Syros Island, Greece
June 11 – 14, 2025

Inaugural

Tasos C. Papanastasiou Award

ΕΛΛΗΝΙΚΟΣ ΣΥΛΛΟΓΟΣ ΡΕΟΛΟΓΙΑΣ • HELLENIC SOCIETY OF RHEOLOGY • 1996
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Cyprus
Chamber of
Commerce &
Industry

11th HSR
Meeting
Syros Island
June 11-14
2025

Tasos C. Papanastasiou Award

The **Tasos C. Papanastasiou Award** honors the memory of Professor Tasos C. Papanastasiou, a distinguished researcher whose pioneering contributions significantly advanced the field of rheology. Throughout his esteemed career in Cyprus, the USA, and Greece, Professor Papanastasiou made lasting impacts in non-Newtonian fluid mechanics, polymer processing, and computational rheology. His influential work continues to inspire new generations of scientists.

Established in 2023 by **the Hellenic Society of Rheology**, the award is presented to outstanding young scientists engaged in rheological research, recognizing their exceptional achievements and contributions to the advancement of rheological science. The inaugural award will be presented at the 11th International Meeting of the Hellenic Society of Rheology (HSR).

The award, held under the auspices of **the Hellenic Society of Rheology** and the **Cyprus Chamber of Commerce and Industry**, includes a trophy and a €3,000 prize, generously sponsored by the Chamber and the Papanastasiou Family.

The next nomination period for the Tasos C. Papanastasiou Award (2028) will be open from October 1 to December 31, 2027. For more information or to submit a nomination, please contact the Hellenic Society of Rheology at Hellenic.Society.Rheology@gmail.com.

Professor Yannis Dimakopoulos
President of HSR

Greeting by Mr. Stavros Stavrou President of the Cyprus Chamber of Commerce and Industry for the Tasos Papanastasiou Award

It is with deep honour and sincere pleasure that the Cyprus Chamber of Commerce and Industry (CCCI) participates in this distinguished event celebrating the Tasos Papanastasiou Award. This award pays tribute to a remarkable individual whose enduring contributions to science—and Rheology in particular—have left a lasting legacy.

Professor Tasos Papanastasiou was much more than an esteemed academic and professional. He was a man driven by a profound sense of duty, a steadfast belief in the power of science, and an unwavering commitment to contribute meaningfully—not only to the scientific world but to society.

His life's work stands as a beacon of integrity, dedication, and strategic vision. He spearheaded initiatives that fostered the growth of Rheology, promoted sustainable business practices, and supported endeavours with cultural and social significance.

Through the Tasos Papanastasiou Award, we not only celebrate an individual who continues to inspire through both his achievements and values, but we also affirm the importance of honouring role models who can guide and motivate future generations.

On behalf of the Board of Directors and the members of the CCCI, I extend our heartfelt congratulations to the Hellenic Society of Rheology for its commendable initiative to spotlight the invaluable legacy of Professor Papanastasiou's scientific work.

Stavros Stavrou
President of CCCI

The History of Tasos C. Papanastasiou Award

During the first General Assembly of the Hellenic Society of Rheology (HSR) in 1997, a significant decision was made to establish an award in memory of the esteemed Tasos Papanastasiou. This decision reflected not only the respect and admiration for his contributions to the field of rheology but also the desire to preserve his legacy and inspire future generations. The intention was clear: to create an honor that would recognize the spirit of innovation, dedication, and intellectual rigor that Tasos exemplified throughout his career. However, for over two decades, this noble intention remained unrealized, awaiting the right moment to come to fruition.

In 2023, after years of anticipation, the Award Committee of the HSR—comprising D. Vlassopoulos (chair), J. Tsamopoulos, and A. Beris—took decisive action to bring the original vision to life. With a deep sense of purpose and respect for Tasos Papanastasiou's lasting influence, the Committee took the initiative to establish the 'Tasos C. Papanastasiou Award' in his honor. This award would serve as a testament to his remarkable contributions and the profound impact he had on the field of rheology.

The 'Tasos C. Papanastasiou Award' was created with the goal of recognizing and supporting young rheologists who are making significant contributions to the field. It aims to celebrate those who, like Tasos, show exceptional promise, passion, and dedication to advancing our understanding of rheology. Through this award, the HSR ensures that his legacy will continue to inspire and shape the future of the discipline.

