general solution can be written as

$$X = A^-B + (I - A^-A)U,$$

where U is arbitrary; similarly $AXB = C$ is solvable iff $AA^-CB^-B = C$, and in this case the general solution can be written as

$$X = A^-CB^- + (I - A^-A)U_1 + U_2(I - BB^-),$$

where U_1 and U_2 are arbitrary. These two results give the key applications of generalized inverses for solving linear matrix equations.

Great difficulty is encountered, however, in solving some more general linear matrix equations. Jerzy K. Baksalary and Radosław Kala were two pioneers in solving the two matrix equations $AX - YB = C$ and $AXB + CYD = E$ using generalized inverses. In two papers [23, 38] by Baksalary and Kala published in 1979 and 1980 and in the paper [43] by Baksalary in 1982, it was established that $AX + YB = C$ is consistent iff

$$(I - AA^-)C(I - B^-B) = 0,$$

and in this case the general solution is

$$X = AC^- + A^-Z + A^-ZB + (I - AA^-)W,$$

$$Y = -(I - AA^-)C^-B + A^-Z - (I - AA^-)ZBB^-,$$

where W and Z are arbitrary. This result shows that the solvability condition and the general solution of the equation can be expressed by generalized inverses.

Moreover, Baksalary and Kala [38] gave the solvability condition and the general solution of the equation

$$AXC + CYD = E$$

by generalized inverses. This inspired a variety of subsequent works in the 1990s and 2000s on $AX + YB = C$ and $AXC + CYD = E$, for example, properties of their solutions, least-squares solutions of the two equations, minimal ranks of $AX + YB - C$ and $AXC + CYD - E$, etc.

Yongge Tian, Shanghai University of Finance and Economics

I first came across Jerzy's name when I attended the International Tampere Seminar on Linear Statistical Models and their Applications in Tampere, Finland, in 1983. Several people from the Eastern European countries had also been invited by the organizers but almost none of them showed up. Jerzy Baksalary and Radek Kala from the Agricultural University of Poznań were not allowed to come to Tampere. After all, we were at the height of the Cold War then.

In the 1980s I had become interested in the performance of restricted least squares and pre-test estimators, which are of some importance in econometrics. One of my favourite topics was the "Comparison of Least Squares and Restricted Least Squares Estimators". Consider the linear regression model $\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u}$, where \mathbf{X} is of full column rank, $E(\mathbf{u}) = \mathbf{0}$, and $\text{cov}(\mathbf{u}) = \sigma^2\mathbf{I}$. Then the least squares estimator (LSE) of $\boldsymbol{\beta}$ is $\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$. Suppose we have additional linear restrictions on the parameter vector $\boldsymbol{\beta}$ in the form $\mathbf{R}\boldsymbol{\beta} = \mathbf{r}$, where \mathbf{R} is of full row rank. The corresponding Restricted Least Squares Estimator (RLSE) is

$$\mathbf{b} = \hat{\boldsymbol{\beta}} - (\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}'[\mathbf{R}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}']^{-1}(\mathbf{R}\hat{\boldsymbol{\beta}} - \mathbf{r}).$$

It is well known that

$$\text{cov}(\hat{\boldsymbol{\beta}}) = \sigma^2(\mathbf{X}'\mathbf{X})^{-1}, \quad \text{cov}(\mathbf{b}) = \sigma^2[(\mathbf{X}'\mathbf{X})^{-1} - \mathbf{G}],$$

where

$$\mathbf{G} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}'[\mathbf{R}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}']^{-1}\mathbf{R}(\mathbf{X}'\mathbf{X})^{-1}.$$

If the condition $\mathbf{R}\boldsymbol{\beta} = \mathbf{r}$ is violated, the RLSE(\mathbf{b}) becomes biased. Nevertheless there is some potential in \mathbf{b} to outperform the LSE $\hat{\boldsymbol{\beta}}$ with regard to

the matrix mean square error (MMSE) criterion. Actually the difference of the MMSE matrices is given by

$$\mathbf{M}(\hat{\boldsymbol{\beta}}) - \mathbf{M}(\mathbf{b}) = \sigma^2 \mathbf{G} - \mathbf{H}\boldsymbol{\delta}\boldsymbol{\delta}'\mathbf{H}',$$

where

$$\mathbf{H} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}'[\mathbf{R}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}']^{-1} \quad \text{and} \quad \boldsymbol{\delta} = \mathbf{R}\boldsymbol{\beta} - \mathbf{r}.$$

Consulting a well-known result from matrix theory, we see that $\mathbf{M}(\hat{\boldsymbol{\beta}}) - \mathbf{M}(\mathbf{b}) \geq_L \mathbf{0}$, i.e., \mathbf{b} is better than $\hat{\mathbf{b}}$ with respect to the MMSE criterion if and only if

$$\boldsymbol{\delta}'\mathbf{H}'\mathbf{G}^{-1}\mathbf{H}\boldsymbol{\delta} \leq \sigma^2.$$

A similar result had been achieved by Toro-Viczarrondo & Wallace [*Journal of the American Statistical Association* 63 (1968), 558–572], but I was happy to derive the preceding equivalence without using their tedious derivations involving eigenvalues. Using this approach, I was able to obtain a number of additional theorems, relying heavily on the matrix \mathbf{G}^{-1} . The manuscript was soon ready for submission, but one day before sending it off to the Editor of *Communications in Statistics–Theory and Methods*, I realized that the matrix \mathbf{G} was *singular*. The paper disappeared into a dark corner of my study to slumber there for two years.

In 1983, by chance I browsed through some not so well-known journal in our library entitled *Bulletin of the Polish Academy of Sciences* and found the article [49] by Baksalary and Kala under the title: “Partial orderings between matrices one of which is of rank one”. Its main result saved my paper:

Theorem. *Let $\mathbf{A} \in \mathbb{C}^{n \times n}$ be Hermitian, $\mathbf{a} \in \mathbb{C}^n$ and $\alpha > 0$. Then $\alpha\mathbf{A} - \mathbf{a}\mathbf{a}^* \geq_L \mathbf{0}$ if and only if*

- (i) $\mathbf{A} \geq_L \mathbf{0}$
- (ii) $\mathbf{a} \in \mathcal{R}(\mathbf{A})$
- (iii) $\mathbf{a}^*\mathbf{A}^-\mathbf{a} \leq \alpha$,

where \mathbf{A}^- is any generalized inverse of \mathbf{A} .

Using this important theorem I could revive and repair my manuscript. For example, the now correct criterion for dominance of $\hat{\mathbf{b}}$ over $\hat{\boldsymbol{\beta}}$ became

$\delta'[\mathbf{R}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{R}']^{-1}\delta \leq \sigma^2$. My paper was published in *Communications in Statistics—Theory and Methods* 14 (1985), 2495–2509.

Some years later I received an invitation to participate in the International Conference on Mathematical Statistics held in Kozubnik, Poland, June 10–14, 1986. The Solidarity movement had already been founded then with Lech Wałęsa as its leader (becoming later Poland's President). During the conference I had the opportunity to meet Jerzy for the first time.

I was immediately fascinated by Jerzy's style of presenting and explaining his research results. His transparencies were perfectly prepared in a remarkably beautiful handwriting. I liked his crystal-clear, but nevertheless high-level and original presentations from the very beginning. This was my first experience attending a conference in Poland. After the lectures and after some vodkas, the participants had a chance to get better acquainted with each other at the informal meeting during the evening. Normally, the discussions started with some mathematics and ended up with hot debates over politics.

