

# Topics in Operator Theory

Volume 1:

Operators, Matrices and Analytic Functions

A tribute to Israel Gohberg  
on the occasion of his 80<sup>th</sup> birthday

Joseph A. Ball  
Vladimir Bolotnikov  
J. William Helton  
Leiba Rodman  
Ilya M. Spitkovsky  
Editors



# Operator Theory: Advances and Applications

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Vol. 202

**Founded in 1979 by Israel Gohberg**

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Volume 1:  
Operators, Matrices and Analytic Functions

Proceedings of the XIX<sup>th</sup> International Workshop on Operator  
Theory and its Applications, College of William and Mary, 2008

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# The XIXth International Workshop on Operator Theory and its Applications. I

Joseph A. Ball, Vladimir Bolotnikov, J. William Helton,  
Leiba Rodman and Ilya M. Spitkovsky

**Abstract.** Information about the workshop and comments about the first volume of proceedings is provided.

**Mathematics Subject Classification (2000).** 15-06, 47-06.

**Keywords.** Operator theory, matrix analysis, analytic functions.

The Nineteenth International Workshop on Operator Theory and its Applications – IWOTA 2008 – took place in Williamsburg, Virginia, on the campus of the College of William and Mary, from July 22 till July 26, 2008. It was held in conjunction with the 18th International Symposium on Mathematical Theory of Networks and Systems (MTNS) in Blacksburg, Virginia (Virginia Tech, July 28–August 1, 2008) and the 9th Workshop on Numerical Ranges and Numerical Radii (July 19–July 21, 2008) at the College of William and Mary. The organizing committee of IWOTA 2008 (Ball, Bolotnikov, Helton, Rodman, Spitkovsky) served also as editors of the proceedings.

IWOTA 2008 celebrated the work and career of Israel Gohberg on the occasion of his 80th birthday, which actually fell on August 23, 2008. We are pleased to present this volume as a tribute to Israel Gohberg.

IWOTA 2008 was a comprehensive, inclusive conference covering many aspects of theoretical and applied operator theory. More information about the workshop can be found on its web site

<http://www.math.wm.edu/~vladi/IWOTA/IWOTA2008.htm>

There were 241 participants at IWOTA 2008, representing 30 countries, including 29 students (almost exclusively graduate students), and 20 young researchers (those who received their doctoral degrees in the year 2003 or later). The scientific program included 17 plenary speakers and 7 invited speakers who gave overview of many topics related to operator theory. The special sessions covered



Israel Gohberg at IWOTA 2008, Williamsburg, Virginia

a broad range of topics: Matrix and operator inequalities; hypercomplex operator theory; the Kadison–Singer extension problem; interpolation problems; matrix completions; moment problems; factorizations; Wiener–Hopf and Fredholm operators; structured matrices; Bezoutians, resultants, inertia theorems and spectrum localization; applications of indefinite inner product spaces; linear operators and linear systems; multivariable operator theory; composition operators; matrix polynomials; indefinite linear algebra; direct and inverse scattering transforms for integrable systems; theory, computations, and applications of spectra of operators.

We gratefully acknowledge support of IWOTA 2008 by the National Science Foundation Grant 0757364, as well as by the individual grants of some organizers, and by various entities within the College of William and Mary: Department of Mathematics, the Office of the Dean of the Faculty of Arts and Sciences, the Office of the Vice Provost for Research, and the Reves Center for International Studies. One plenary speaker has been sponsored by the International Linear Algebra Society. The organization and running of IWOTA 2008 was helped tremendously by the Conference Services of the College of William and Mary.

The present volume is the first of two volumes of proceedings of IWOTA 2008. Here, papers on operator theory, linear algebra, and analytic functions are collected. The volume also contains a commemorative article of speeches and reminiscences dedicated to Israel Gohberg. All papers (except the commemorative

article) are refereed. The second volume contains papers on systems, differential and difference equations, and mathematical physics.

August 2009

Added on December 14, 2009:

With deep sadness the editors' final act in preparing this volume is to record that Israel Gohberg passed away on October 12, 2009, aged 81. Gohberg was a great research mathematician, educator, and expositor. His visionary ideas inspired many, including the editors and quite a few contributors to the present volume.

Israel Gohberg was the driving force of iwota. He was the first and the only President of the Steering Committee. In iwota, just as in his other endeavors, Gohberg's charisma, warmth, judgement and stature lead to the lively community we have today.

He will be dearly missed.

The Editors: Joseph A. Ball, Vladimir Bolotnikov, J. William Helton,  
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## Speeches and Reminiscences

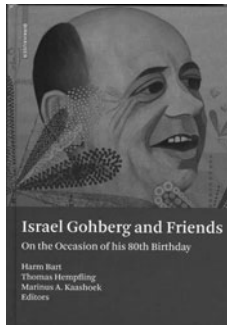
**Abstract.** This is a collection of speeches given by Israel Gohberg's colleagues and family during the banquet that took place on July 24, 2008 at the Sadler Center, the College of William and Mary, as part of the XIXth International Workshop on Operator Theory and its Applications. The speech by Dan Amir delivered on November 17, 2008 at the meeting of the School of Mathematical Sciences of Tel-Aviv University on the occasion of Israel Gohberg's 80th birthday is also included as well as a note by H. Baumgärtel. The texts by Gohberg's colleagues were revised and approved by speakers. The texts by Gohberg's family were submitted by Gohberg.

**Mathematics Subject Classification (2000).** 47-06.

**Keywords.** Israel Gohberg.

### 1. Presentation of book

Marinus A. Kaashoek



*Dear Professor Gohberg, dear Israel, dear Mrs. Gohberg, dear Bella, dear members of the Gohberg family, dear guests, dear colleagues and friends.*

---

Edited by Leiba Rodman.

