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Petros Serghiou Florides 1937–2023

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FIGURE 1. Petros Florides at his inauguration as Pro-Chancellor of Trinity College Dublin, in the Provost's House, on 4th November 2010.

Petros Florides was born in Lapithos, Cyprus on 16th February 1937. He was the fourth of five children, and youngest son, born to parents Serghios Florides and Panayiota Florides (née Hadjiphotiou). His aptitude for mathematics was recognized by one of his teachers, prompting a move to London, England, in February 1954, where he was subsequently joined by his mother and, later, by his father and his sister Nitsa. There he studied at Northern Polytechnic culminating with the award of a BSc (Special) in Mathematics in 1958 from the University of London.

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Petros continued to doctoral studies at Royal Holloway College, where he worked under the guidance of Sir William Hunter McCrea FRS. He submitted his thesis entitled *Problems in Relativity Theory and Relativistic Cosmology* on 29$^{\text{th}}$ September 1960, and was awarded a PhD a few weeks later at just 23 years old. From there, Petros moved to Dublin to work as a research scholar with John L. Synge FRS in the School of Theoretical Physics at the Dublin Institute for Advanced Studies (DIAS). He wasted no time, with his position at DIAS starting on 1$^{\text{st}}$ October 1960, just two days after he submitted his PhD thesis! While still working at DIAS, Petros took a part-time lecturer position at University College Dublin (UCD) in 1961, where he was responsible for courses on relativity theory. In 1962, he accepted a permanent position as a lecturer in applied mathematics at Trinity College Dublin. Shortly thereafter, in 1963, he was elected a Fellow of the Royal Astronomical Society.

Petros held both McCrea and Synge in great esteem. He often spoke fondly of them and their time together. He continued to work with Synge as he settled into his position at Trinity College Dublin and for several years thereafter. Not only was Synge the reason Petros moved to Dublin, but he remained a friend until his death in 1995. Petros was also close to Synge's daughter, Cathleen Synge Morawetz, and enjoyed a dear and lifelong friendship with McCrea that extended beyond both men to their respective families. On the subject of friendships, the late, great Irish poet and novelist Brendan Kennelly was one of the first people Petros met when he came to Dublin. They both lived in Trinity College Dublin and quickly struck up a friendship, going out regularly together and reciting poetry – Kennelly in English and Petros in Greek. They, too, were lifelong friends.

Petros capitalized on Synge's connection to Trinity College Dublin to establish a prize and a lecture in his honour in 1992. The J.L. Synge Public Lectures and the J.L. Synge Prize in Mathematics are still given in alternate years. The former is a very popular event at Trinity College Dublin, and Petros took great pleasure in hosting these lectures. He used the occasion to recall to his audience Synge's life and achievements. It is a tribute both to Synge's lasting influence on general relativity as well as to Petros' connections in the international community and his powers of persuasion that the list of speakers at this biennial event is a roll call of some of the most outstanding figures in the area over the last 50 years, including: Sir Hermann Bondi FRS, who delivered the inaugural J.L. Synge Public Lecture in 1992; Nobel laureate Sir Roger Penrose FRS (1996); Roy Kerr FRS (2008); Sir Martin Rees FRS (2012); and Dame Jocelyn Bell Burnell FRS (2014).

At the invitation of the Royal Society, Petros wrote a wonderful biographical memoir of Synge, published in 2008 [17], where he takes great care to pull information from many and varied sources, including his own earlier work [16]. He also wrote respective obituaries for Synge [15] and McCrea [19]. In this memoir [17], Petros recounts McCrea's praise for Synge as a lecturer:

> The greatest living lecturer in mathematics lives in Dublin... Every lecture he gives is the superb performance of a master—or ought I say maestro?

Of these words, Petros writes [17]:

> It may be added that the word maestro is in no way misplaced.

This is one of very many indications of the importance Petros placed on the art and practice of lecturing.