It was embarrassing for me to notice that the Polish participants expressed their opinion about their government very freely, whereas my colleagues from East Germany would not do the same, obviously fearing that somebody might report them to the Secret Police when they returned to the German Democratic Republic, the official name of East Germany. Jerzy hated communism, and even more its supporters. Having become one of the front leaders of Solidarity in Poznań, he had to spend some days in prison.

About that time our first joint project started. I applied for a scholarship for Jerzy at the Alfried Krupp Foundation of Germany. Ironically, Jerzy's father had worked as a coal miner close to Dortmund after World War I in a pit owned by Alfried Krupp, one of Germany's richest men. Incidentally, Krupp had made a fortune by selling arms to the German Emperor, Kaiser Wilhelm. When Poland became independent, Jerzy's father went back to Poland.

Jerzy got the support and visited Dortmund for three months in 1988. We had a good time together. Jerzy worked very hard on matrices and statistics, and even on Sundays, after we had had lunch together in our house, he returned to the university to resume his thinking about new theorems. I was very impressed with his intellectual abilities. Equipped with a sharp mind, a photographic memory and a broad imagination, he was able to put forward and solve many problems. My estimate is that he finished over ten papers during his short stay in Dortmund. Occasionally, I suggested some

problems to him, and often he came up with some neat counterexamples, mainly by presenting some matrices of low order.

When communism had lost its power in Poland, he became professor at the Tadeusz Kotarbiński Pedagogical University in Zielona Góra, a town close to the German border. In 1990, he took over the rectorship of this University, and, alas, stopped his research activities to devote all his strength to administrative tasks. Fortunately, he came back to science in 2000, and we resumed our collaboration. We wrote a joint paper (together with his son Oskar), and planned to investigate the determinant of modified matrices.

To give an impression of the extent of Jerzy's work, I prepared the following list of topics he has worked on:

- Admissibility
- Aggregation of data
- Canonical correlation
- Covariance adjustment technique
- Distribution of quadratic forms
- Equality of the OLSE and the BLUE
- Estimability
- Estimation in linear models under different dispersion matrix structures
- Estimation in regression under restrictions
- Estimation in the presence of nuisance parameters
- Euclidean distance between estimators
- Experimental design
- Generalized inverses
- Growth curves
- Invariance (rank, trace, eigenvalues, singular values, norms)
- Matrix equations and inequalities
- Modified matrices
- Oblique, orthogonal, generalized, hypergeneralized projectors
- Partial orderings (Löwner, star, minus)
- Prediction in linear models
- Pre-test estimation

- Structure of dispersion matrices
- Symmetrizers of matrices
- Variance components estimation

On the 8th of March, Jerzy died. I am very sad, and I wish to express my deep respect for him by using one of his favourite expressions (in his own pronunciation)

“Jerzy, you were an unbillivable man”.

Götz Trenkler, Universität Dortmund

I first learnt of Jerzy during the preparations for the Auburn Matrix Theory Conference on “Directions in Matrix Theory” held at Auburn University in March 1990. There was a desire to invite a statistics researcher to the conference and George Styan suggested Jerzy. The Organizing Committee agreed and proceeded to invite him. He came and a few months later in 1990, I had a visitor in my office. He wore the ubiquitous grey suit, a badge inside the lapel, a briefcase, etc. And he wanted to know whether I thought that Jerzy was a bona-fide math researcher or not, and what did I think of him. Did I have any suspicions, observed any strange contacts, requests made by him during the conference, etc. I was taken aback by this query and went into math-defense mode on behalf of Jerzy, stating his credentials, those of George and of our organizers and ILAS as well, emphasizing that we were a bunch of mostly pure scientists with a love for math and that Jerzy was my friend and beyond suspicion, as all my math friends are. Then I asked of the purpose of this inquiry: the iron curtain had fallen, the great divide was passé, what gave the secret service cause to investigate? Well, I was told that nothing had changed concerning the threat from the “east” and it was just routine caution of visitors from there that brought him to my office. Mind you, I am still travelling on a German passport today!

So I decided to remind the visitor, that as far as I knew, all our research went into the open literature. That Jerzy was quite prolific as a researcher and would not have any spare time to act as a covert spy or engage in some such activity as suggested. And I expressed my offense at this seemingly unprovoked dirt-digging for no good purpose, et cetera, et cetera, given his character beyond reproach. I remember the helplessness of the visitor: he knew nothing of mathematics, nor mathematicians, of our internationality and connectedness despite all those dividing politics. He had not done his

homework and yet he asked me, a “foreigner”, about another one of those. Eventually he left.

I met Jerzy again in Haifa in June 2001 and there I also met his photographing son and they fitted into our venue very well. They have come back to ILAS meetings a few times since as a pair and singly as of late. And when I read the death notice for Jerzy last spring, I was shocked that he is gone, that his son is all alone now on his travels, in photography and in mathematics. And I recalled this episode, that there is a secret service file on Jerzy, on me and ILAS somewhere, connecting us all.

Frank Uhlig, Auburn University

As every day, this morning (Monday, 21 March 2005) I opened my e-mail in my office and there it was. The announcement from ILAS-NET about the sudden death of Jerzy. It is one of those moments that hit you in your face very unexpectedly. There are people in the big world whom even if we do not know very closely in person, their names accompany us over many, many years in our professional life and somehow we are constantly aware of their existence even without special thinking. Jerzy, in my case, was one of them. In an instant moment memories brought back the time when the name Baksalary came up on an almost everyday basis in my work. If I step back in time and think about the period when I was working with Lubomír Kubáček in Bratislava and tried hard to make some progress with my Ph. D. research, dealing a great deal with linear models, subjects like linear projectors in connection with estimability, admissibility, restrictions in linear models, singular models, or nuisance parameters troubled my mind a lot.

That was the time when I started to get familiar with Jerzy Baksalary’s work. I remember reading very thoroughly and in detail many of his papers and finding answers in them to many of my questions. Here is a short list of some just as a sample of those that I thought were the most influential [19, 25, 26, 27, 40, 41] and then later [60] or [100]. Then came the time when I started to look more closely at topics regarding nuisance parameters in linear models and there were again at least several papers by Jerzy that I found extremely useful. The papers [56, 69, 100] were considered to contain important information when we were putting together the chapters on nuisance parameters in my joint monograph with Lubomír Kubáček and his late wife Ludmila Kubáčková [*Statistical Models with Linear Structures*,

pub. Veda: Publishing House of the Slovak Academy of Sciences, Bratislava, 1995].

Then, several years later I became fortunate and for the first time I met Jerzy in person at the International Workshop on Matrices and Statistics in Hyderabad, India, December 2000. He was already not in good health but always smiling, very kind, a real gentleman and indeed, very productive and active. Again, here I just mention two of his papers that I looked through not too long ago. They are [147] and [157].

His insight and active work during that recent time was and still is a very reliable source of information for me. And, it will be for many more years. Jerzy will be never forgotten.

Júlia Volaufová

Louisiana State University Health Sciences Center, New Orleans

Dear Oskar: It was a profound shock to hear of the sudden death of your great father Dr. Jerzy K. Baksalary. Your sorrow will be shared by everyone in the world who knew and loved him. I send my deepest sympathy to you.