I am speaking on behalf of Harm Bart and Thomas Hempfling. The three of us are the editors of the book *Gohberg and Friends*, which will be presented to Professor Gohberg shortly.<sup>1</sup>

As you know mathematicians stand a long and time honored tradition. They write papers and sometimes books, they read publications of fellow workers in the field, they meet other mathematicians at conferences all over the world and sometimes in Williamsburg. In this way, in contact with colleagues from far away and nearby, from the past via their writings and the present, mathematical results are obtained which are recognized as valid. In this process, some distinguished individuals play a special and striking role. They assume a position of leadership, they guide people working with them through uncharted territories, thereby making a lasting imprint on the field, something which can only be accomplished through a combination of rare talent, unusually broad knowledge, unfailing intuition, and a certain kind of charisma that binds people together. All this is present in Israel Gohberg, the man to whom this book is dedicated on the occasion of his 80th birthday.

The documents collected here give a fascinating and sometimes moving insight in the human factors that influence the development of mathematics. The focus is not on formal mathematical results but instead on the personal relationships that constitute the underlying propelling power of scientific cooperation. Centered around the remarkable figure of Israel Gohberg, a picture emerges of the development of operator theory and its applications during the last four or five decades.

The above is a quote from the preface, and you can see and hear what an excellent book it is. I want to tell a bit more about the contents of the book. It consists of seven parts, and I will read to you the titles of the parts, adding some additional information.

**Part 1.** *Mathematical and Philosophical-Mathematical Tales.*

This part begins with *Mathematical Tales* a presentation given by Israel Gohberg at the 1988 Calgary Conference organized to celebrate his 60th birthday. It contains stories from Gohberg's career in mathematics, mostly from the times when he lived in the Soviet Union before immigrating to Israel. The paper is preceded by an introduction by Ralph Phillips. The second contribution, *Philosophical-Mathematical Tales: A personal account*, is a talk given by Gohberg in January 2002 at the University of West Timișoara, where he was awarded the degree of honorary doctor. It contains reflections on the general nature of mathematics and on the way mathematical research is done. About the final article in this part I will speak a little later.

**Part 2.** *Work and Personalia.*

This part contains Gohberg's curriculum vitae, the list of his publications and a list of his Ph.D students. Also included are a translation of a letter of reference

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<sup>1</sup>The present text is an expanded version of my speech given at the banquet. Much of the material is taken from the book.

written by M.G. Krein, when Gohberg was a master student, and translations of letters and telegrams supporting his nomination as a corresponding member of the Academy of Sciences of the Moldavian SSR. The next two documents, written by Rien Kaashoek and by Rien Kaashoek and Leonid Lerer, respectively, present a review of Gohberg's mathematical work. The final document concerns the Nathan and Lily Silver chair of Mathematics of which Israel Gohberg has been the incumbent from 1981 to 1998.

**Part 3.** *Gohberg Miscellanea: Celebrating the 60th birthday in Calgary, Alberta, Canada.*

This part consists of the Gohberg Miscellanea, written on the occasion of his sixtieth birthday. This biographical text was composed by H. Dym, S. Goldberg, M.A. Kaashoek, and P. Lancaster from reminiscences, notes, letters and speeches prepared by Gohberg's former students, colleagues and friends.

**Part 4.** *Celebrating the 70th Birthday at the IWOTA meeting in Groningen, the Netherlands.*

This part contains the texts of the speeches given by Alek Markus, Hugo Woerdeman, Heinz Langer, Cora Sadosky, Hary Dym, Bill Helton, and Harm Bart at the conference dinner of the IWOTA meeting in Groningen, in the context of a pre-celebration of Israel Gohberg's 70th birthday later in 1998.

**Part 5.** *About Colleagues and Friends.*

This part presents a collection of sixteen articles that were written or coauthored by Israel Gohberg himself. Some of these have character of a memorial article, paying tribute to a dear colleague who has passed away. Others are recollections or reviews that highlight personality of a friend celebrating a special occasion. These documents together give a fascinating, and sometimes moving, insight into human factors that influenced the development of the field.

**Part 6.** *Honorary doctorates, laudatios, and replies.*

This part concerns the six honorary doctorates that Israel Gohberg has received. Corresponding documents such as laudatios, acceptance speeches, and other related material are presented here.

**Part 7.** *Festschrift 2008.*

This final part consists of material comparable to that of Parts 3 and 4, but then from a younger date and written especially for this occasion. In short articles, seventeen friends, colleagues, and co-authors reflect on their experience with Israel Gohberg. All of them have felt his influence. In some cases, it has changed their lives.

Who are the authors of the book *Israel Gohberg and Friends*? From the short description I gave you, you may guess, well, the authors of the book *Israel Gohberg and Friends* are Israel Gohberg and friends. This answer is almost correct. There are two authors who do not fit into these two categories. They are Zvia Faro-Gohberg and Yanina Israeli-Gohberg, the two daughters of Israel and Bella. They

wrote a beautiful article which appears in the first part of the book under the title *Dad's Mathematics*. It is a fascinating account on how their father's mathematics came to them in their younger years. At the same time *Dad's Mathematics* gives an impression of Israel Gohberg's talent to convey the beauty of the field even to those lacking elaborate mathematical training. The two Gohberg daughters are present here at this banquet. I ask them to stand up so that we can see them and welcome them with a warm applause.

Dear Israel, my task is completed. I wish you many happy returns. Thomas Hempfling, the mathematics editor of Birkhäuser Verlag, will continue and present the book to you.

### **Thomas Hempfling**

Do not worry, I will make it short. First of all, thanks for your marketing procedures, if you are out of business just apply so that we can do something together.

I would like to congratulate Israel. One reason obviously is that we celebrate his 80th birthday. The second reason is that he has continuous business with us for 30 years, which is really remarkable. And third, I did some computations yesterday afternoon, because I had a guess, concerning the total number of pages Israel is responsible for as an editor. Can you guess? It is close to 100,000 pages [applause], about 37,000 for the journal and more than 60,000 for the books. This is really something remarkable I think.

When the idea came up to do this special commemorative book, we thought that there should be one very special version just for Israel, and here it is. It is a bound version with silver shine on it. I think you deserve it. I congratulate you.