Petros was, for four decades, one of the most well known, best liked, and highest regarded lecturers at Trinity College Dublin. Every lecture was a well-rehearsed performance. His lectures were carefully planned, so much so that he developed a vast repository of beautiful lecture notes. In the lecture theatre, he was superb. He dressed

immaculately, even wearing black tie on rare occasions in preparation for an imminent College event, and spoke in a gentle, mellifluous voice with a Greek accent. His writing on the blackboard was exquisite, his notation was memorably clever, and he drew magnificent diagrams to help students grasp concepts. In fact, he could draw an essentially perfect circle on the blackboard with seemingly little effort. He solved example problems with a slickness that gave students something to aspire to. And he did all this with a smile and incredible enthusiasm, with the latter often causing lectures to run slightly over time.

Even in the face of unexpected questions or comments from students, he was relentlessly kind. For example, when a student wondered about his pronunciation of the word analogous (a-nal-o-goose), Petros just smiled and reminded the student that it was a Greek word. He made complicated ideas seem disarmingly straightforward and brought an elegance to mathematical methods that could easily have been made to seem clunky. On the occasions when he was discussing material that had an inherent elegance, he elevated it to a level of class that seemed almost out of place in a mathematics lecture. McCrea's choice of the word maestro in praise of Synge would be in no way misplaced when describing Petros as a lecturer. Few, if any, were better and none cared more about their students.

Petros worked at Trinity College Dublin for 40 years, retiring as a Senior Fellow in 2002, having been elected to Fellowship in 1971. He served Trinity College Dublin in many ways, including a significant stint as Warden of Trinity Hall (1989–1996) when he helped resist efforts to sell Halls [3], and service on many College committees including the Board, the Academic Council, and the Central Fellowship Committee. During his years as a Senior Fellow Emeritus, Petros remained active in College life. He was elected Pro-Chancellor in 2010 and greatly enjoyed presiding over Commencements in that capacity. At his inauguration ceremony, which was held in the Provost's House, then-provost John Hegarty welcomed Petros to the role as follows [27]:

> It is with the greatest pleasure that I welcome a colleague with a tremendous record of teaching, scholarship and contribution, a colleague with such a tremendous record of service to the College and wider community, to the Pro-Chancellorship of the University of Dublin.

As part of his speech, Petros in turn reflected on the importance of presiding over Commencements noting [3]:

> ... the strong bond that always existed between me and my students, and my sincere and deep empathy with them, will enable me to enhance this experience and make it a memorable one.

Petros was not exaggerating when he spoke of the 'strong bond' he had with his students, and he certainly made Commencements memorable with his grace, kindness, and the marrying of Latin words with his Greek accent. He greatly enjoyed occasions when he was complimented on the latter. In fact, when writing to Senators in an Election Message ahead of a Pro-Chancellorship election, Petros outlined the most important duty of the role, as he saw it, and alluded to 'Latin with a touch of Greek pronunciation':

> The most important and frequent duty of a Pro-Chancellor is to officiate at *Commencements*, the degree-conferring ceremonies. These are performed in Latin and they are, undoubtedly, one of the most solemn public functions of the university. I believe that I can fulfill this particular duty very well, bringing '*a warm, genuine, human touch to the office, along with an easy and natural dignity, and all that is good*', to quote the unsolicited observations of a respected colleague in a recent letter of

> support for my candidature. With regard to Latin, I regret to say that I have had no formal education in this subject. But this did not prevent me from discharging, in 1976/7, the duties of Junior Proctor eloquently, thanks to a little coaching by the late Dr D.E.W. Wormell, the Regius Professor of Latin at the time. Indeed, as was then said, Latin with a touch of Greek pronunciation can sound quite beautiful!

In addition to being a maestro in the lecturer theatre and a great servant to Trinity College Dublin, Petros was a renowned researcher. His interests focused on Einstein's theory of relativity, venturing now and again into the fields of cosmology and astrophysics. Starting with his PhD work with McCrea, Petros made several important contributions to the problem of energy and its localization. For example, he was the first to show that the charge of a spherically symmetric (charged) system contributes to the gravitational mass of the system an amount which is exactly the mass-equivalent of the electric energy of the system ([4], [7], [9]). In another important contribution, he showed that the Tolman and Møller mass-energy formulae in general relativity, which for forty years had been considered completely independent and unrelated, are in fact completely equivalent [13].

