

# Tribute to Apostolos Mastichiadis

by Charles Dermer  
(June 5, 2023)

Greetings, dear Apostolos!

I am happy to offer words of congratulations to you, being told that you have achieved a milestone we should all reach—retirement, or quasi-retirement, or transition to the next stage. (Hint: If you're still teaching, it's not really retirement.)

But whatever it is, I am happy to wish you and Evi all the best!

Being in the retirement state now for 7 years, it is easy to get verbose.

So I'll write a few words about our amazing passage from PhD to PhD+10 yrs or so.

I received my PhD at UCSD under Bob Gould in 1984, while you were a 1985 Boston University PhD under Ken Brecher, with advisor Alan Marscher, as I understand. I worked on radiation processes in hot astrophysical plasmas for my PhD, whereas you looked at ultrarelativistic electrons scattering soft photons to make pairs.

We had a natural affinity toward exotic radiation processes, at least what we then thought were exotic:  $\gamma\gamma \rightarrow e^+e^-$  and  $\gamma e \rightarrow ee^+e^-$ . This particular kink led us soon to hadronic processes, but I digress.

Looking back, it was a really primitive time for our science, though we didn't think so then.

I saw Alan Marscher at a June 1985 Charlottesville AAS meeting, having already met him at UCSD when he was there in 1979. Alan and I drove back to DC from Charlottesville together. I met Reinhard Schlickeiser during the time that I was at Goddard Space Flight Center for my first

post-doc, supervised by Reuven Ramaty. You and I met in the mid-80s, as I recall. Was it at the Charlottesville AAS?

I do recall us talking about our research and work with colleagues.

Here is a short table I drew up listing some of the colleagues and institutions that connect Apostolos and myself\*:

UCSD	BU	Adelaide	Max Planck	NASA/GSFC
Gould CD (77-84)	AM (<85) Brecher (>79)	Protheroe AM (88-90)	Schlickeiser** Kirk (MPE, MPK)	Ramaty CD (84-86)
Marscher (79) Burbidge Brecher (<73)	Marscher (>82)	CD (1990 ICRC)	AM (MPK) CD (visitor)	Marscher (~80) AM (92-93)

\*All dates last century \*\*Schlickeiser worked primarily at MPIfR where I was a frequent guest visitor.

It's interesting that a researcher can sometimes have a strong influence years after he or she has left the institution. This also suggests the importance of having a network of connections.

Apostolos and I caught up at the Adelaide 21st International Cosmic Ray Conference (6-19 Jan 1990). With the great, now sadly late Ray Protheroe, who had an artist's touch with radiation physics, we wrote a paper on pair production in anisotropic radiation fields.

Reinhard Schlickeiser and I took great interest in Apostolos's papers on the triplet pair production process. We obtained simplified expressions in a 1991 A&A paper for your detailed numerical calculations with an accuracy we could determine from your calculations.

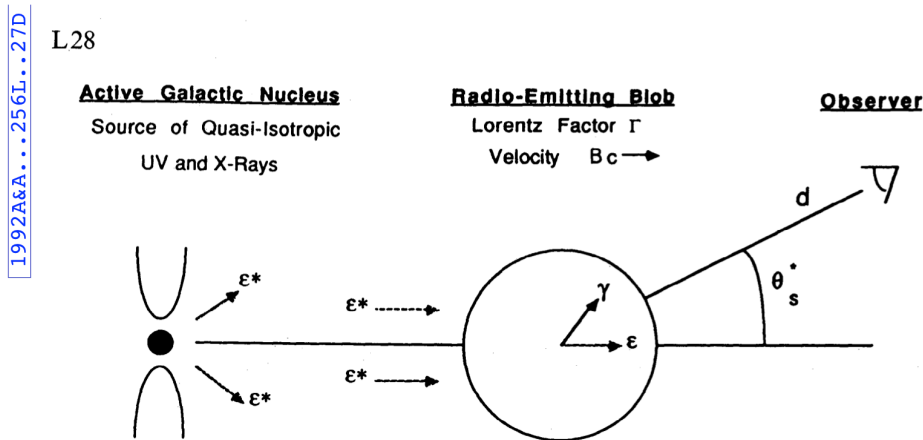
The end of the 80s and early 90's were the payoff for our years in the gamma-ray desert. The Whipple Observatory positively detected the Crab Nebula in 1989 using the imaging technique, and had detected 3 extragalactic sources by 1992. The Compton Gamma Ray Observatory was launched April 5, 1991.

I visited Reinhard Schlickeiser in August, 1991, when I was a research scientist at Rice University with Edison Liang. The EGRET collaboration had already announced the >100 MeV detection of 3C 279 and the

dimming of 3C 273 from its COS-B days. We had also received word under the table that PKS 0528+134 was a strong EGRET gamma-ray source.

