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# This page is not blank, but I forgot why...

## Testing the remote control...

## **Personal Statement**

I feel very uncomfortable to give a talk while our Ukrainian colleagues are being bombarded and are made refugees by the Russian Armed Forces overwhelmingly supported by the Russian people. Ukraine is the birthplace of some of the best OPSF people and/or their ancestors. I dedicate this talk to my Ukrainian born co-authors.

N.B. My paternal grandmother was born in 1890 in Khust, then in the Austro-Hungarian Empire but today it belongs to Ukraine.

### **Those Were the Days...**

Paul Nevai

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I am not really affiliated with any institution, especially not with the one that thinks that 14 is 10 or, maybe, I should replace the in this sentence by The.

#### Richard Allen Askey 1933–2019



1935...

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#### Richard Allen Askey 1933–2019

Plus ça change, plus c'est la même chose...



1998...

Paraphrasing Dick, a 20-minute nap during a lecture is equivalent to a couple of hours of deep sleep at night.

Paraphrasing Dick, a 20-minute nap during a lecture is equivalent to a couple of hours of deep sleep at night.

Let me add that the above might be accurate as long as the speaker  $\neq$  the sleeper.

Having Dick Askey in my life was one of the greatest professional pleasures I ever had the privilege to experience.

Our almost daily relationship lasted roughly speaking 25 years between 1974 and 1998 and it was the most intense, most fruitful, and most mathematically fulfilling period in my life.

It started around 1972 or, perhaps, 1973 when Dick gave a series of lectures on special functions at (what's today called) Rényi Institute in Budapest...

The military crew cut, the fast talk, the incomprehensible math...

Then, around the summer of 1973, I had two life changing (separate) conversations with the archenemies Paul Turán and Géza Freud regarding the direction of my research. Both were impressed by my one-sided Dini-Lipschitz result and recommended me to develop a long term research program.

They both proposed to study mean convergence of Lagrange interpolation (MCLI) and the general theory of orthogonal polynomials (OPs). Both subjects were at a standstill.

MCLI had decades old results by Erdős-Turán, Marcinkiewicz, Grünwald, Feldheim, etc., and a recent breakthrough by Dick prepared for the 1969 Budapest conference but published only in 1972 in AMASH. More about it later...

OPs were in a somewhat similar situation. Although there were plenty of results with weights satisfying some mild smoothness conditions, there were very few general results after the works of Szegő, Bernstein, Smirnov, Kolmogorov, Krein, Akhiezer, Geronimus, Freud, etc., and, as it turned out, some of the most exciting results of Geronimus had unfixable defects in their proofs. More about it later...

N.B. Four of the above are Ukrainian Jews and three of the above were murdered by the Soviets/Hungarians/Germans.

**PUZZLE**. Which mathematician listed on the previous slide, i.e. Bernstein, Smirnov, Kolmogorov, Krein, Akhiezer, Geronimus, had the courage to stand up against Stalin and which one kissed the Soviet leaderships' butt (pardon my French), actually more than once?

#### ANSWER. ???

N.B. One of the people listed on the previous slide was an informer of the Hungarian Secret Police (ÁVH).

Coming back to Dick, our next encounter was in August of 1974 when I participated in the US–Hungarian Approximation Theory conference in Madison....

1. Turán's talk about Erdős weights that later led me to the *M*-class.

2. Meeting Ranko Bojanic who I already knew and Ron DeVore (who was impressed that I was familiar with the then fashionable term BMO).

3. Dick, dressed in shorts, taking me to the airport in his Fiat and complaining about the A/C systems in US buildings.

4. I made my decision to "defect".

Then, in October of 1974, I "defected". Absolutely no one knew about my plans in advance except for a couple of my relatives and Dick. They were dangerous times. This happened a couple of months after Freud defected and was declared an "enemy of the state" by the Hungarian math establishment.