## **2. Gohberg's colleagues**

### **Joseph A. Ball**

My first contact with Israel was as a graduate student at the University of Virginia. There were the books by Gohberg and Krein from which operator theorists were supposed to study Operator Theory. Later we intersected at University of Maryland. He was settling down in a new place at West Hyattsville, Maryland, just a couple of blocks from where I grew up. So I showed him the place I grew up. He said, "Some people are local, but you are an aborigine". I had experience of working with Israel over a period of four or five years on a book, one of many books in which Israel took part. It felt like becoming part of the family. He leaves behind a large legacy in Operator Theory, and I congratulate Israel and wish him the best in the future. Thank you.

### **Ronald G. Douglas**

I first met Israel at the 1966 International Mathematical Congress in Moscow. As far as I know, this is something that most of the people here do not realize, since they are young. If you go back to the 60's, there were two worlds of Operator

Theory: there was one world on one side of the iron curtain, and the other world on the other side of the iron curtain. There were occasionally letters that went back and forth, and a few visits, but not many. The Moscow congress provided people in the rest of the world, the United States, Europe, Australia, Japan and so forth, with an opportunity to actually meet these people that were creating so much of Operator Theory. Otherwise, we would have to learn from translations of books which would occur in one year, two years, three years, or may be never.

Among the people I met there was Israel. At the same time I met both Kreins, M.G. Krein and S.G. Krein, Arov, Adamyan, and I can just keep going. I certainly remember Israel standing out, I do not remember what we talked about but we talked. We both knew who each other was. The “official” translator between the two sides was Ciprian Foias. We had some rousing seminars where Ciprian would listen to the Russian and explain it to us in English, and then he would comment in English and then in Russian, and this went on and on and on. In any case, after that meeting I got a letter from Israel, and I also, in a bit of a surprise, started getting these large envelopes with Israel’s reprints. And of course you heard a few days ago that there are more than 400. I do not know what the number was there but it was substantial. Of course I was very pleased to get those even though most of them were in Russian; I think all of them at this point were in Russian. I later found that, as one of the family indicated, Israel is methodical about planning and possibly planning for the best or the worst.

After Israel emigrated to Israel, one of his first visits to the United States was to Stony Brook. He came and spent many semesters there. In fact, he reminded me today that his crash course in English was because Stony Brook’s Dean or Vice President or somebody told him, “We have money to hire you, but you have to lecture in English, and that classes started almost immediately”. So he was telling me that his first month in Stony Brook was a lot of work, a lot of effort.

I’ll just say two more things. I remember a couple of more visits, he came to Stony Brook many times around the seventies. But I remember one visit to Amsterdam. I will not go through the whole visit. His grandson talked about berries. The thing I remember, walking back from the Mathematics Department to the apartment, was that Israel spied wild mushrooms all over the place, mushrooms I have never seen before. He picked them up, gathered them, and took them to the apartment. His mother was there, and she cooked wonderful dishes I could not have imagined. I was sure I would be dead next morning. I was somewhat surprised when I woke up. The other comment I am going to make has also to do with Israel’s mother. She was very important part of his visits. He brought her to Stony Brook on more than one occasion. My first visit to Israel was in 1977, arranged by Israel, and I came over to their apartment. I was there with my family. Israel’s mother fixed a meal that, well, it seemed like it went on and on, and my children had to be excused because they could not even look at the food. It was an absolutely wonderful meal which I still remember. It is clear to me where Israel got his loving nature and optimism for life: that was from his mother. I can say more about mathematics, but probably I have said enough.



**Roland Duduchava**

Dear Colleagues.

I am very happy to call this outstanding personality my teacher. When I arrived in Kishinev, it was 1968, unexperienced young man not only in mathematics but also in life. I learned a lot from Israel Gohberg. He was a wonderful teacher in mathematics, and in life. When I left Kishinev three years later, I brought with me back to Georgia not only dissertation, but also wife and child. In the process of my marriage Bella Yakovlevna and Israil Tsudikovich played an essential role, and I am very thankful to them for this.

**Harry Dym**

*Sayings of the Fathers* is a short extract from the Talmud that includes a number of suggestions for virtuous living. I think that many of you who are here tonight share the sentiments expressed in the following transparency:

Sayings of the Fathers:

*Acquire a teacher  
and  
Acquire a friend*

Thanks to Israel on his ~~75~~<sup>75</sup>th  
80th  
for being both.

As you can see, I have used this transparency on Israel's 75th birthday, I am using it again for his 80th birthday, and I would like to point out that there is a lot of space left for the future.

I do not want to take too much time. Israel's family is a hard act to follow, and there are many more speakers.

You all know about Israel's mathematical accomplishments. I would like instead to tell four stories that illustrate his other dimensions. I have told them before, but I rely on the fact that the audience is largely new, and the hope that the older members of the audience who have heard these stories before have forgotten them.

I met Israel for the first time in Spring of 1975, when he joined the Department of Mathematics at the Weizmann Institute as a part time member. Shortly thereafter we began to work together and continued to do so for close to ten years.

Israel used to spend a day and a half at the Institute. On Sundays he would usually arrive between 9 am and 9:30 am, we worked a little, he would lecture from 11:00 am to 1:00 pm, afterwards we would go for lunch, then work again. One day he arrived rather late. What happened? Well, on the way, while driving

from Raanana (where he lives) to the Weizmann Institute, a car crashed into him from behind. I believe it was a police car. Anyway, after he settled in, Israel called Bella, his wife, and explained to her that he had an accident on the way to work, someone bumped into his car from behind, but there was no need to worry, he was not hurt.

Bella: "Why did he do that?"

You can imagine your response to that question. But Israel very calmly says, "Bellechka, this question you have to put to him not to me."

In between our working sessions we would talk about other things, and from time to time would drift into anecdotes. I would like to relate two stories that I heard from Israel from his Russian period, which illustrate Russian humor, maybe Jewish Russian humor, sort of bittersweet.