This award is not just an acknowledgment of individual achievement but a reflection of Tasos's enduring influence—a legacy that lives on through the work of those he inspired. It stands as a beacon for young researchers, encouraging them to build upon the foundation he helped lay, and to continue pushing the boundaries of knowledge in the way he did throughout his life. The 'Tasos C. Papanastasiou Award' is now a symbol of excellence in the field, a lasting tribute to a man whose contributions will never be forgotten.

2025 Tasos C. Papanastasiou Awardee

Decision

January 30, 2025

After careful evaluation of nominations, the Award Committee unanimously selects Professor Stephanou for **his exceptional research in non-equilibrium thermodynamics and constitutive modeling, which has significantly advanced the understanding of complex fluid behavior**. His work, including the development of a simple, accurate, and user-friendly differential constitutive model for the rheology of entangled polymer melts and solutions, has had a profound impact on the field.

In recognition of this achievement, **Professor Stephanou** will deliver a keynote speech titled **"Non-Equilibrium Thermodynamics Modeling of Complex Fluids: From Polymer Melts to Cement Pastes"** at the **11th International Meeting of the Hellenic Society of Rheology (HSR 2025)**, taking place in **Syros, Greece, from June 11 to 14, 2025**.

The award, held under the auspices of the **the Hellenic Society of Rheology** and **the Cyprus Chamber of Commerce and Industry**, includes a trophy and a €3,000 prize generously sponsored by the Chamber and the Papanastasiou Family.

We extend our warmest congratulations to **Professor Stephanou** on this well-deserved recognition and look forward to celebrating his contributions at **HSR 2025**.

Dimitris Vlassopoulos (Chair)
John Tsamopoulos
Antony Beris

Award Committee

Dimitris Vlassopoulos (Chair)
University of Crete (Greece)

John Tsamopoulos
University of Patras (Greece)

Antony Beris
University of Delaware (USA)

Pavlos Stephanou

Tasos C. Papanastasiou Awardee – 2025

Associate Prof. Pavlos Stephanou, PhD (b. 1982), graduated in 2006 from the Department of Chemical Engineering at the University of Patras, Greece, with a GPA of 9.24/10. He pursued postgraduate studies at the same department under the supervision of Prof. Vlasis Mavrantzas, completing a PhD thesis titled "Development of Scale-Bridging Methodologies and Algorithms Based on Atomistic Simulations for the Reliable Prediction of the Viscoelastic Properties of Polymer Melts."

During his academic career, he has held positions at the University of Cyprus, ETH Zürich (Switzerland), the Cyprus University of Technology, and Novamechanics Ltd (Cyprus), securing multiple research grants. In 2015, he was awarded *the Cyprus Research Award – Young Researcher* in the Physical Sciences and Engineering category by the Research and Promotion Foundation of Cyprus for his work on "Modeling the Viscoelasticity of Polymer-Based Nanocomposites Using Principles of Non-Equilibrium Thermodynamics."

Since September 2019, he has been a faculty member in the Department of Chemical Engineering at the Cyprus University of Technology in Limassol. His research focuses on bridging three levels of system description—atomistic (microscopic), mesoscopic, and macroscopic—through the development of scale-bridging methodologies. His work integrates:

- Non-equilibrium thermodynamics for deriving constitutive models of complex fluids.
- Simulation strategies to understand the dynamics of polymeric systems.

Dr. Stephanou is the author or co-author of over 40 journal publications.

Non-equilibrium thermodynamics modeling of complex fluids: From polymer melts to cement pastes