As you know, I have a joint paper [116] with your father, and among the many papers written by your father, I was most influenced by the 46 equivalent conditions given in the invited paper [69] entitled “Algebraic characterizations and statistical implications of the commutativity of orthogonal projectors”.

I was honoured that your father kindly included two conditions given in my joint paper with C. Radhakrishna Rao [*Journal of Statistical Planning and Inference* 3 (1979), 1–17] among the 46 equivalent conditions in [69], and owing to this paper by your father I have been motivated to work more on projectors, both orthogonal and oblique.

Haruo Yanai

The National Center for University Entrance Examination, Tokyo

Jerzy passed away: the linear algebra community lost an active researcher and we lost a friend. He was a nice man and very fine mathematician. I knew Jerzy from his papers long before I met him in person. His contributions to matrix theory particularly in the area of matrix orderings are of fundamental importance. I met Jerzy only a few times at meetings. He had many interests and a great enthusiasm for mathematics. He will be remembered!

Fuzhen Zhang

Nova Southeastern University, Fort Lauderdale, Florida

2. PUBLICATIONS BY JERZY K. BAKSALARY

In Table 2.1 we present an annotated list, which we believe to be complete, of Jerzy Baksalary's publications in research journals and collections (conference proceedings, Festschriften, and other edited books), proposed problems and solutions to research problems, and edited journal special issues. We also include references to reviews of his publications in *Mathematical Reviews* (MR) and *Zentralblatt MATH* (Zbl); for signed reviews the reviewer's name is given in parentheses. For reviews in *Mathematical Reviews*, the new style review number (six or seven digits) is given; the old-style number is given (when available) in parentheses.

The 183 entries¹¹ in Table 2.1 are listed chronologically, and by authorship within year, and may be classified as follows:

- 135 research papers in 34 peer-refereed research journals (with 48 papers published and one accepted for publication in *Linear Algebra and its Applications* and 23 published in the *Journal of Statistical Planning and Inference*),
- 12 original research papers in research collections (conference proceedings, Festschriften, and other edited books), see Table 2.2 (which includes 2 collections in which research papers by Jerzy Baksalary have been reprinted),
- 31 solutions to research problems (28 in *Image: The Bulletin of the International Linear Algebra Society*, and one each in *Econometric Theory*, *The IMS Bulletin*, and *Statistica Neerlandica*),
- 5 other items, being Jerzy Baksalary's Ph.D. dissertation, two journal special issues (one of *Linear Algebra and its Applications* and one of the *Journal of Statistical Planning and Inference*), two research problems (both in *Image*).

Table 2.2 lists the 14 research collections (conference proceedings, Festschriften, and other edited books) in which Jerzy Baksalary published. Included in Table 2.2 are two collections in which research papers by Jerzy Baksalary (originally published in research journals) are reprinted.

Furthermore Jerzy Baksalary published 17 reviews of research papers in *Mathematical Reviews* between 1975–1984; five of the articles reviewed are in Polish. References to these reviews are listed in sequence in Table 2.3.

¹¹ We have assembled scans (as pdf files) of almost all of these 183 items and plan to make these available (on a CD-ROM and/or on the Web) in due course.

Almost all of these reviews are extensive and many identify misprints in the article under review.

For the 1989–1990 academic year, Jerzy Baksalary was a Professor of the Finnish Academy of Sciences in the Department of Mathematical Sciences of the University of Tampere. And during this academic year he produced 31 research reports in the departmental A series of which at least 26 were later published in research journals. Jerzy Baksalary also collaborated with Bronisław Ceranka, Janina Świetlicka-Grała, and Jolanta Krzyszkowska on a set of mathematical exercises for students¹² at the Agricultural University of Poznań in 1989.

Jerzy Baksalary also supervised the four Ph.D. dissertations (in Polish), respectively, by Augustyn Markiewicz, Paweł Pordzik, Idzi Siatkowski, and Zenon Tabis at the Adam Mickiewicz University, Poznań, between 1985–1990; these are listed chronologically in Table 2.4. At the time Jerzy Baksalary passed away three students, Katarzyna Chylińska, Paulina Kik, and Anna Kuba at the Zielona Góra University were working with him on their Ph. D. dissertations.

Table 2.1. Annotated complete list of publications by Jerzy K. Baksalary.

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1. Jerzy Baksalary, Radosław Kala (1973). Wyznaczanie bazy macierzy. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 64 (2), 3–9. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-11 and is in Polish. English translation of article title: “The determination of a basis of a matrix”.] 18
 2. Jerzy Baksalary, Radosław Kala (1974). Metody analizy doświadczeń nieortogonalnych. In *Czwarte Colloquium Metodologiczne z Agro-Biometrii: Referaty (Poznań, 10–15 września 1974)* (Eugeniusz Bilski, Tadeusz Caliński, Witold Klonecki, Wiktor Oktaba, eds.), Komitet Hodowli i Uprawy Roślin Polskiej Akademii Nauk i Polskie Towarzystwo Biometryczne, Warszawa, 1974, pp. 201–258. [Article in Polish. English translation of article title: “Methods for analysing nonorthogonal experiments”.] 60
 3. Jerzy Baksalary, Radosław Kala (1974). Procedura obliczania uogólnionej odwrotności macierzy. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 71 (3), 157–165. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-30 and is in Polish. English translation of article title: “Procedure for calculating a generalized inverse of any matrix”.]

¹²In Polish: Zbiór zadań przygotowawczych z matematyki dla kandydatów na studia w Akademii Rolniczej w Poznaniu.

4. Jerzy K. Baksalary (1975). Estymowalność funkcji parametrycznych w modelach liniowych. Ph.D. dissertation, Adam Mickiewicz University, Poznań, iv + 72 pp. [Dissertation in Polish, deposited in May 1975 and defended on 29 September 1975. English translation of title: “Estimability of the parametric functions in linear models”.] 8
5. Jerzy Baksalary, Anita Dobek, Radosław Kala (1975). Rozwiązywanie równań liniowych z nieujemnie określoną symetryczną macierzą układu. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 80 (4), 243–260. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-40 and is in Polish. English translation of article title: “Procedure for solving a nonnegative definite symmetric system of equations”.]
6. Jerzy Baksalary, Anita Dobek, Radosław Kala (1976). Wyznaczanie operatorów rzutowania ortogonalnego. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 86 (5), 187–194. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-49 and is in Polish. English translation of article title: “Computation of the orthogonal projectors”.]
7. J.K. Baksalary, A. Dobek, R. Kala (1976). A method for computing projectors. *Žurnal Vyčislitel'noj Matematiki i Matematičeskoj Fiziki* 16, 1038–1040. [Article in English (with abstract and two references in Russian); MR421063 (54 #9068, L.W. Ehrlich); Zbl 0338.65024. Reprinted (with English translation of abstract and two references all by J. Berry) in *U.S.S.R. Computational Mathematics and Mathematical Physics* 16 (1976), 216–218 (1977). Zbl 0357.65029.]
8. Jerzy K. Baksalary, Radosław Kala (1976). Extensions of Milliken’s estimability criterion. *The Annals of Statistics* 4, 639–641. [MR415900 (54 #3978, C. R. Rao); Zbl 0336.62058.]
9. Jerzy K. Baksalary, Radosław Kala (1976). Criteria for estimability in multivariate linear models. *Mathematische Operationsforschung und Statistik* 7, 5–9. [MR413375 (54 #1489, C. G. Khatri); Zbl 0329.62053.]
10. J.K. Baksalary, A. Dobek, R. Kala (1977). A method of finding bases of a matrix. *Annales Societatis Mathematicae Polonae, Series I: Commentationes Mathematicae* 20, 1–5. [MR453773 (56 #12027); Zbl 0364.65029.] 18
11. Jerzy Baksalary, Anita Dobek, Radosław Kala (1977). Wyznaczanie operatorów rzutowania. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 95 (6), 175–183. [Article has # ABS-60 and is in Polish. English translation of article title: “The computation of projectors”.]
12. Jerzy K. Baksalary, Radosław Kala (1977). An extension of a rank criterion for the least squares estimator to be the best linear unbiased estimator. *Journal of Statistical Planning and Inference* 1, 309–312. [MR518938 (58 #24745, George P.H. Styan); Zbl 0383.62041.] 27, 28
13. Jerzy K. Baksalary, Radosław Kala (1977). Sums of squares and products of matrices for a non-full ranks hypothesis in the model of Potthoff and Roy.