I was a PostDoc in Orsay with Jean-Pierre Kahane, but my plan was to immigrate to the US of A. To do that, I needed a job, and to get a job I needed some remarkable mathematical results.

N.B. I was neither a refugee nor an asylum seeker.

Dick comes to the rescue. He mailed me a copy of his **Mean convergence of Lagrange interpolation** preprint published by the University of Wisconsin MRI. I was impressed! What Erdős and maybe Feldheim did for Chebyshev about 30 years earlier was extended to Gegenbauer (ultraspherical Jacobi) by Dick. Positivity of linearization and connection coefficients played a crucial role in his approach.

I immediately recognized that the crux of the matter was an appropriate Marcinkiewicz–Zygmund inequality, and that I might be able to do that for generalized Jacobi weights using an entirely different approach that I believe I learned from A. F. Timan's infamous book. It involved weighted  $L^p$  inequalities of Markov and Bernstein type.

Then tragedy struck. I found an error in Dick's preprint. A serious one that happened elsewhere too in papers by other mathematicians: using a theorem of Banach in the wrong setting.

I don't recall the details but eventually I got hold of the AMASH reprint of the same paper, and voilà, the error was fixed. It must have had a careful referee. Who was he? I never found it out.

To make a long story short, I succeeded extending Dick's result. I submitted the resulting paper to J. Approximation Theory in 1975 and that was the start of my love affair with JAT.

MCLI and Turán's 1974 talk led me to study OPs. In addition, the following events happened.

1. Dick started to work on the Two Papers on Special Function project and I got involved too. I don't remember the details but #9 in the Szegő paper references is the Blumenthal paper (that has the Blumenthal Theorem) and one way or another Geroniumus refers to the Poincaré and Perron theorems too.

2. Dick organized an SF meeting in Madison and he sent me the 1975 Ken Case paper Orthogonal polynomials revisited. Very interesting but I again discovered an error (that led to my meeting of Jeff Geronimo in 1976 at UW).

I could use the cliché that the rest is history and the *M*-class was born.

In April of 1975 I formally applied for an immigration visa at the US consulate in Paris and the response was that "great, welcome, here are a gazillion papers to fill out". Oh yes, one more tiny detail: since you applied for immigration, you are disqualified to ever go to the US with a visitor's visa.

What a bummer. I was invited as a Principal Speaker to the January of 1976 AT meeting in Austin, Texas.

Despite pleas from the organizers, I was not allowed to enter the US. Who else but Dick came to the rescue and he agreed to deliver my lecture on Lagrange Interpolation at Zeros of Orthogonal Polynomials. Dick even fixed the English in my notes.

In addition...

Dick helped to arrange that my AMS Centennial Fellowship was converted to a formal PostDoc position at Wisconsin and the latter was sufficiently kosher for the State Department to consider me for an immigration visa.

However, as always, tragedy struck again. My visa application was rejected because of my membership in various communist youth organizations in Hungary (the Hungarian version of Komsomol and such).

Who came to the rescue? Dick, the Wisconsin Math Department, and senators William Proxmire (Wisconsin) & George McGovern (South Dakota).

It worked and eventually I was granted the visa. I received the letter on July 4, 1976. True story. Yes, on that glorious day.

**Funny story.** When I went to the US consulate in Paris to get my travel documents, the guy treated me with great respect and showed me the letter written by Senator Proxmire on my behalf. It referred to me as one of the most promising physicists of my generation.

**PUZZLE**. What is Senator Proxmire famous, or, rather, infamous about?

A tidbit. In 1975/76 I wrote probably over a hundred math letters to Dick discussing my research on OPs and he responded to all of them. In addition, Dick also read the handwritten original version of my OPs book and richly annotated it. In retrospect, this is an incredible feat. I spent the 1976/77 academic year in Madison.