Despite not many people knowing its significance in our lives, rheology plays a crucial role in various aspects of everyday life, influencing numerous products and processes and even the functioning of living organisms. Rheology affects the food industry (mayonnaise, dough), the pharmaceutical industry (ointments), the plastics industry (polymer melts, polymer solutions), the construction industry (cement pastes, paints, plaster, other coatings), the personal care industry (Cosmetic pastes, toothpaste), the oil and gas industry (crude oil, natural gas multiphase flows, drilling fluids), and even the health sector (blood flow controls the transport of oxygen and nutrients, the immune system, etc.). In addition to improving our comprehension of rheological events, rheology opens the door for novel applications in domains ranging from biophysics to space exploration. Understanding rheological concepts and principles has allowed product development and process design in silico, thus facilitating enhanced product performance and quality. Such computational optimization necessitates the availability of accurate, trustworthy constitutive rheological models that can encode the actual physics in a mathematical model. In this presentation, we show how non-equilibrium thermodynamics can be used to derive thermodynamically admissible constitutive models that capture the rheological behavior of complex fluids and soft materials. We will delve into most of the above-cited industries by presenting constitutive models for polymeric systems, oil-in-water emulsions, blood, drilling fluids, and cement pastes, validated using rheological experiments and often complemented with atomistic molecular dynamics simulations. We will only be able to improve our knowledge of the fundamental physics governing the macroscopic properties of complex fluids and open the door for novel design approaches in material science and engineering if theory, experiments, and simulations work in tandem (to prevent empiricism)..

Tasos C. Papanastasiou

Τάσος Χ. Παπαναστασίου

The following text is drawn from the guest editorial published in *Rheologica Acta* (Vol. 35, Issue 6, Nov.-Dec. 1996) by **Professor Evan Mitsoulis.** This editorial commemorates the legacy of Professor Tasos Papanastasiou, whose pioneering contributions to rheology and computational fluid mechanics have left a lasting impact on the field.

Beyond His Equations

The Essence of Tasos Papanastasiou

Portrait of Tasos Papanastasiou

"Professor Papanastasiou, in a short professional career spanning about a decade, was able to tackle many problems in the fields of rheology and computational fluid mechanics. His numerous contributions have stayed with us in the form of new knowledge contained in the scientific papers he authored and co-authored, and the two books on fluid mechanics he produced. An even more important legacy of his contribution to science are the dozen graduate students he had, and to whom his knowledge was imparted, allowing them to have successful careers of their own, some as professors, some as research engineers in the industry. Their ongoing contribution is a guarantee that this knowledge and work will also continue in the future based on many of the ideas that Professor Papanastasiou put forth."

Evan Mitsoulis

Rheol Acta 35:525-530 (1996)

Honoring Tasos and His Enduring Legacy

Dear Androula, Georgios, Evan and Panos,
Thank you for putting together this wonderful and fitting tribute to Tasos. I was delighted that the Hellenistic Society of Rheology has created an Award in his name to recognize an outstanding young scientist engaged in rheological research.

It is indeed fitting that this award be associated with Tasos, whose contributions to rheology continue to impact the field. I am currently working on the second edition of my rheology text with Randy Ewoldt of University of Illinois and Gareth McKinley of MIT. Just this week I was working on the chapter which introduces Nonlinear Viscoelasticity and features his integral model. It is remarkable to see how widely the model, which he developed in his thesis research, has been used and how many citations it has received. I was even more amazed to learn how his 1987 yield stress model, which he created as an assistant professor and is also featured in the new text, now has 1900 citations!

Kathleen and I and our two oldest children have sweet memories of our visit to Cyprus in 1983. We were treated royally by Tasos' family. We loved learning about Cypriot culture, wonderful food in beautiful surroundings. I still have a sharp image of Tasos' mother going to the barn to prepare part of the meal. Kathleen remembers the family recommended a glass of water after the meal!

I wish I could be present for this ceremony in person. Please convey my congratulations to the awardee Professor Stephanou and my warm greetings to the selection committee and the excellent Hellenistic rheology community. To quote President Obama " you punch above your weight!"

Chris Macosko
Professor Emeritus
Department of Chemical
Engineering and Materials Science
University of Minnesota