His major work with Synge concerns the formulation of approximate methods for the solution of the Einstein field equations ([2], [20], [21], [22], [24]). Extensive applications for these methods are detailed in [5], [6], [20], and [25]. From these papers, it emerged that a rotating sphere [25] and a rotating spheriod [6] are possible sources of the Kerr (exterior) solution. Notably, in the aforementioned approximation methods, the exterior and interior (inside the matter) fields are calculated simultaneously. Thus, [25] and [6] also provide (approximate) Kerr solutions. Petros also obtained a number of interior exact solutions for the Einstein and Einstein-Maxwell equations ([7], [9], [23]). Of particular interest, perhaps, is the 'new interior Schwarzschild solution' [23], sometimes referred to as the Florides solution. It is, by far, the simplest interior solution and is characterized by the complete absence of radial stresses; physically, it represents the field of an 'Einstein cluster'.

His work on the Robertson-Walker metrics, and their generalizations, is perhaps more important in differential geometry than in cosmology ([8], [10], [11]). This work establishes the rather unexpected result that, independently of dimensionality and signature, the necessary and sufficient condition for a Robertson-Walker metric to be expressible in time-independent form is for the Robertson-Walker manifold to be of constant curvature. In later work, Petros was concerned with the formulation of a model for steadily rotating prolate galaxies ([12], [14]).

Petros supervised a number of research students during his time at Trinity College Dublin. Among these were Phelim Boyle (PhD, 1969), who went on to do seminal work in mathematical finance, introducing Monte Carlo methods in option pricing [1], Richard Jones (PhD, 1970), and Brendan Guilfoyle (MSc, 1991), who is now on the faculty at Munster Technological University (MTU) Tralee. Guilfoyle went on to do a PhD (1997) under Karen Uhlenbeck at the University of Texas at Austin, and continues an active research career in differential geometry and geometric analysis, with much of his work bearing the clear stamp of a relativist.

Petros went to great efforts to communicate important scientific ideas to the general public. The J.L. Synge Public Lectures were a wonderful example of this. In addition to organizing public lectures, Petros also delivered them expertly. His public lectures on the life and work of Albert Einstein FRS were a particular favourite for many. Petros' standing in the general relativity community and his powers of persuasion have been central to the success of the J.L. Synge Public Lectures. These attributes also came to the fore when Malcolm MacCallum, secretary of the International Society on General

Relativity and Gravitation, invited the local general relativity community to consider hosting the Society's 17th International Conference. Petros subsequently chaired the local organizing committee for this conference, which took place in July 2004, joined by Guilfoyle (MTU), Peter Hogan (UCD), Brien Nolan (Dublin City University), Niall Ó Murchadha (University College Cork), and Adrian Ottewill (UCD). His abilities were vital to the success of the conference, not least in securing the ideal venue (the RDS) at excellent rates and SFI funding for the conference, and in convincing his good friend and former Trinity College Dublin colleague, President Mary MacAleese, to preside over the opening ceremony. What would normally have been a meeting of interest almost exclusively to its participants gained much greater exposure when, a few weeks before the conference took place, Stephen Hawking FRS announced he had solved the much-debated Black Hole Information Paradox. At late notice, a slot on the schedule was found, and much media brouhaha ensued. Petros chaired the session in which Hawking presented his results to an audience of some 600 physicists, dozens of journalists, and a handful of others; ultimately, his PhD student Christophe Galfard delivered the presentation and Hawking subsequently fielded questions, with Kip Thorne moderating the Q&A session. Petros put his inimitable stamp on the session in his introduction, noting that while Einstein maintained nothing travels faster than the speed of light, this hypothesis had been invalidated by the speed at which Hawking's announcement had spread around the world!