- Mathematische Operationsforschung und Statistik, Series Statistics* 8, 459–465. [MR501598 (58 #18914, J.A. John); Zbl 0397.62035.]
14. Jerzy Baksalary, Radosław Kala, Krystyna Katulska (1977). Analiza wariancji dla klasyfikacji krzyżowych metodą Bocka. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 95 (6), 3–32. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-51 and is in Polish. English translation of article title: “Analysis of variance for cross classifications by the method of Bock”.]
 15. J.K. Baksalary, L.C.A. Corsten, R. Kala (1978). Reconciliation of two different views on estimation of growth curve parameters. *Biometrika* 65, 662–665. [MR521835 (80g:62034, C.G. Khatri); Zbl 0398.62063.] 19
 16. Jerzy Baksalary, Anita Dobek, Radosław Kala (1978). Analiza statystyczna w ogólnym modelu liniowym. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 106 (7), 3–23. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-61 and is in Polish. English translation of article title: “Statistical analysis in a general linear model”.]
 17. Jerzy Baksalary, Anita Dobek, Radosław Kala (1978). Estymacja krzywych wzrostu. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 106 (7), 81–113. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-65 and is in Polish. English translation of article title: “Estimation of growth curves”.]
 18. Jerzy Baksalary, Anita Dobek, Radosław Kala (1978). Rozkład macierzy rzeczywistej na czynniki pełnych rzędów. *Roczniki Akademii Rolniczej w Poznaniu: Algorytmy Biometryczne i Statystyczne* 106 (7), 179–183. [Part number refers to the series *Algorytmy Biometryczne i Statystyczne*. Article has # ABS-69 and is in Polish. English translation of article title: “Rank factorization of a real matrix”.]
 19. Jerzy K. Baksalary, Radosław Kala (1978). A bound for the Euclidean norm of the difference between the least squares and the best linear unbiased estimators. *The Annals of Statistics* 6, 1390–1393. [MR523772 (80f:62065, Lubomír Kubáček); Zbl 0392.62051.] 37
 20. Jerzy K. Baksalary, Radosław Kala (1978). Estymowalność liniowych funkcji parametrycznych w jednowymiarowym modelu liniowym. *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 12, 133–144. [MR517468 (80d:62046, R. Zmyślony); Zbl 0439.62045. Article in Polish. English translation of article title: “Estimability of linear parametric functions in a one-dimensional linear model”.]
 21. Jerzy K. Baksalary, Radosław Kala (1978). Estymowalność liniowych funkcji parametrycznych w jednowymiarowym modelu liniowym z restrykcjami. *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 12, 145–151. [MR517469 (80d:62047, R. Zmyślony); Zbl 0439.62046.]

- Article in Polish. English translation of article title: “Estimability of linear parametric functions in a one-dimensional linear model with restrictions”.]
22. J.K. Baksalary, R. Kala (1978). Relationships between some representations of the best linear unbiased estimator in the general Gauss–Markoff model. *SIAM Journal on Applied Mathematics* 35, 515–520. [MR507953 (80a:62094, Lubomír Kubáček); Zbl 0398.62062.]
 23. J.K. Baksalary, R. Kala (1979). The matrix equation $AX - YB = C$. *Linear Algebra and its Applications* 25, 41–43. [MR528711 (80d:15014, Harald K. Wimmer); Zbl 0403.15010.] 26, 31
 24. Jerzy K. Baksalary, Radosław Kala (1979). Two relations between oblique and Λ -orthogonal projectors. *Linear Algebra and its Applications* 24, 99–103. [MR524829 (80c:15013, M.F. Smiley); Zbl 0401.15004.]
 25. J.K. Baksalary, R. Kala (1979). Best linear unbiased estimation in the restricted general linear model. *Mathematische Operationsforschung und Statistik, Series Statistics* 10, 27–35. [MR542361 (82c:62093); Zbl 0416.62049.] 37
 26. J.K. Baksalary, R. Kala (1979). On the prediction problem in the seemingly unrelated regression equations model. *Mathematische Operationsforschung und Statistik, Series Statistics* 10, 203–208. [MR544566 (81b:62118, Kenneth N. Berk); Zbl 0417.62053.] 37
 27. J.K. Baksalary, R. Kala (1979). Covariance adjustment when a vector of parameters is restricted to a given subspace. *SIAM Journal on Applied Mathematics* 37, 20–21. [MR536300 (80m:62063, Federico O’Reilly); Zbl 0411.62033.] 37
 28. Jerzy K. Baksalary, Tadeusz Caliński, Radosław Kala (1980). Estymacja krzywych wzrostu i jej zastosowanie do oceny odmian gatunków o plonowaniu wielokrotnym. *Biuletyn Oceny Odmian / Cultivar Testing Bulletin (Poznań)* 8, 167–181. [Article in Polish. English translation of article title: “Estimation of growth curves and its application in evaluating varieties of species with repeated yielding”.]
 29. Jerzy K. Baksalary, Anita Dobek, Radosław Kala (1980). A necessary condition for balance of a block design. *Biometrical Journal / Biometrische Zeitschrift* 22, 47–50. [MR576961 (81h:62134, K.L. Sharma); Zbl 0457.62059.]
 30. Jerzy K. Baksalary, Anita Dobek, Radosław Kala (1980). Some methods for constructing efficiency-balanced block designs. *Journal of Statistical Planning and Inference* 4, 25–32. [MR587028 (81j:62149); Zbl 0461.62066.]
 31. J.K. Baksalary, A. Dobek, R. Kala (1980). Calculation of projections. *Zastosowania Matematyki / Applicationes Mathematicae (Warsaw)* 17, 209–215. [Zbl 0466.65024. Article in English.]
 32. J.K. Baksalary, J. Hauke, R. Kala (1980). Nonnegative definite solutions to some matrix equations occurring in distribution theory of quadratic forms. *Sankhyā, The Indian Journal of Statistics: Series A* 42, 283–291. [MR656262 (83e:15015, John P. Daughtry); Zbl 0501.62036.] 16