Tasos and the Art of Thoughtful Persistence

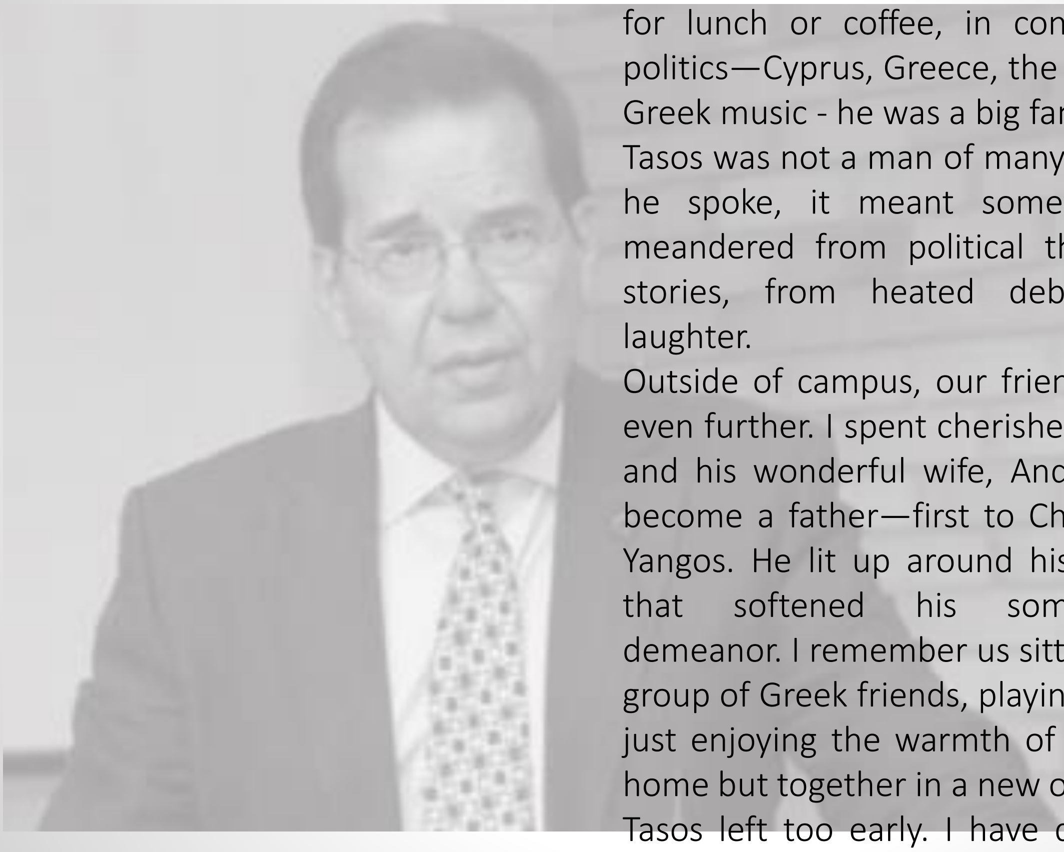
Andreas Boudouvis
Professor
School of Chemical Engineering
National Technical University of Athens

When I think of Tasos, I think first of a mind both sharp and restless. We met at the University of Minnesota in the chemical engineering graduate program—he was a bit ahead of me, both in years and in wisdom. He had a deep command of mathematics and computing, and together we dove into long, passionate discussions about finite elements, flexible boundary conditions, nonlinearity and all the wonderful stuff that comes with fluid mechanics. Our conversations were not just academic; they were creative, even playful at times, and always fruitful.

Tasos was not short on strong opinion. In fact, he held on to his views with a kind of stubbornness that could be frustrating—and yet, that same conviction often brought out ideas that were insightful, even brilliant. He wasn't always quick to admit when he was wrong, but he was always deeply thoughtful. Talking to him meant thinking harder.

One of the things I remember with particular fondness was being close to him as he developed what later became known as the Papanastasiou equation—a constitutive equation in Rheology that turned out to be both powerful and widely used. I would often tease him during that time, watching him carefully adjust and fine-tune the model, slipping in clever "tricks" to make it not just mathematically elegant but also practical, matching up better with experimental data. He was determined to get it right, and it was a joy to see his mind at work—precise, persistent, and quietly proud of the outcome.

We shared an advisor, Skip Scriven—brilliant, pioneering, and tough. As the younger one in the lab, I often leaned on Tasos for advice—he had a way of making Skip's tough standards feel just a bit more manageable. He was a guide, someone who had already faced the storm and could help me find my way through it.



We often found ourselves at Coffman Union, for lunch or coffee, in conversations about politics—Cyprus, Greece, the world. And about Greek music - he was a big fan of Haris Alexiou. Tasos was not a man of many words, but when he spoke, it meant something. Our talks meandered from political theory to real-life stories, from heated debates to shared laughter.