Mourad Ismail, Dennis Stanton, Jim Wilson, Walter Gautschi, George Gasper, Giovanni Monegato, Allan Pinkus, (I think) Charlie Micchelli, Al Cavaretta, Carl de Boor, Walter Rudin, Iso Schoenberg, Peter Orlik, Paul Rabinowitz, Seymour V. Parter, Simon Hellerstein, etc., etc.

Seminars and lectures galore.

I spent almost every afternoon at the U.S. Army Math Research Center building sharing an office with Dick. He preached SF to me and I preached OPs to him. It appears that neither of us converted the other but still left deep impressions on both of us.

Do I need to say more?

I finished my OPs book by 1978 (mucho typing, etc.) and at Dick's recommendation I submitted it to the AMS Memoirs. It was refereed and I correctly guessed who the referee was, and, thus, Ted Chihara and I became friends and eventual co-authors.

I believe that my AMS Memoir was sold out and reprinted a total of 3 more times.

Just between us, I hated my OPs book because I didn't have sufficient experience at that time to write math papers and books yet and it took me years to learn the tricks of the trade by studying works of Paul Halmos, Walter Rudin, Eli Stein, I. P. Natanson, Sergey "the villain" Stechkin, and so forth.

I have personal stories to tell about all of them.



Ted & his daughter Laura @ NATO ASI, 1989.

## 1981

The year when the first volume of Szegö's 3-volume Collected Papers was published. Unlike most of us, I consider this as Dick's magnum opus.

It was the result of Dick's extraordinary efforts that included researching and annotating many of the papers. I estimated that the project lasted about 6 years.

My contribution was  $\leq \varepsilon$  but still fundamental: the correct spelling of Szegö's name on all 3 volume's dust jacket. Sadly, it was too late to make the changes elsewhere. Szegö himself spelled his own name in various ways, such as Gábor Szegő, Gabor Szegö, Gabriel Szegő, Gabor Szegoe, Gabor Szegő, and probably more.

Although Szegö was still alive while his Collected Papers were published, everyone, including he and Dick overlooked this minor detail.

Eventually, on the very last handwritten letter by Szegö that we found, I noticed that he signed his name as

## Gabor Szegő

and that is on the dust jacket, and that is how the OPs community started to spell his name. My  $\leq \varepsilon$  claim to fame.

I realize that Dick is praised for things other than editing Szegő's Collected Papers, such as for being the SF evangelist, for awakening 19th century math in the 20th century, for the Askey–Wilson polynomials, for the Askey Scheme (aka Askey Tableau  $\neq$  ASCII Table), for the Andrews–Askey–Roy book on special functions, for trying to reform math education, etc., but still I don't think I commit a mortal sin if I put Dick's Szegő job on such a high pedestal. Only time will tell...

My prediction is that Dick will go down in history as The Great Communicator, The Great Organizer, and The Great Enthusiasm Spreader & Infector (?infectionist, infectioner?).

Dick recommended me for a one hour invited address at the April 1984 meeting of the AMS at Notre Dame, Indiana. He was supposed to introduce me but in the morning of the talk Dick had a gallstone attack and was hospitalized. Ted Chihara took over the job of the emcee.

This was the start of Dick's long journey of living with a serious illness and unrelenting pain. I don't remember when his gallbladder was removed but, as I recall, the operation (laparoscopic cholecystectomy) was initially unsuccessful.

Dick's advice that I am sure he told many of us: one must drink sufficient H20 so that one's pee were colorless.

For me this was a memorable day for another reason: Dick's illness made me give up smoking for good (prior to this I smoked a pipe for about 10 years). Dick (almost) introduced me at the April 1984 meeting of the AMS and I repaid the honor at the Bar-le-Duc meeting later that year.

As I recall, that was one of the first times when I was disciplined for outrageous behavior.

I started the introduction by saying

testing, testing ... we begin bombing in five minutes

that was a rather controversial joke in 1984 not unlike Biden's suggestion that for God's sake, this man cannot remain in power (I agree).