Petros remained active in research long after he retired from lecturing. As recently as 2013, he published a preprint about what he called 'the midwife' [18]. The abstract Petros wrote for this preprint is a wonderful summary:

> Long before the general theory of relativity was finally formulated in 1916, arguments based entirely on Einstein's equivalence principle predicted the well known phenomenon of the gravitational red shift. Precisely the same arguments are widely being used today to derive the same phenomenon. Accordingly, it is often claimed that the observed gravitational red shift is a verification of the equivalence principle rather than a verification of the full theory of general relativity. Here we show that, contrary to these claims, the arguments based on the equivalence principle are false and that *only the full theory of general relativity can correctly and unambiguously predict the gravitational red shift.*

Petros was a scientist who thought very deeply about theories and problems. His 2013 preprint [18] is a perfect illustration of this: not only does he question arguments of the most famous scientist of the 20th century, but he proposes an elegant alternative.

Besides his stature as an eminent lecturer and scientist, Petros was a human being of the very highest quality – the kind of person who was not only great, but who stood out as great even when compared to other great people. No matter how hopeless or dire a situation seemed, Petros managed to come up with a smile as well as good advice. He was both wise and compassionate: a wonderful combination. From offering a stressed-out student a cigar, when smoking was allowed in faculty offices, to sitting with a struggling student over coffee, he was consistently and unerringly kind. The presence of such a brilliant and yet kind man had a notable impact on his department as well as the broader community at Trinity College Dublin. Charles Mollan, who wrote extensively about the lives and contributions of eminent Irish scientists, appreciated the broad impact of Petros' presence [26]:

> ... Florides, having moved there [DIAS] and then transferred to the Department of Mathematics in Trinity College, spent almost the whole of his academic life in Dublin, to the great advantage of the country and his many grateful students and friends.

Petros was extremely proud of his Greek Cypriot heritage and, despite having left as a teenager, he carried his love of Cyprus with him throughout his life. He was a founding member, past-president, and active patron of the Irish-Hellenic Society. He served as a member of the preparatory committee for the University of Cyprus — the first public university in the Republic of Cyprus — and as chair of the selection committee for the early cohorts of academic members of the Department of Mathematics and Statistics. He was also a founding member of the Hellenic Society on Relativity, Gravitation and Cosmology.

Above all else, Petros loved his family and the time he spent with them. He married Despina in 1967, and they had three sons: Serghios, Andros, and Constantinos. Petros loved literature, music, and the arts, but he was especially fond of music and poetry. Fittingly, Serghios read one of his favourite poems, 'Ithaca' by Cavafy, at his funeral service. Petros was a fine violinist and often treated his household to classical music, Hungarian gypsy dances, and Greek and Cypriot songs. As Andros pointed out in his eulogy:

> His claim to fame was that he once played the violin with a famous physicist named Lanczos who in turn had once played the violin with Einstein, bringing him another step closer to his hero.

Petros was, at heart, a deeply loving and passionate person. In his copy of Synge's *Kandleman's Krim* [28], which he acquired in January 1962, Petros underlined some sentences here and there. One such sentence should strike a note with those who had the great good fortunate to know him:

> For what is life but a passionate pilgrimage?

Petros died on 30$^{\text{th}}$ October 2023 in Athens with Despina by his side. Petros is survived by Despina, Serghios, Andros, Constantinos, and his grandchildren Anna, Enzo, Sofia, and Alexia. His funeral service was held at Trinity College Chapel on 7$^{\text{th}}$ November 2023. Petros' son Andros delivered a moving eulogy, which concluded:

> I remember being asked countless times as a kid what I wanted to be when I grew up. I never had a clear answer back then. Today, I know exactly what I want to be: like him.

Something we could all aspire to.

References

[1] P.P. Boyle: Options: A Monte Carlo approach. *Journal of Financial Economics* 4(3), 323–338, 1977.

[2] A. Das, P.S. Florides, J.L. Synge: Stationary weak gravitational fields to any order of approximation. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 263(1315), 451–472, 1961.

[3] C. Dempsey: Inauguration for Professor Florides. *Trinity News*, November 23, 2010.