One story is about a baker. A man goes to a bakery and wants to buy a loaf of bread.

Baker: "Fine, it is two rubles."

Man: "Why is it two rubles? In the store down the street it is only one ruble."

Baker: "Ah, but that baker has no bread. If I had no bread, I would also sell it for one ruble."

Another story is about a collective farm where they raised chickens. An inspector came from the Central Committee, to see how the farm workers were doing. He goes to one worker and asks,

Inspector: "What do you feed your chickens?"

First worker: "Corn."

Inspector: "What! You feed your chickens corn? We do not have enough wheat or grain to feed our children! – Siberia!"

The inspector turns to a second worker and repeats the question.

Second worker: "Chocolate."

Inspector: "What! You feed your chickens chocolate? We do not have candy to feed our children! – Siberia!"

He then turns to a little old Jewish worker with the same question.

Worker: "I do not feed my chickens. I give them each a ruble, and they can buy what they want."

The final story is based on a conversation that took place when Israel met our youngest son Michael for the first time.

Israel: "How many children are there in your class?"

Michael: "Forty three,"

Israel: "Forty three? That's wonderful, so many friends."

### **Lillian Goldberg**

I am pleased to say that I go back before any of these people. I am the wife of Seymour Goldberg who has passed on, and he met Israel in 1964, before the mathematical congress, before anything else. I just tell one funny story, I think it is funny.

Bella and Israel were given permission to have Seymour at their home. This was not easy; the KGB had to know everything about Seymour before he is permitted to enter Russian house, including if you see him mailing a letter tell me what mailbox, if he is talking to somebody tell me who he is talking to. Israel and Bella, being what they are, and Clara, said they are going to make him a special dinner. And they stood on line, both women, cut all these wonderful things, meat, chicken, and everything else which was very hard to get. Shortly before Israel is going to take Seymour home for dinner, Seymour says, "Oh, by the way, I forgot to tell you that I am a vegetarian." Seymour related to me, and to many other people, that Israel called home and told his mother and his wonderful wife. And from across the room Seymour heard in the phone two "*Oy*"s. That's how loving families got together, and we love them, their children and grandchildren.

### **J. William Helton**

I am honored to be here honoring Israel Gohberg on his 80th birthday. As we are all seeing, this conference honoring Gohberg is in our own self-interest, because it is this occasion which has drawn here this remarkable broad collection of powerful mathematicians from all branches of operator theory.

As we all know Gohberg has had a profound influence and much of what you see around you this week stems from areas he invented, students he trained, and areas where he solved basic problems. Since we all know this, maybe I should say something about his lesser known side.

I will always recall the first time he visited my house in San Diego. We all know Gohberg can fix bad matrices; he adds a column, takes off a row, transposes, permutes and voila! the matrix is beautiful. However, Gohberg can also fix plumbing. Our guest bathroom had drain caps on fancy levers which did not work, so we had rubber stoppers and gaskets. I was afraid he would have trouble with our "system". After his shower, after breakfast, I went in with new towels; but behold all the rubber stoppers were gone. I asked Israel if his shower went OK and he said, "All is fine, I will show you." He took out a coin, unscrewed the plate holding the lever, pulled some rods out of the wall, showed how to clean and unstick them, "that is all there is to it".

My wife was delighted. On the other hand from then on I faced the problem that my wife thought plumbing was easy to fix.

Another example, concerns the IWOTA conference I did not like. This is unusual because I always love IWOTA conferences. However, at this conference a screw fell out of my glasses. They fell apart, so I could not see anything. I could not see the talks, but that probably did not matter much, since they are hard to understand anyway. Unfortunately, the lever on the conference coffee pot was small, so I had trouble using it; clearly the situation was serious. When there are serious situations at IWOTA we go to our president. He looked at the pieces of my spectacles and said: "no problem, such glasses were very common" in the Soviet Union. Immediately he got a paper clip from the registration desk, threaded it through the hole in the glasses frame and in the paper clip tied a knot so strange

it is found only in Moldova. Immediately, the conference began to make sense to me.

In conclusion, Israel Gohberg is always welcome in my home, he is of great value at conferences and his mathematics and his friendship are welcome anywhere in the world.

### **Peter Lancaster**

It is a great pleasure and privilege to be here, and to have the opportunity to say a few words. I would like to repeat a number of sentiments that already have been expressed. They each have to do with family.

I remember Israel's mother quite well, although I could not possibly know her intimately. I never cease to wonder at the way that she was able to protect and inspire her children – in spite of the most dreadful times and conditions of war. Israel and I are about the same age, and I can't help contrasting his war years with mine. I had a relatively sheltered and secure existence in England through my first 15 or 16 years. So for me, it is hard to imagine the trauma that Israel and the family went through and, in particular, how much is owed to Israel's mother. I sensed the strength of her personality even though I could not know her very well.

Secondly, it is wonderful to see all the Gohberg family together once more, as we did twenty years ago in Calgary, and I am so delighted for each and every one of you.

The third aspect of Israel's extended family has to do with the mathematical community. How did this come about? Of course, scholarship is at the root of it, but it is unassuming scholarship, a modest scholarship, scholarship that does not intimidate, that welcomes ideas and people on an equal basis. I am privileged to have been one of these friends and colleagues.

The last little twitch on the family theme is to mention my own family, who all have very fond memories of Israel. They join me in wishing you many happy returns of the day.

### **Henry Landau**

When I was a student, we heard a lot about a famous chemist. The problem for chemists in those days was to understand the structure of molecules, and in order to do that they had to crystallize them. This was a difficult art, but this chemist was phenomenal not only for being able to do it seemingly at will in his own lab, but also wherever he went all those waiting chemical solutions would suddenly crystallize. The explanation finally given was that he had a long beard, and that over the years so many different crystals had found their way into this beard that when he leaned over a sample something would drop out that was just the right seed around which everything would coalesce. Now Israel has been doing exactly that for us for about sixty years, going from place to place and wherever he goes ideas crystallize, beautiful structures appear – and he doesn't even have a beard!