33. J.K. Baksalary, R. Kala (1980). A new bound for the Euclidean norm of the difference between the least squares and the best linear unbiased estimators. *The Annals of Statistics* 8, 679–681. [MR568730 (81c:62070, Simon Dahan); Zbl 0464.62055.]
34. Jerzy K. Baksalary, Radosław Kala (1980). Two properties of a nonnegative definite matrix. *Bulletin de l'Académie Polonaise des Sciences, Série des Sciences Mathématiques* 28, 233–235. [MR620194 (82i:15020, Thomas L. Markham); Zbl 0463.15017.]
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124. J.K. Baksalary, J. Hauke, G.P.H. Styan (1994). On some distributional properties of quadratic forms in normal variables and on some associated matrix partial orderings. In *Multivariate Analysis and Its Applications* (T.W. Anderson, K.T. Fang, I. Olkin, eds.), Institute of Mathematical Statistics Lecture Notes–Monograph Series 24, Institute of Mathematical Statistics, pp. 111–121. [MR1479460.] 17, 20, 29, 61
125. J.K. Baksalary, S. Gnot, S. Kageyama (1995). Best estimation of variance components with arbitrary kurtosis in two-way layouts mixed models. *Journal of Statistical Planning and Inference* 44, 65–75. [MR1323071 (96a:62076, James D. Malley); Zbl 0812.62076.]
126. Jerzy K. Baksalary, Augustyn Markiewicz, C. Radhakrishna Rao (1995). Admissible linear estimation in the general Gauss–Markov model with respect to an arbitrary quadratic risk function. *Journal of Statistical Planning and Inference* 44, 341–347. [MR1332678 (96h:62115, Khursheed Alam); Zbl 0811.62064.] 20, 26
127. Jerzy K. Baksalary, Augustyn Markiewicz (1996). Further results on invariance of the eigenvalues of matrix products involving generalized inverses. *Linear Algebra and its Applications* 237/238, 115–121. [MR1382668 (96m:15014, Rafael Bru); Zbl 0851.15006 (J.D. Dixon).] 20
128. Jerzy K. Baksalary, Peter Šemrl, George P.H. Styan (1996). A note on rank additivity and range additivity. *Linear Algebra and its Applications* 237/238, 489–498. MR1382690 (97b:15026, Guo Rong Wang); Zbl 0856.47001.] 29
129. Jerzy K. Baksalary, Oskar Maria Baksalary (2000). Idempotency of linear combinations of two idempotent matrices. *Linear Algebra and its Applications* 321, 3–7. [MR1799981 (2001m:15056); Zbl 0984.15021 (T. Nono).]
130. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 25-1.1 (to Problem 25-1: “Moore–Penrose inverse of a skew-symmetric matrix” proposed by Jürgen Groß, Sven-Oliver Troschke, Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 26, 2.
131. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 25-4.1 (to Problem 25-4: “Two rank equalities associated with blocks of an orthogonal projector” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 26, 6–7.

132. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 25-5.1 (to Problem 25-5: “Three inequalities involving Moore–Penrose inverses” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 26, 9–10.
133. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 25-6.1 (to Problem 25-6: “Generalized inverse of a matrix product” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 26, 10–11.
134. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 26-4.1 (to Problem 26-4: “Commutativity of EP matrices” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 27, 30.
135. Jerzy K. Baksalary, Oskar Maria Baksalary (2001). Solution 26-5.1 (to Problem 26-5: “Convex matrix inequalities” proposed by Bao-Xue Zhang). *Image: The Bulletin of the International Linear Algebra Society* 27, 33–34.
136. Jerzy K. Baksalary (2002). Solution 28-6.1 (to Problem 28-6: “Square roots and additivity” proposed by Dietrich Trenkler, Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 29, 30.
137. Jerzy K. Baksalary, Oskar Maria Baksalary (2002). Solution 27-2.1 (to Problem 27-2: “Specific generalized inverses” proposed by Jürgen Groß, Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 28, 29.
138. Jerzy K. Baksalary, Oskar Maria Baksalary (2002). Solution 28-5.1 (to Problem 28-5: “A range equality for Moore–Penrose inverses” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 29, 28–29.
139. Jerzy K. Baksalary, Oskar Maria Baksalary (2002). Solution 28-7.2 (to Problem 28-7: “Partial isometry and idempotent matrices” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 29, 31.
140. Jerzy K. Baksalary, Oskar Maria Baksalary (2002). Problem 29.1: “A condition for an EP matrix to be Hermitian”. *Image: The Bulletin of the International Linear Algebra Society* 29, 36. [For a solution see [161].] 56
141. Jerzy K. Baksalary, Oskar Maria Baksalary (2002). Commutativity of projectors. *Linear Algebra and its Applications* 341, 129–142. [Correction from the authors (within remarks “From the Editor-in-Chief” by Richard A. Brualdi): *Linear Algebra and its Applications* 360 (2003), 279. MR1873614 (2002j:15027, Tomaz Košir); Zbl 0997.15011 (Hans Havlicek).]
142. Jerzy K. Baksalary, Oskar Maria Baksalary, George P.H. Styan (2002). Idempotency of linear combinations of an idempotent matrix and a tripotent matrix. *Linear Algebra and its Applications* 354, 21–34. [MR1927644 (2003h:15036, R. Kala); Zbl 1016.15027 (Erich Ellers).]
143. Jerzy K. Baksalary, Oskar Maria Baksalary, Tomasz Szulc (2002). A property of orthogonal projectors. *Linear Algebra and its Applications* 354, 35–39. [MR1927645 (2003h:15037); Zbl 1025.15039 (A.-A. Jafarian).] 30

144. Jerzy K. Baksalary, Richard William Farebrother (2002). Solution 27-1.1 (to Problem 27-1: “A class of square roots of involutory matrices” proposed by Richard William Farebrother). *Image: The Bulletin of the International Linear Algebra Society* 28, 26–28. [15](#)
145. Jerzy K. Baksalary, Jan Hauke (2002). Solution 27-6.1 (to Problem 27-6: “Inequalities of Hadamard products of nonnegative definite matrices” proposed by Xingzhi Zhan). *Image: The Bulletin of the International Linear Algebra Society* 28, 33. [17](#)
146. Jerzy K. Baksalary, Jan Hauke (2002). Solution 28-10.1 (to Problem 28-10: “Inequalities involving square roots” proposed by Fuzhen Zhang). *Image: The Bulletin of the International Linear Algebra Society* 29, 33–34. [17](#)
147. Jerzy K. Baksalary, George P.H. Styan (2002). Generalized inverses of partitioned matrices in Banachiewicz–Schur form. *Linear Algebra and its Applications* 354, 41–47. [MR1927646 (2003h:15006); Zbl 1022.15006 (Néstor Janier Thome).] [29](#), [38](#)
148. Jerzy K. Baksalary (2003). Solution 29-10.1 (to Problem 29-10: “Equivalence of three reverse-order laws” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 30, 31.
149. Jerzy K. Baksalary, Oskar Maria Baksalary (2003). Solution 29-5.1 (to Problem 29-5: “Product of two Hermitian nonnegative definite matrices” proposed by Jürgen Groß, Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 30, 24–25.
150. Jerzy K. Baksalary, Oskar Maria Baksalary (2003). Solution 30-5.1 (to Problem 30-5: “A range equality for the difference or orthogonal projectors” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 31, 36–37.
151. Jerzy K. Baksalary, Oskar Maria Baksalary (2003). Solution 30-6.1 (to Problem 30-6: “A matrix related to an idempotent matrix” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 31, 39.
152. Jerzy K. Baksalary, Oskar Maria Baksalary (2003). Solution 30-7.1 (to Problem 30-7: “A condition for an idempotent matrix to be Hermitian” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 31, 41.
153. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2003). Problem 30-1: “Star partial ordering, left-star partial ordering, and commutativity”. *Image: The Bulletin of the International Linear Algebra Society* 30, 36. [19](#), [55](#)
154. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2003). Solution 30-1.1 (to Problem 30-1: “Star partial ordering, left-star partial ordering, and commutativity” proposed by Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu [[153](#)]). *Image: The Bulletin of the International Linear Algebra Society* 31, 30–31. [19](#)

155. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2003). Further properties of the star, left-star, right-star, and minus partial orderings. *Linear Algebra and its Applications* 375, 83–94. [MR2013457 (2004m:15029, Alexander E. Guterman); Zbl 1048.15016 (Fuad Kittaneh).] 19
156. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2003). Further relationships between certain partial orders of matrices and their squares. *Linear Algebra and its Applications* 375, 171–180. [MR2013463 (2004h:15029, Maria Elena Valcher); Zbl 1048.15017 (Fuad Kittaneh).] 19
157. Jerzy K. Baksalary, Oskar Maria Baksalary, Götz Trenkler (2003). A revisitation of formulae for the Moore–Penrose inverse of modified matrices. *Linear Algebra and its Applications* 372, 207–224. [MR1999148 (2004f:15008, Donald W. Robinson); Zbl 1038.15001 (Ki Hang Kim).] 38
158. Jerzy K. Baksalary, Jan Hauke (2003). Solution 29-9.1 (to Problem 29-9: “Equality of two nonnegative definite matrices” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 30, 29–30. 17
159. Jerzy K. Baksalary, Roger A. Horn (2003). Solution 29-7.1 (to Problem 29-7: “Complementary principal submatrices and their eigenvalues” proposed by Chi-Kwong Li). *Image: The Bulletin of the International Linear Algebra Society* 30, 26–27.
160. Jerzy K. Baksalary, Xiaoji Liu (2003). Solution 29-8.1 (to Problem 29-8: “A range equality involving an idempotent matrix” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 30, 27.
161. William F. Trench, Jerzy K. Baksalary, Oskar Maria Baksalary (2003). Solution 29-1.2 (to Problem 29-1: “A condition for an EP matrix to be Hermitian” proposed by Jerzy K. Baksalary, Oskar Maria Baksalary [140]). *Image: The Bulletin of the International Linear Algebra Society* 30, 22. 54
162. Jerzy K. Baksalary (2004). Solution 31-3.1 (to Problem 31-3: “A range equality for block matrices” proposed by Yongge Tian). *Image: The Bulletin of the International Linear Algebra Society* 32, 23–24.
163. Jerzy K. Baksalary (2004). An elementary development of the equation characterizing best linear unbiased estimators. *Linear Algebra and its Applications* 388, 3–6. [MR2077843 (2005f:62107, Lutz Edler); Zbl 1052.62062.]
164. Jerzy K. Baksalary (2004). A new approach to the concept of a strong unified-least-squares matrix. *Linear Algebra and its Applications* 388, 7–15. [MR2077844 (2005h:15014); Zbl 02105726 (Néstor Janier Thome).]
165. Jerzy K. Baksalary, Oskar Maria Baksalary (2004). Solution 31-7.1 (to Problem 31-7: “On the product of orthogonal projectors” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 32, 30–31.
166. Jerzy K. Baksalary, Oskar Maria Baksalary (2004). On linear combinations of generalized projectors. *Linear Algebra and its Applications* 388, 17–24. [MR.2077845 (2005h:15082); Zbl 02105727.]

167. Jerzy K. Baksalary, Oskar Maria Baksalary (2004). Nonsingularity of linear combinations of idempotent matrices. *Linear Algebra and its Applications* 388, 25–29. [MR2077846 (2005h:15083); Zbl 02105728.]
168. Jerzy K. Baksalary, Oskar Maria Baksalary (2004). Relationships between generalized inverses of a matrix and generalized inverses of its rank-one-modifications. *Linear Algebra and its Applications* 388, 31–44. [MR2077847 (2005h:15013, A.M. Galperin); Zbl 02105729 (Néstor Janier Thome).]
169. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2004). Solution 31-2.1 (to Problem 31-2: “Matrices commuting with all nilpotent matrices” proposed by Henry Ricardo). *Image: The Bulletin of the International Linear Algebra Society* 32, 21–22.
170. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu (2004). Further properties of generalized and hypergeneralized projectors. *Linear Algebra and its Applications* 389, 295–303. [MR2080412 (2005h:15070); Zbl 02117299.] 19
171. Jerzy K. Baksalary, Oskar Maria Baksalary, Halim Özdemir (2004). A note on linear combinations of commuting tripotent matrices. *Linear Algebra and its Applications* 388 (2004) 45–51. [MR2077848; Zbl 1057.15018 (Ki Hang Kim).]
172. Jerzy K. Baksalary, Oskar Maria Baksalary, Tomasz Szulc (2004). Properties of Schur complements in partitioned idempotent matrices. *Linear Algebra and its Applications* 379, 303–318. [MR2039745 (2005b:15044); Zbl 1043.15019 (Omar Hirzallah).] 30
173. Jerzy K. Baksalary, Jan Hauke (2004). Characterizations of minus and star orders between the squares of Hermitian matrices. *Linear Algebra and its Applications* 388, 53–59. [MR2077849 (2005h:15060); Zbl 02105731 (Juan Ramón Torregrosa Sánchez).]
174. Jerzy K. Baksalary, Jan Hauke, Xiaoji Liu, Sanyang Liu (2004). Relationships between partial orders of matrices and their powers. *Linear Algebra and its Applications* 379, 277–287. [MR2039743 (2005b:15039); Zbl 1044.15011 (Juan Ramón Torregrosa Sánchez).]
175. Jerzy K. Baksalary, Paulina Kik, Augustyn Markiewicz (2004). Solution 31-6.1 (to Problem 31-6: “A full rank factorization of a skew-symmetric matrix” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 32, 27–28. 20
176. Jerzy K. Baksalary, Anna Kuba (2004). Solution 31-7.2 (to Problem 31-7: “On the product of orthogonal projectors” proposed by Götz Trenkler). *Image: The Bulletin of the International Linear Algebra Society* 32, 31–34.
177. Jerzy K. Baksalary, Xiaoji Liu (2004). An alternative characterization of generalized projectors. *Linear Algebra and its Applications* 388, 61–65. [MR2077850 (John Chollet); Zbl 02105732.] 19
178. Jerzy K. Baksalary, Oskar Maria Baksalary (2005). An invariance property related to the reverse order law. *Linear Algebra and its Applications* 410, 64–69. [MR2177830 (2006i:15007, Ar. Meenakshi); Zbl 1085.15004 (Juan Ramón Torregrosa Sánchez).]