Then I told the audience the semi-truth that I "defected" at the suggestion of Dick that I go west, young man.



Dick in Bar-le-Duc, France, October, 1984.



Doron & Paul & Dick & Tom in Bar-le-Duc, France, October, 1984.



Jet & Walter (+Charles) in Bar-le-Duc, France, October, 1984.



Finally, can anyone guess this guy?



Jean Dieudonné in Bar-le-Duc, France, October, 1984.

I must show now a couple of rare photos.



Alphonse, the elusive friend, in Segovia, Spain, September, 1986, or perhaps in Louvain-la-Neuve sometime in 1986.


Herbert in Segovia, Spain, September, 1986.



Ed in Segovia, Spain, September, 1986.



Zhenya & Paul in Segovia, Spain, September, 1986.

Dick & Liz were some of the most modest people I ever met. I stayed at their house in 1986. Apart from having electricity and plumbing plus the abundance of books, one could have mistaken it for an Amish home.

However, Dick knew when modesty is not the best way to conduct business and he could turn into a high powered and authoritative executive when the circumstances demanded it.

Tell the story with the Math Reviews and the USC math library.

I spent 1987/88 at the University of South Carolina (USC) and we invited Dick for a visit...

## Extraordinary picture:



Two of the men who I loved the most, Dick Askey and George Lorentz at USC (of the East) in 1988.

Next we met at the Computational Methods and Function Theory conference organized by Ed Saff in Valparaiso, Chile in March of 1989.

Great conference but all US participants became violently ill with dysentery because they bought those gorgeous unwashed fruits at the market. Luckily, antibiotics were widely available without prescription at pharmacies.

After the conference, Dick and I stayed an extra day in Santiago de Chile we did something extraordinary: we hired a private tour-guide and a taxi for a full day sightseeing.

I will never forget the solemn moments we spent at the soccer stadium Estadio Nacional Julio Martínez Prádanos made infamous by the Pinochet regime, see the Oscar nominated movie Missing by Costa-Gavras.



Hans-Peter-Dick-Paul in Valparaiso, Chile, March of 1989



Dick the capitalist in Santiago de Chile, March of 1989.

Then came the NATO Advanced Study Institute on Orthogonal Polynomials and their Applications (aka OPSFA2), at The Ohio State University, Columbus, Ohio, May 22 – June 3, 1989, that was formally dedicated to who else but Dick Askey.

Both Liz & Dick were here for the entire duration of the event.

Tell the story of the phone answering machine.

We bought a number of gifts for Dick, including...

Now I will show you a few pictures from the conference. A world premiere event.



George & Paul & Dick & Mourad @ NATO ASI, 1989.



Vilmos & Herbert @ NATO ASI, 1989.



Walter & Jeff @ NATO ASI, 1989.



Ted & Waleed & Nadhla @ NATO ASI, 1989.



George & Dick @ NATO ASI, 1989.



Walter & Adhemar @ NATO ASI, 1989.



André & Lance & Paco @ NATO ASI, 1989.

With apologies to those whose pictures I didn't show.

After Dick's super successful Ramanujan bust project, I caught the bust fever and shamelessly copycatted (pardon my French) Dick that resulted in 3 identical Szegő busts. One in Szegő's birthplace Kunhegyes, Hungary, one at Washington University in St. Louis, and one at Stanford. Three milestones in Szegő's life.

The cost of each bust was about \$3000 and was paid by contributions for Kunhegyes and by the corresponding math depts for the other 2.

Tell the story of the Mrs. Ramanujan letter.



The scan of the "official" photograph of the Ramanujan bust.



The clay version of Szegő's bust by the sculptor Lajos Győrfi.



Szegő's bust dedicated in Kunhegyes on August 23, 1995.



Veronica Szegő Tincher and Paul with Szegő's bust.

Dick and I had one joint paper Gabor Szegő: 1895–1985 published in Mat. Lapok, #3, 1993, 13–32 (in Hungarian) and in Math. Intelligencer, #18:3, 1996, 10–22 (in English).