Well, Iz'ia, as everybody knows we owe you so much, not only in mathematical ideas – they are precious – but even more precious are the worlds of friendship which

you create for us and among us. You take us into your marvellous family: Bella, Feya, Tzvia, Yanina, all of you welcome us, and make us join work with feeling. This is something so extraordinary, as we can see just from our gathering here.

I think that every celebration really unites past and future, folds them into the present. So I think of Mark Grigoryevich Krein, Israel's friend and collaborator, whom he always brings to life on such occasions. And I think too of the dark stories of his early years that terrify even today. Here's one I always remember: when the nazis invaded, Israel's mother miraculously managed to get him and Feya with her on a train heading east away from the fighting. In the course of this voyage, always uncertain, they stopped in a little town and were told that the train would stay all day, so she went to try to find some food, but when she returned a short time later the train was gone! How can one imagine this moment? Someone told her that there was another place where the train might be, so in desperation she gave away her only winter coat to be taken to it, and providentially the train was indeed there and they were reunited. Such things are part of their past, as is the endless hardship of Soviet antisemitism, and yet in all these situations Israel was able to maintain brightness and hope. We saw this so clearly in Kishinev, on the occasion of his honorary doctorate. There was a strange atmosphere at the formal ceremonies, with the officials saying nothing about how he had been treated, but later in more private meetings, when Israel broached the subject, there was such an outpouring of emotion on the part of every one. They remembered details from thirty years ago. It seemed to us that they had always kept him in their minds as their source of joy, learning, and happiness in mathematics.

So as we are here all together, four mathematical generations of your friends and students gathered in this lovely place, with a full moon overhead, it is a wonderful moment in which to thank you. As I picture it, things may get a little dark at times but when you appear the sun comes out and mathematics blossoms. This will always be true, Iz'ia, so the only thing to say is: L'CHAIM!

### **David C. Lay**

I am really pleased to participate in this conference honoring Professor Gohberg. I think my first contact with Israel's work was in 1973, when I spent the first half of a sabbatical at the Free University. Rien Kaashoek and Harm Bart were working on ideas from Gohberg's paper, and Rien invited me to participate. Then I met Israel in 1974 when he came to visit Seymour Goldberg at the University of Maryland.

I have two short stories about Israel and my family that illustrate how generous and kind Israel is on a personal level. You know, I thought people will be talking a lot about his mathematics tonight, and yet I find I am doing the same thing they did, seeing him as a man, a wonderful man.

In the fall of 1979 I began a sabbatical year at the Free University in Amsterdam, and we lived in a house in the same town as Harm and Greetje Bart. My wife Lillian and I had a 14 month old adopted daughter, Christina, and Lillian was

pregnant as well. Soon Lillian gave birth to our second daughter in our home. Fortunately, the midwife arrived in time, because I did not have all the preparations ready. After a few weeks, Israel came to visit, to see our new baby. Shortly after he entered our house, Lillian came down with our new baby, Deborah, followed by little Christina who was just 14 months old. When Christina saw Israel she stopped and stood very still. But Israel smiled, held out his arms, and without hesitation Christina ran to him to be held.

After we returned to the University of Maryland, Israel and Bella started to visit Seymour and Lillian Goldberg at our university. They came for about two months each year for twenty years, and Israel visited our family on most of these trips. Israel became like a grandfather or uncle to our children. When our daughter, Deborah, was three and a half years old we had a large playhouse in our main family room. We still have a photograph of this house with Israel down on the carpet playing house with Deborah. He was there a long time that afternoon. You can imagine how the children looked forward to these visits each year.

### **Jürgen Leiterer**

Dear Israel. You know, I too have an anniversary this year. Forty years ago I became a student of yours, exactly forty years ago. In September 1968, I moved to Kishinev and started my active mathematical life as your Ph.D. student. After two years I think I got some qualification after learning the basics, and you proposed to me to come as your collaborator. This was a big aid in my life. After that, I think it was three or four years, we worked together. It was a very good, maybe the best time of my life, it was a pleasure to work with you.

Then this collaboration stopped for political reasons, you moved to the West, I remained in the East. There was an attempt of Rien Kaashoek to join us again inviting us at the same time to Amsterdam. But this was “observed” and prevented. So we have a long way back.

Already when we were working together we observed that several complex variables are important for us, and you encouraged me to study such things. As a result, I became more and more interested in several complex variables. At the end, I changed the field completely. I worked in several complex variables, and forgot about operator theory for almost twenty years.

Then politics changed and we lived again in the same world. (I did not have to move for that, the West came to me to Berlin.) We met again, and you proposed to me to continue our collaboration. In the beginning I was skeptical about this, because I forgot almost everything. Nevertheless, five years ago we have started again, and I am again very happy that we have decided to start. It is again a very pleasant time for me.

How to explain that? There are many remarkable properties in your personality. But one which is most important – you are not only the founder and the head of a mathematical school. What you have is much more – it is a home, a house of hospitality not just for mathematics, but for people doing mathematics.

If I would meet somebody who is looking for a good problem to work on, I would say, “Go go Israel. He will speak to you, you will speak to him, he will speak to you, and at the end you will work on one of his problems. Even more, if you have a good problem, and you approach him, then he will speak to you, you will speak to him . . . , and at the end you will forget about your problem and start to work with him.”

Dear Israel, I am most impressed with your optimism. Meeting you I am always infected by it. It seems to me, there is nothing in the world that could destroy your optimism. I wish you on your birthday, most of all, keep this optimism.

Thank you.

### **Vadim Olshevsky**

I seem to be one of the few people who are not wearing a jacket, but I believe I got a special permission from Gohberg.

Kishinev was already mentioned quite a few times today. I got my Ph.D. degree in Kishinev as well, but this was many years after Israel left. So I did not have a chance to meet him until I moved to Israel in 1989 to start a post doc position at Tel Aviv University.