179. Jerzy K. Baksalary, Oskar Maria Baksalary (2006). When is a linear combination of two idempotent matrices the group involutory matrix? *Linear and Multilinear Algebra* 54, 429–435. [MR2259600 (2007f:15001); Zbl 1112.15009 (Rodica Covaci).]
 180. Jerzy K. Baksalary, Oskar Maria Baksalary, Jürgen Groß (2006). On some linear combinations of hypergeneralized projectors. *Linear Algebra and its Applications* 413, 264–273. [MR2197162 (2006i:15033, R. Kala); Zbl 1088.15026 (Václav Burjan).]
 181. Jerzy K. Baksalary, Oskar Maria Baksalary (2007). Particular formulae for the Moore–Penrose inverse of columnwise partitioned matrices. *Linear Algebra and its Applications* 421, 16–23. [MR2290682; Zbl 1116.15003 (Néstor Janier Thome).]
 182. Jerzy K. Baksalary, Oskar Maria Baksalary, Paulina Kik (2007). Generalizations of a property of orthogonal projectors. *Linear Algebra and its Applications* 420, 1–8. [MR2274944 (2007m:15012, Tomáš Košir), Zbl 1111.15016 (Vladimir P. Kostov).]
 183. Jerzy K. Baksalary, Oskar Maria Baksalary, Xiaoji Liu, Götz Trenkler (2007). Further results on generalized and hypergeneralized projectors. Accepted for publication in *Linear Algebra and its Applications*.
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Figure 4. Jerzy Baksalary relaxing from the 12th International Workshop on Matrices and Statistics: Dortmund, Germany, August 2003. [Photograph: Simo Puntanen.]

Table 2.2. Annotated list of the 14 research collections in which Jerzy K. Baksalary published.

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- The Collected Papers of T.W. Anderson: 1943–1985, Volume 2* (George P.H. Styan, ed.), Wiley, New York, pp. i–viii and 827–1681, ISBN 0-471-52786-6 (v. 2), 0-471-62422-5 (2 volume set), 1990: paper [99]. [MR1065815 (91j:01064, C.R. Rao).]
- Contributions to the Comparison of Linear Models and to the Löwner-Ordering Antitonicity of Generalized Inverses* by Kenneth Nordström, Ph.D. dissertation, University of Helsinki. Tilastotieteellisiä Tutkimuksia (Statistical Studies), vol. 12, Finnish Statistical Society, Helsinki, x + 89 pp., ISBN 951-95421-6-7 (ISSN 0356-3499), 1990: paper [93] is reprinted here. [MR1211187 (94g:62143).]
- Czwarte Colloquium Metodologiczne z Agro-Biometrii: Referaty (Poznań, 10–15 września 1974)* (Eugeniusz Bilski, Tadeusz Caliński, Witold Klonecki, Wiktor Oktaba, eds.), Komitet Hodowli i Uprawy Roślin Polskiej Akademii Nauk i Polskie Towarzystwo Biometryczne, Warszawa, 410 pp., 1974: paper [2]. [Articles in Polish. English translation of collection title and publisher: *Papers Presented at the Fourth Colloquium on Methodology in Agricultural Biometry: Poznań, 10–15 September 1974*, Polish Academy of Sciences and Polish Biometrical Society, Warsaw.]
- Data Analysis and Informatics, Proceedings of the Second International Symposium on Data Analysis and Informatics, organised by the Institut de Recherche d'Informatique et d'Automatique, Versailles, October 17–19, 1979* (E. Diday, L. Lebart, J.P. Pagès, R. Tomassone, eds.), North-Holland, Amsterdam, viii + 790 pp., ISBN 0-444-86005-3, 1980: paper [37]. [MR0621680 (82f:62004), Zbl 0463.00020.]
- Data Analysis and Statistical Inference: Festschrift in Honour of Prof. Dr. Friedhelm Eicker* (Siegfried Schach, Götz Trenkler, eds.), Verlag Josef Eul, Bergisch Gladbach, viii + 584 pp., ISBN 3-89012-274-4, 1992: paper [113]. [MR1248829 (94f:62003), Zbl 0771.00052.]
- Encyclopedia of Statistical Sciences, Volume 5: Lindeberg Condition to Multitrait-Multimethod Matrices* (Samuel Kotz, Norman L. Johnson, Campbell B. Read, eds.), Wiley, New York, ix + 741 pp., ISBN 0-471-05552-2 (v. 5), 1985: paper [59]. [MR0793593 (87a:62001), Zbl 0657.62001.]
- Graphs, Matrices, and Designs: Festschrift in Honor of Norman J. Pullman* (Rolf S. Rees, ed.), Lecture Notes in Pure and Applied Mathematics 139, Marcel Dekker, New York, xv + 314 pp., ISBN 0-8247-8790-0 (ISSN 0075-8469), 1993: paper [122]. [This Festschrift “contains 21 research papers in honor of the sixtieth birthday of Professor Norman J. Pullman on March 31, 1991”. Zbl 0771.00051.]
- Mathematical Statistics* (Robert Bartoszyński, Jacek Koronacki, Ryszard Zieliński, eds.), Banach Center Publications 6, PWN–Polish Scientific Publishers, Warsaw, 376 pp., ISBN 83-01-01493-8 (ISSN 0137-6934), 1980: paper [35]. [This

collection “contains the proceedings of the VIII semester of the Banach Centre ... [and] the conference at Wisła, September 15 to December 18, 1976”. MR0599366 (81m:62004), Zbl 0432.00016.]

Multivariate Analysis and Its Applications (T.W. Anderson, K.T. Fang, I. Olkin, eds.), Institute of Mathematical Statistics Lecture Notes–Monograph Series 24, Institute of Mathematical Statistics, Hayward, California, 1994, xiv + 472 pp., ISBN 0-940600-35-8, 1994: paper [124]. [Collection comprises selected papers presented at the “International Symposium on Multivariate Analysis and Its Applications, Hong Kong, March 14–18, 1992”. MR1479452 (98e:62010), Zbl 0942.00038.]

Multivariate Statistics and Probability: Essays in Memory of Parachuri R. Krishnaiah (C.R. Rao, M.M. Rao, eds.), Academic Press, Boston, xiii + 567 pp., ISBN 0-12-580205-6, 1989: paper [79] is reprinted here. [This Festschrift is reprinted from *Journal of Multivariate Analysis*: vol. 27, no. 1 & 2 (1988) and vol. 28, no. 2 (1989). MR1056087 (90m:62004), Zbl 0692.00014.]

Probability, Statistics and Design of Experiments (R.R. Bahadur, ed.), Wiley Eastern Limited, New Delhi, viii + 737 pp., ISBN 81-224-0335-2, 1990: paper [102]. [This collection “contains papers presented at a Symposium held in Delhi in December 1988 in honour of the late Professor R.C. Bose”. Header for each paper reads (in part) “Proceedings of the R.C. Bose Symposium on Probability, Statistics and Design of Experiments, Delhi, 27–30 December 1988”.]

Proceedings of the Second International Tampere Conference in Statistics: University of Tampere, Tampere, Finland, 1–4 June 1987 (Tarmo Pukkila, Simo Puntanen, eds.), Department of Mathematical Sciences/Statistics, University of Tampere, Tampere, Finland, xi + 708 pp., ISBN 951-44-2168-X, 1987: paper [69]. [Report A 184, Department of Mathematical Sciences, University of Tampere, ISSN 0356-4231.]

A Spectrum of Statistical Thought: Essays in Statistical Theory, Economics and Population Genetics in Honour of Johan Fellman (Gunnar Rosenqvist, Katarina Juselius, Kenneth Nordström, Juni Palmgren, eds.), Ekonomi och Samhälle: Skrifter utgivna vid Svenska Handelshögskolan, Helsingfors (Swedish School of Economics and Business Administration, Helsinki), xii + 276 pp., ISBN 951-555-351-2, 1991: paper [107].