I don't remember if the two are identical or if there are slight differences between them. What I recall is that we both took the job very seriously and worked hard on it.

For instance, I consulted Erdős many times regarding some aspects of Szegő's private life. That was when I realized that Erdős had photographic memory.

Among others, I interviewed Szegő's private nurse who came from Budapest to take care of him in Palo Alto.

For better or worse, we decided to keep mum about Szegő's second marriage.

Dick visited me again in June of 1996. As I did it with most of my visitors such as Dany Leviatan or Zhenya Rakhmanov, I took him to the Columbus Center of Science and Industry (COSI). As with all my victims, we walked from the OSU campus to the museum in downtown Columbus, appr. 4 miles (6.5 km) each way.

So far so good. However, one of the experiments involved hitting a virtual ball and then a timed running from home plate to first base (a baseball thingie) where the first base had a solid wall behind it. I comfortably jogged the distance a la Babe Ruth but Dick suddenly became an Usain Bolt-like person and took off faster than I ever imagined he would or could. To make a long story short, Dick ran into the solid wall and seriously injured himself, both his hands and his legs. Well, at least he didn't have to walk back to campus. We took a cab.

My regret is that I didn't take a picture of the accident.

Dick visited me the last time in June of 1999 when my Israeli friend and co-author Leonid Golinskii was here as well.

Yes, no mistake: Lenya is Israeli because he was bombed out by the Russians and had to take refuge in his new homeland. The last time I met Dick was at the celebration of Mourad's retirement at UCF in Orlando in May of 2015. By that time he visibly aged.

The last time I heard from Dick was on January 27, 2017, when he informed me that they moved to a retirement center in Madison.

Then 4 years later Mourad told me that Dick was very ill and he died shortly after that.

Dick's death left a huge void in my heart.

A tidbit. This is something I never told Dick before, I lobbied heavily in the 1990s for Dick to be elected to foreign membership at the Hungarian Academy of Sciences but I miserably failed in my mission. The only outcome was that Dick was invited to give the Turán lectures. I never figured it out why the Hungarians weren't interested.

A tidbit. Dick told me a deep secret that for some reason (I don't see why) we decided to keep private. Namely, Dick had a good reason to believe that one of our most distinguished and long deceased OPs guys was a serial philanderer. I love juicy stories but I guess I have to respect Dick's wishes and keep my mouth shut. A tidbit. I used to have an incredible collection of AT and OPs related preprints but around the dawn of the electronic age I threw out almost all of them. The few I kept were those of Dick, Freud, Erdős, and Turán.

A story. The check, George Andrews, and the final outcome.

A story. Refereeing for Dick: Jesús S. Dehesa in 1979, Gilbert G. Walter in 1981, and the one with the punchline.

**N.B.** Gilbert was the student of Jacob Korevaar, born on January 23, 1923, who I believe is the oldest approximator alive.

Let me end by a typical (bad) joke of the 1980s:

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Question: How many Askeys are needed to screw in a light bulb?

Let me end by a typical (bad) joke of the 1980s:

Question: How many Askeys are needed to screw in a light bulb?

Answer: Seven.

Because...

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Another to understand Ramanujan's solution.

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Another to organize an international symposium to celebrate Ramanujan's solution.

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Another to organize an international symposium to celebrate Ramanujan's solution.

Another to check the Norvegian literature to see if Selberg did it too.

Another to consult Gregory Chudnovsky if he has an easier and more conceptual solution.
One (Liz) to actually screw the light bulb in

One (Liz) to actually screw the light bulb in and another (Dick) to take a refreshing nap while the job is being completed.

One (Liz) to actually screw the light bulb in and another (Dick) to take a refreshing nap while the job is being completed.



A direct quote from Dick:

## In the long run we are all dead.

How true.

And that's...

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## The End