I remember that Israel immediately told me that we should do something about structured matrices. Today we have a three-day special session on structured matrices at IWOTA which indicates that the topic has garnered a lot of attention. But in 1989 I told him that I do not find structured matrices interesting. Well, he insisted, and we wrote several papers together. When the first joint papers were completed, we submitted a contributed talk for the 1990 ILAS conference in Haifa. By mistake, it was listed as Gohberg’s talk and not mine. It was only a contributed talk, and there were four or five parallel sessions, but many people showed up nonetheless to come hear Israel speak.

There were about a 100 people in the room. Peter Lancaster was the chairman; when he announced Israel’s talk, Gohberg rose up said, “We changed the title of the talk, and we also changed the speaker.”

And somehow I got this large audience which came to listen to Gohberg, but instead received someone completely unknown. This helped me greatly at the beginning of my career.

Now I realize how right was Gohberg in predicting how important this research topic, structured matrices, will be in two decades. Everybody knows that this ability to choose “the right topic” is one of Israel’s many talents. I thank you Israel Tsudicovich for many years of working together [applause].

This was my first remark, and I would like to make a second remark.

I would like to say a few words about the “Gohberg phenomenon,” because I believe Israel is unique in succeeding in every enterprise he starts. One may think why this is, and of course there are many obvious ingredients: talent, hard work, personal charisma. But since this is a dinner speech, here I can tell you the truth. I think that luck that plays a crucial role in Gohberg phenomenon.

How many times today have we heard people quoting Gohberg as saying “Do not worry, everything will be OK?” Somehow there are people with whom everything is always OK: they can eat wild berries, wild mushrooms (as someone mentioned a moment ago), a police car can hit you from behind (as we learnt from another speech today), and yet “Do not worry, everything will be OK.”

Let me tell you one more personal story. Seven or eight years ago Israel visited us in Atlanta. He gave a terrific talk, and afterwards we went to dinner together with Mihaly Bakonyi. At that time Israel was two hours late for his dialysis, and Bellochka was very nervous. But Israel said: “Do not worry, everything will be OK.”

So, we went to the restaurant, and Israel ordered beer. Bella was again cautious, but Israel said again: “Do not worry, everything will be OK.”

A couple of hours later, he was already four hours late for his dialysis. Actually, I needed to go back to the university because I had a class, I believe the time was about 8 pm, and the plan was that Mihaly would drive to highway 75, and Israel in his car would follow Mihaly, and we believed that once Israel was on highway 75, he will find a way to my house (where his dialysis machine was). It was back in pre-GPS era. In accordance with the plan, Mihaly drove to 75, made a gesture to indicate this is it, and took an exit. Israel instead followed him and also took this exit. Mihaly stopped, expecting that Gohberg would also stop and they would talk. Instead, Gohberg continued straight ahead and disappeared.

Now let me describe the topology of Atlanta. The Chattahoochee river divides the city, and one can cross it in only two places. Needless to say, my house was on the other side of the river. Given all this, in the direction which Israel followed it was simply impossible to get to my house. So we were very worried. We tried to call him but his cell phone was off.

About an hour later, I called my house, and Israel picked up the phone. I said, “Israel? Izrail’ Tsudikovich?” And he said, “Yes”. “How did you make it?” “What do you mean, how did we make it? We just followed the direction you indicated!”

To sum up, “some people” are successful even after initially taking the wrong turn. (As you can see, by successful I mean they come to my house).

### **3. Gohberg’s family**

#### **3.1. The young years of Israel Gohberg**

##### **Dr. Feya Gohberg**

My name is Feya Gochberg–Eidelstein and I have been a surgeon for over 50 years. I am Israel Gochberg’s younger sister. My brother Professor Israel Gochberg was born on August, 23, 1928 in the small town Tarutino in the region of Bessarabia, that was then Romania and now belongs to the Ukraine.

He wasn’t born an outstanding personality nor even a professor. Like all newborns he was small, helpless and very noisy.



His parents Clara and Tsudick Gochberg adored him and his arrival brought great happiness to their marriage.

His grandparents Izhak and Rivka Gochberg were very observant Jews. They loved their firstborn grandson very much and spoiled the child in every possible way, since he remained their only grandson for quite a long time. Our father was one of 6 children, and he was an educated person, he had graduated in accountancy, opened his own prosperous business – a printing house – and was a very devoted family man.

Our mother was quite a different person: she was a resourceful, very beautiful woman with dark skin, long brown hair and green eyes. Our mother Clara-Haya Gochberg was a midwife. She had lost her parents at a very young age, an orphan since the age of 14, she achieved everything in her life on her own. She graduated from Kishinev's nursing school, got her diploma as a qualified midwife and left for Tarutino where she started her working career. There she met our father. The two fell in love and soon got married. They gave birth to 2 children: my brother Israel and 5 years after his birth – to me.

My brother was brought up in a loving, well-off family, surrounded with warmth and care. From his early childhood his thoughts were filled with logic. When he was only 4 years old, while visiting some relatives, he saw a young couple kissing. When he came back home he asked his mother: "I don't understand, why Leon and Balbina kissed each other all the time?". Mother, worried about his "sexual education" tried to detract his attention and answered: "They probably were going away and saying "good bye" to each other." My brother thought for a while and said: "I don't think so. There were no suitcases around!"

Our parents tried to give him the best of everything: he had a new Mustang bicycle, a real Sima watch and each summer they took him to a sea resort.

When he was 7 years old he began to study in Tarutino primary school and finished with good grades.

At the age of 9 he started smoking and I was honestly fulfilling the role of a guard warning when our mother was approaching. I had a tricycle with 3 wheels. My brother used to let me pedal it and he himself liked to stand behind me on the tricycle and I had to pedal on it forward. Once, while riding like that on a high speed we both fell into a deep hole and almost got killed.