Statistical Data Analysis and Inference (Yadolah Dodge, ed.), North-Holland, Amsterdam, xii + 615 pp., ISBN 0-444-88029-1, 1989: paper [86]. [This collection “contains invited papers presented at the International Conference on Recent Developments in Statistical Data Analysis and Inference in Honor of C. Radhakrishna Rao, held in Neuchâtel, Switzerland, August 21–24, 1989”. MR1089619 (91i:62004), Zbl 0732.00019.]

Table 2.3. Reviews by Jerzy K. Baksalary published in *Mathematical Reviews*.

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- MR437554 (55 #10478) Frank J. Hall, Carl D. Meyer, Jr., (1975). Generalized inverses of the fundamental bordered matrix used in linear estimation. *Sankhyā, The Indian Journal of Statistics: Series A* 37, 428–438.
- MR442001 (56 #390) George A. Milliken, Fikri Akdeniz (1977). A theorem on the difference of the generalized inverses of two nonnegative matrices. *Communications in Statistics—A, Theory and Methods* 6, 73–79.
- MR448720 (56 #7025) A. Bartkowiakowa (1976). Algorithms for regression analysis (in Polish). *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 7, 101–115.
- MR448733 (56 #7038) Wiktor Oktaba (1976). Matrix relations in the analysis of variance (in Polish). *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 8, 81–88.
- MR455227 (56 #13466) Roman Zmysłony (1976). Quadratically admissible estimators in random models (in Polish). *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 7, 117–122.
- MR458732 (56 #16932) Stanisław Gnot, Witold Klonecki, Roman Zmysłony (1977). Uniformly minimum variance unbiased estimation in various classes of estimators, I. *Mathematische Operationsforschung und Statistik, Series Statistics* 8, 199–210.
- MR468046 (57 #7885) Johan Fellman (1976). On the effect of “nuisance” parameters in linear models. *Sankhyā, The Indian Journal of Statistics: Series A* 38, 197–200.
- MR480556 (58 #715) Ching Hsiang Hung, Thomas L. Markham (1977). The Moore–Penrose inverse of a sum of matrices. *Journal of the Australian Mathematical Society, Series A* 24, 385–392.
- MR514647 (80h:62055) David W. Smith, R.R. Hocking, (1978). Maximum likelihood analysis of the mixed model: the balanced case. *Communications in Statistics—A, Theory and Methods* 7, 1253–1266.
- MR518661 (81b:62013) Roman Różański (1978). $G_{1,-1}$ -minimax estimation of the parameters of a distribution of exponential type (in Polish). *Roczniki Polskiego Towarzystwa Matematycznego, Seria III: Matematyka Stosowana* 13, 59–66.
- MR531457 (80e:15002) Michał Kolupa (1978/1979). Construction of an interval which contains all components of the solution vector of an inhomogeneous Cramer system of linear equations (in Polish). *Przegląd Statystyczny* 25, 295–299.
- MR544565 (82g:62088) I.S. Alalouf, G.P.H. Styan (1979). Estimability and testability in restricted linear models. *Mathematische Operationsforschung und Statistik, Series Statistics* 10, 189–201.
- MR567938 (82e:62097) R.W. Farebrother (1979). Estimation with aggregated data. *Journal of Econometrics* 10, 43–55.

- MR636025 (84a:15021) M. Barel, A. Tamir (1981). Nested matrices and the existence of least majorized elements. *Linear Algebra and its Applications* 38, 65–72.
- MR636034 (84a:15017) Franklin T. Luk (1981). The communality problem for Stieltjes matrices. *Linear Algebra and its Applications* 38, 161–169.
- MR645257 (83h:62109) C.G. Khatri, D. Raghavarao, R. Mercado (1981). On the estimation of fixed effects in a mixed model. *Gujarat Statistical Review* 8 (1), 1–6.
- MR745226 (86j:62154) D. Pfeffermann (1984). On extensions of the Gauss–Markov theorem to the case of stochastic regression coefficients. *Journal of the Royal Statistical Society, Series B* 46, 139–148.
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Table 2.4. Ph.D. dissertations supervised by Jerzy K. Baksalary.

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- Paweł R. Pordzik, Adam Mickiewicz University, Poznań, 1985. Ph.D. dissertation in Polish: Testymatory funkcji parametrycznych w modelach liniowych. [English translation of title: “Testimators of parametric functions in linear models”.]
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- Augustyn Markiewicz, Adam Mickiewicz University, Poznań, 1988. Ph.D. dissertation in Polish: Dopuszczalne estymatory liniowe w modelach liniowych. [English translation of title: “Admissible linear estimators in linear models”.]
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Acknowledgements

A Special Memorial Session for Jerzy Baksalary was organized by Oskar Maria Baksalary, Simo Puntanen, George P.H. Styan, and Götz Trenkler at the 14th International Workshop on Matrices and Statistics held on the Albany Campus of Massey University in Auckland, New Zealand, 29 March–1 April 2005. For this Memorial Session a set of handouts was prepared by the Session organizers which included a reprint of a booklet prepared for the “Session on the occasion of the 60th birthday of Jerzy K. Baksalary” held at the Mathematical Research & Conference Center, Polish Academy of Sciences, Będlewo, Poland, on 17 August 2004, just before the 13th International Workshop on Matrices and Statistics. The

set of handouts distributed at the Baksalary Memorial Session in Auckland was revised and updated into a single 24-page handout for the Southern Ontario Matrices and Statistics Days: Dedicated to Jerzy K. Baksalary (1944–2005) held in Windsor, Ontario, Canada, 9–10 June 2005. This Windsor handout was revised and published, together with the survey entitled “On some of Jerzy Baksalary’s contributions to the theory of block designs” by Tadeusz Caliński, as the two lead articles in the Tenth Special Issue (Part 2) on Linear Algebra and Statistics of *Linear Algebra and its Applications* (vol. 410, 15 November 2005), in remembrance of Jerzy K. Baksalary.

We are particularly grateful to Tadeusz Caliński, Augustyn Markiewicz, Simo Puntanen, and Götz Trenkler for their help in preparing this article. Many thanks go to Simo Puntanen and the University of Tampere for allowing us to reprint their photographs, to *Image* Editors-in-Chief Bryan L. Shader and Hans Joachim Werner for allowing us to reprint their remarks on Jerzy Baksalary, and to Anita Dobek, R. William Farebrother, Jürgen Groß, Jan Hauke, Radosław Kala, Erkki Liski, Xiaoji Liu, Augustyn Markiewicz, Thomas Mathew, Wiesław Migdałek, Friedrich Pukelsheim, Tarmo Pukkila, Simo Puntanen, C. Radhakrishna Rao, Dietrich von Rosen, Tomasz Szulc, Yongge Tian, Götz Trenkler, Frank Uhlig, Júlia Volaufová, Haruo Yanai, and Fuzhen Zhang for giving us their comments on the life and publications of Jerzy K. Baksalary. We are also grateful to S. Ejaz Ahmed, Mirosława Baksalary, Jennifer Barranger, Torsten Bernhardt, S.W. Drury, Jarkko M. Isotalo, Charles R. Johnson, Mirosław Krzyśko, Owen Scott Martin, Lindsey E. McQuade, Joanna Modławska, Jarmo Niemelä, Paweł R. Pordzik, and Evelyn M. Styan. Oskar Maria Baksalary would like to express his sincere thanks to the Alexander von Humboldt Foundation for its financial support. This research was supported in part by the Natural Sciences and Engineering Research Council of Canada.

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Received 14 December 2007