The 22nd ICRC at Dublin, Ireland, also took place in August, 1991, though I stayed behind at the Max Planck Institute for Radioastronomy in Bonn and brushed up on my knowledge of radio-loud AGN and superluminal sources, which seemed to be the important property connecting 3C 273, 3C 279, and PKS 0528+134.

I had taken interest in a paper by Melia and Konigl where they consider beamed electrons that Compton-scatter accretion-disk photons while suffering radiation drag. But this couldn't be the right geometry, because beamed electrons can't make radio emission. So the correct geometry must be closer to the sketch we used already in the Compton Observatory Science Workshop\* in Annapolis, MD, Sep. 23-25, 1991:

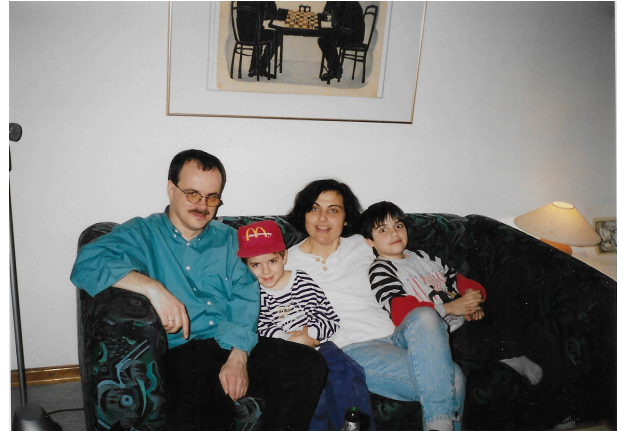


The extraordinary thing about this geometry is that photons are preferentially scattered through the Compton process in the superluminal direction, even for photons entering directly from behind. Apostolos, Reinhard, and I worked out some of the elementary physics of this system and published it in A&A Letters.

This paper set the stage for dozens if not hundreds of studies that have included synchrotron and synchrotron self-Compton emissions; accretion-disk, broad-line region, infrared torus, and/or microwave photons Compton-scattered by jet electrons; hadronic processes;  $\gamma\gamma \rightarrow e^+e^-$  and  $p\gamma$ -

induced cascades;  $\gamma$ -ray sources as probes of the background radiation fields and intergalactic magnetic fields; black-hole physics; things yet unthought of.

On one of my trips to MPIfR when I was visiting Reinhard, I went down to Heidelberg and visited Apostolos, Evi, and their family when their kids (Fotis, the older boy, and Alexis, the younger) were little. I think this was



1993 or 1994.

What a nice memory that is!

After our work together, Apostolos and I followed different paths, intersecting mostly at meetings. Yet we have remained friends all these years. We've only written 3 papers together but one was a hit. After all, gamma-ray blazars were not the only interesting high-energy topic in the '90s—gamma-ray bursts were just starting to be understood, and CGRO

was unveiling the gamma-ray sky in unprecedented detail. Even with blazars alone, there are many ways to approach the modeling.

I could talk about many of Apostolos's interesting and important papers, but his 2001 ApJ paper with Markos Georganopoulos and John Kirk is one that has both impressed me and simplified my life. It provided a method that made it easy to scatter photons equally in the Klein-Nishina as in Thomson regime of Compton scattering, a precondition for doing pair cascade calculations.

Apostolos, no offense, but you need better branding on your "supercritical pile model"! I never took to that!

This reminds me of all the impressive Greek high-energy astrophysicists I know fairly well: Apostolos, foremost, Markos, Demos Kazanas, Cryssa Kouveliotou, Spiro Antiochos. I had the good fortune to work with Maria Petropoulou on one of my last papers. She introduced me to new currents of thought in blazar physics, including magnetic reconnection. The addition of hadronic processes is so important. I also took that direction in my work with Armen Atoyan and in work with our joint collaborator Kohta Murase. Maria's work is first rate. It makes me want to get back in the game, and work with Stella Boula too.

Or maybe this is what I'm really missing, Apostolos!:



If you or your family show up in the DC area, you're always welcome. If we're on our way to Greece, we'll give you advanced notice.

Congratulations on developing world-class researchers that are pushing the boundaries of the high-energy universe and, in particular, blazar physics.

Have a great retirement!

best wishes,  
y gran abrazo

Chuck

and also Bea

btw, daughter Sonia married last year, son Mikel this year

Notes:

See my "Retrospective of Research with Reinhard Schlickeiser," <https://arxiv.org/pdf/2111.09106.pdf>, for a more detailed account of these times.

\*The discovery of gamma-ray blazars was not the most extraordinary thing announced at this workshop. This was the meeting where Jerry Fishman and the BATSE team announced the isotropy of GRB arrival directions and the flattening of their arrival strengths from a  $-3/2$  distribution. Wow!