When he was punished for his deeds, I used to cry bitterly and say that it was my fault and I was the one to be punished. He appreciated it and never neither during our childhood nor later did he offend or hit me. Never has there been between us jealousy or envy. Through all of our lives we have always kept a warm and loving relationship and it was all our mother's achievement. It was our mother who taught us to love, honor and take care of each other. During our life in Tarutino our parents did their best to give my brother a good education: he took violin lessons, he was taught the Bible by a private teacher, he liked sports and was the only goalkeeper of the school's football team.

On finishing school in Tarutino, our parents decided to send him to one of the best secondary schools in the region, but he wasn't accepted there because of

his low mark in mathematics and only because the school had a lack of students was he enrolled there. He studied there only for one year. The Second World War started – the most dreadful war for the whole world and especially for Jews. But in our family a great disaster had happened before that.

When the Soviet troops occupied Bessarabia our father was arrested in the middle of the night, without any explanation. Our mother was told that in 20 minutes, after answering some questions, father would be back home. We never saw him again. Our father was accused of Zionism and without being even prosecuted, he was sent to Siberia, to a Gulag. There, at the age of 40, he died of hunger. Our mother kept waiting for him all her life! The details of his death became available only few years ago, when the Soviet regime had changed. Our father was rehabilitated due to the lack of any proof of his guilt. In his holy memory my brother's firstborn daughter was called Tsvia. Exactly 15 years later, on the day of the anniversary, of our father's death, I gave birth to my only daughter, whom we naturally also named after him – Tsvia.

During the years of WW II my brother suffered hunger. We were always hungry, we fell asleep being hungry and we woke up being even more hungry. My brother worked in the fields together with our mother in order to get some carrots and potatoes so that we would not starve to death. He was very creative: he learned to make rubber rain-shoes from old tyres and exchanged them for some food. At this period of his life, my brother had already a mature personality and he was our mother's chief adviser and partner. At the age of 14 he decided to change his life and fight starvation. He stopped attending school and started working in a bakery. When our mother found out about his new career – I remember there was a serious scandal at home after which my brother preferred to remain being hungry and went back to school. In spite of his absences he completed his school education during the last year of the war.

He graduated from school with very high marks and at that time his outstanding abilities in mathematics were discovered. His school teacher, Mr. Shumbarsky noticed his talent in math. I think that he was the one who played an important role in forming my brother's interest in math. His teacher was sure that math should become his future. But our mother didn't think so. Working as a midwife, all her life she dreamt to be a doctor, but that was impossible for her to reach. She certainly thought that her talented son should become a physician. There was a lot of disagreement at home and at last mother told my brother that if he didn't apply to medical school she wouldn't support him financially. My brother was scared and told his teacher everything that had happened at home. His teacher paid us a visit and told my mother that if she insisted on my brother's learning medicine – she should know for sure: that on that very day a great talent in mathematics will be not developed and be lost. My mother got scared and gave in. In 1946, at the age of 18 years, my brother became a student at the faculty of mathematics of the Kirghiz State College. A new period in his life started.

All her life our mother lived with my brother's family. She always helped us and the last 10 years of her life she spent in Israel.

Our mother died at the age of 80, she always helped us, until her last day and was full of energy, had a tremendous sense of humor, an outstanding example of dignity, loyalty and love. In memory of our mother Clara-Haya were named our grandchildren: my brother's granddaughter – Keren and my grandson Hannan.

This is our family today: my brother and his wife Bella, his elder daughter Tsvia, her husband Nissim and their children Tali and Jonathan; his younger daughter Yanina, her husband Arie and their children: Keren, Raviv, and Tslil, and I – his sister Feya, my daughter Tsvia, her husband Malcolm and their children: Hannan and Liat.

### **3.2. My father I.C. Gohberg**

#### **Zvia Faro (Gohberg)**

As we were growing up Dad's work seemed very mysterious and unclear to us, we considered it his "Dark Side".

There was also the bright side, the Dad, whom we understood, who made us laugh, taught us math, history, science, who was fun to be around and learn from. I want to talk about this side, the side so dear and familiar to us.

Our Dad is a devoted family man, caring son, loving husband and Father, dedicated brother and uncle. He is a wonderful Grandfather, who can do magic tricks like a professional magician.

He is very athletic a good soccer player, skier, swimmer and runner.

His "golden" hands can fix or make anything. Dad is a good cook and can create some elaborate gourmet dishes. He is a well rounded man, and has many other interests in life besides mathematics, being very thorough, he does not accept shortcuts and excels in everything he does.

He had many hobbies, at times it was photography, aquariums, later fishing, agriculture, wine making and many more. When I was born Dad's hobby was photography. At night, when everyone was asleep, our tiny bathroom turned into a dark room and in the morning there were many photos drying on the blanket on the floor.

Another hobby was his bicycle, to which he installed a motor, tied a little pillow to the ramp and often took me for long rides to the country fields.

I still remember the fun, the wind was blowing in our faces, while we were riding and singing. Here I will probably uncover one of the very few things that he is not good at: he does not have an ear-for-music, and I am the same. My Mom and my sister have a perfect ear for music, so we never even dare to sing at home, but on those trips only the wind, the cows and the sheep we passed by were our audience and at that time I thought that they really enjoyed our out-of-tune singing.

On the way we played games, he asked me riddles, logical puzzles and taught addition. As I grew the trips became longer and the problems harder. Our family often vacationed on the Black Sea. I remember how writing with a stick on the sand he explained binary numbers and limit. Limit was hard, I kept asking what does it mean that for every epsilon there is a delta? What if I find a smaller epsilon,

I asked, then I will find a smaller delta he replied, drawing another segment on the sand. He was never tired or impatient and could repeat things over and over with new intuitive examples and jokes.

Notwithstanding his busy schedule, there always was time for us. Dad taught us riding bike, skiing, ice skating, swimming, diving. We loved long walks in the woods where we learned survival skills and the difference between good mushrooms and the poisonous ones. When our Mom who is a doctor was on call, he cooked us our favorite dinner, it was the best mashed potatoes I have ever had.

When we decided to immigrate to Israel, we were refused the exit visa and became refuseniks.