[4] P.S. Florides: The electromagnetic energy and the gravitational mass of a charged particle in general relativity. *Mathematical Proceedings of the Cambridge Philosophical Society* 58(1), 110–118, 1962.

[5] P.S. Florides: The foundations of the theory of relativity. Part II: the general theory. *Kosmos* 5, 8–16, 1967.

[6] P.S. Florides: Rotation bodies in general relativity. In *General Relativity. Papers in Honour of J.L. Synge.* J.L. Synge and L. O'Raifeartaigh (eds.). Oxford: Clarendon Press, pp. 167–181, 1972.

[7] P.S. Florides: A new interior Schwarzschild solution. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 337(1611), 529–535, 1974.

[8] P.S. Florides: The Newtonian analogue of the relativistic Oppenheimer-Snyder solution. *Physics Letters A* 62(3), 138–140, 1977.

[9] P.S. Florides: The complete field of a general static spherically symmetric distribution of charge. *Nuovo Cimento A* 42(3), 343–359, 1977.

[10] P.S. Florides: Einstein—his life and work. *Hermathena* 127, 7–32, 1979.

[11] P.S. Florides: The Robertson-Walker metrics expressible in static form. *General Relativity and Gravitation* 12, 563–574, 1980.
[12] P.S. Florides: Generalized Robertson-Walker metrics and some of their properties. *Physics Letters A* 96(1), 7–9, 1983.
[13] P.S. Florides: Generalized Robertson-Walker metrics and some of their properties. II. *General Relativity and Gravitation* 17, 319–341, 1985.
[14] P.S. Florides: On the Tolman and Møller mass-energy formulae in general relativity. In *Proceedings of the Cornelius Lanczos International Conference, North Carolina State University, Raleigh, December 12–17, 1993*, SIAM, pp. 503–505, 1994.
[15] P.S. Florides: Professor John Lighton Synge, FRS. *Irish Mathematical Society Bulletin* 37, 3–6, 1996.
[16] P.S. Florides: John Lighton Synge. In *Irish Physicists*. A. Whitaker and M. McCarthy (eds.), pp. 208–219. Bristol: Institute of Physics Publishing, 2003.
[17] P.S. Florides: John Lighton Synge. 23 March 1897 – 30 March 1995, *Biographical Memoirs of Fellows of the Royal Society* 54, 401–424, 2008.
[18] P.S. Florides: Einstein's equivalence principle and the gravitational red shift II, arXiv preprint arXiv:1310.1788, 2013.
[19] P.S. Florides, P. Dolan: Professor Sir William Hunter McCrea, FRS. *Irish Mathematical Society Bulletin* 43, 70–72, 1999.
[20] P.S. Florides, J.L. Synge: Notes on the Schwarzschild line-element. Technical Report No. NP-11574. Dublin Institute for Advanced Studies, 1961.
[21] P.S. Florides, J.L. Synge: The gravitational field of a rotating fluid mass in general relativity. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 270(1343), 467–492, 1962.
[22] P.S. Florides, J.L. Synge: Stationary gravitational fields due to single bodies. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 280(1383), 459–465, 1964.
[23] P.S. Florides, J.L. Synge: Coordinate conditions in a Riemannian space for coordinates based on a subspace. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 323(1552), 1–10, 1971.
[24] P.S. Florides, J.L. Synge, T. Yukawa: Stationary gravitational fields due to symmetrical systems of bodies. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 284(1396), 32–39, 1965.
[25] P.S. Florides, R. Wingate: Rotating shells in general relativity. *Bulletin of the Greek Mathematical Society* 11, 172–230, 1970.
[26] C. Mollen: *It's Part of What We Are. Some Irish Contributors to the Development of the Chemical and Physical Sciences*. Vol. 2, p. 1598. Royal Dublin Society, 2007.
[27] Professor Petros Florides is Inaugurated as New Pro-Chancellor. News & Events, Trinity College Dublin (accessed November 27, 2024), 2010.
[28] J.L. Synge: *Kandleman's Krim*, London: Jonathan Cape, 1957.

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