I was expelled from the University, Dad stopped going to work, it seemed that my life was over. We have spent a lot of time together, he became my best friend and cheerleader. He was encouraging me, telling about the infinite opportunities that awaited me and my children in the free world. I wanted to hear about our wonderful new life, but he never painted a pink picture, preparing me for difficulties. During those long months we discussed politics, listened to the Voice of America, he allowed me to read forbidden Solzhenytsin SAMIZDAT books. I learned about the world outside the Soviet Union, my heritage, the history of my people and many other subjects that were dangerous even to think about at that time. He taught me to fight and not to give up under any circumstances. I was very impressed by the story of Massada fortress, a source of inspiration and a symbol to everyone, who fights for freedom.

When we came to Israel he could not speak neither English, nor Hebrew and in a very short time with no formal training was fluent and lectured in both languages.

35 years since we left Russia I still admire his courage and confidence, that helped us overcome those difficult times and opened to me and my family new unsurpassed opportunities.

I always looked up to you, you were my role model. Today, when my kids are grown up, I still look up to you, ask for your good advice, for encouragement, you always stands by us and support us in all our endeavors.

When I was little, I looked very much like my Dad. People who did not know me, stopped me on the street and asked if I was Gohberg's daughter. I hope that now when I am all grown up I am at least a little bit like you, and not only look like you.

Many good wishes we are sending your way,  
 Get younger and younger day after day,  
 May you live long and happy life  
 Always together with your wonderful wife  
 (Always share with us your good advice)  
 The troubles and misfortunes should pass you by  
 May your humor and jokes make everyone smile  
 May your laughter roam like a thunder

And good friends be always around you  
 Have nakhes from children, grandchildren and family  
 Happiness and sunshine with Bella sharing  
 We wish you health – it is needed a lot  
 May luck always follow you and support  
 Keep dreaming big and may all your dreams come true  
 Travel, research, prove new theorems too  
 And on your 80th birthdays we say right from the start  
 Accept our best wishes from the bottom of the heart.

### 3.3. Dad's 80th birthday

#### Yanina Israeli (Gohberg)

I have always admired my Dad's outstanding personality. He is a man of many talents and excels in everything he does or puts his mind to. There are many contradictions in his character; I often think that these contradictions make him the remarkable person he is.

Dad is an optimist and a believer in good outcomes, but he always plans and prepares himself for the worst.

A person, who had overcome a lot of difficulties in his life, who knew loss and sorrow, but nevertheless loves life and enjoys every minute of it.

He is a wonderful friend with a lot of friends all over the world but on the other hand a very private person, who religiously guards his privacy.

A devoted and loving family man, who spent a lot of time travelling far away from the family and dedicated his life to mathematics.

Humble and modest, does not need much for himself, but very giving and generous to the people he loves.

Flexible, curious, progressive and open-minded, he can be very conservative and stubborn at the same time.

A person who describes himself as not a sentimental one, he is very compassionate and kind-hearted.

Demanding, critical and tough he expects everyone to excel, but at the same time he is the most caring and supportive person, who stands by and encourages in the difficult and most disappointing moments.

Dad has a rare sense of humor and roaming laughter and a joke for every situation, but he knows how to be very serious and with one glance can make serious everyone around him.

He can advise in the most difficult situations, but does not interfere and volunteer his advice, unless he is asked for his opinion.

Although he has very logical and analytical mind and believes in thinking things through, sometimes he tends to rely on his intuition.

He can spend hours concentrating on mathematical research, being disconnected from the world around him, but will drop everything in a second to help his children or grandchildren with their homework.

Can't live without email, loves technology and internet communication, but on the other hand loves nature, enjoys long walks, good swim and camping away from the civilization.

These contradictions in his character make him the most interesting, surprising and creative person. We love you and hope to be together with you and Mom for many years to come, may you be healthy and happy, tell jokes, make us laugh, keep being unexpected and surprise us over and over again.

### **3.4. Family reminiscences**

#### **Bella Gohberg**

In 1951 in Bishkek, Middle Asia there were 3 inseparable friends, Nora, Fani and me. We were juniors in college, studying medicine. It was Nora's birthday and we were ready to party. For some reason Fani could not come and send a "delegate", her brother Israel, or Izia, as she called him. The delegate was tall good looking, skinny guy with big green eyes, long eye lashes and full head of hair. He was smart and funny, his laughter was loud and infectious. We liked each other and after the party Israel walked me home, he talked about math with a lot of enthusiasm.

Math was not my strongest subject, I did not believe then that math can be a source of inspiration and disappointment, that it was possible to dedicate one's life to this science. I have learned it much later. Israel was the first mathematician I have ever met.

His vacation was over, he returned to complete his degree in mathematics in Kishinev, my studies were just beginning. After that meeting, we have written each other and met occasionally.

A few month in the beginning of 1954 Israel worked on his Ph.D. thesis in Leningrad, where I was completing my medical studies. He invited me to attend the defence of his Ph.D. thesis. I felt proud and honored, was very impressed how freely, with ease he used mathematical formulas and how attentively everyone was listening. As my husband likes to say: It was wonderful – but not clear at all.

This was my first introduction to Advanced Mathematics.

Later in winter of 1956 Israel came to Leningrad and asked me to become his wife. He stayed for 6 days, everyone told us it was impossible to register in 6 days, but against all odds on February 1, 1956 we have registered our civil marriage. We could not even dream about a traditional Jewish wedding in those difficult times. We have celebrated our Jewish wedding 50 years later in Raanana, Israel.

I joined my husband in the town of Beltsy, Moldova 6 months after our marriage. I was already a licensed medical doctor. 3 months later on November 1, 1956 our first daughter was born. Our friends often joked that those were precise mathematical calculations.

In 1960 we moved to Kishinev, where our younger daughter Yanina was born. Israel's Mother lived with us, she was part of our family and helped us a lot. All five of us shared a 1 bedroom apartment with a tiny kitchen.