Outside of campus, our friendship blossomed even further. I spent cherished time with Tasos and his wonderful wife, Androula. I saw him become a father—first to Charis, and later to Yangos. He lit up around his family in a way that softened his sometimes serious demeanor. I remember us sitting around with a group of Greek friends, playing cards, laughing, just enjoying the warmth of being away from home but together in a new one.

Tasos left too early. I have deep respect and admiration for my friend and for the way he fought against many adversities—some of which he kept deep inside him. He carried those challenges quietly, with a strength that many didn't fully see, but that made him even more remarkable.

Tasos is deeply missed.

Formative Years

1

Early Life

Professor Papanastasiou was born in Paphos, Cyprus, in 1953, the sixth of eight children in a rural family. After completing his primary and secondary education in Cyprus and fulfilling his military service, he enrolled in the National Technical University of Athens in 1973 as a student in the Department of Chemical Engineering.

2

Military Service

In 1974, he interrupted his studies to serve as an army officer in the Cyprus War. He resumed his education and graduated in 1978, ranking among the top students in his highly competitive class. Shortly after, he married his wife, Androula, and together they had two sons, Charis and Yangos.

3

Master's & PhD

In the fall of 1978, he began his Master's degree in the Department of Chemical Engineering and Materials Science at the University of Minnesota, USA. His research in biochemical engineering under Professor Mayer led to the publication of two papers. However, his true passion lay in fluid mechanics. Pursuing this interest, he continued his studies at the University of Minnesota, earning a PhD under the supervision of Professors L.E. (Skip) Scriven and Chris Macosko.

ΕΘΝΙΚΟΝ Μ.ΠΟΛΥΤΕΧΝΕΙΟΝ
ΑΝΩΤΑΤΗ ΣΧΟΛΗ
ΧΗΜΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
(Τμῆμα Χημικῶν Μηχανικῶν)

Π Ι Ν Α Ξ

κατά σειράν ἐπιτυχίας προαχθέντων ἀκαδ.ἔτους 1973-74

Τ Α Ξ Ι Σ Α΄

α/α	ΕΠΩΝΥΜΟΝ	ΟΝΟΜΑ	ΟΝΟΜΑ ΠΑΤΡΟΣ	ΜΕΣΟΣ ΓΕΝΙΚΟΣ ΒΑΘΜΟΣ ΠΡΟΑΓΩΓΗΣ	ΣΕΙΡΑ ΕΠΙΤΥΧΙΑΣ
1.	Παπαναστασίου	Ἀναστάσιος	Χαριλάου	821	1ος
2.	Παύλου	Σταῦρος	Ἡρακλέους	808	2ος
3.	Παπαχριστοδούλου	Γεώργιος	Λαζάρου	804	3ος
4.	Μαρκοβίτση	Δήμητρα	Τρύφωνος	800	4η
5.	Στουκίδης	Μιχαήλ	Δημητρίου	788	5ος
6.	Μπαλτζῆς	Βασίλιεος	Κων/νου	758	6ος
7.	Πετρουλᾶς	Θεόδωρος	Στυλιανοῦ	754	7ος
8.	Κεφαλλωνίτης	Ἰωάννης	Γεωργίου	725	8ος
9.	Καλύβα	Ἀγγελική	Νικολάου	704	9η
10.	Κλήμης	Σωκράτης	Δημητρίου	704	9ος
11.	Μαμαλῆ	Χαρίκλεια	Βασιλείου	704	9η
12.	Προκοπάκης	Γεώργιος	Ἰωάννου	704	9ος
13.	Τσαρνᾶς	Ἀντώνιος	Γεωργίου	704	9ος
14.	Ἀγγελόπουλος	Μιχαήλ	Παναγιώτου	696	10ος
15.	Ριζόπουλος	Κων/νος	Θεοδώρου	688	11ος
16.	Μανθάτης	Μᾶρκος	Βασιλείου	679	12ος
17.	Χατζόπουλος	Νικόλαος	Γεωργίου	679	12ος
18.	Μιχαλόπουλος	Ἀχιλλεύς	Νικολάου	675	13ος
19.	Σπανουδάκης	Γεώργιος	Χαραλάμπους	671	14ος
20.	Γεροντάσιος	Γεώργιος	Σταύρου	667	15ος
21.	Σκούφογλου	Παναγιώτης	Ἐμμανουήλ	667	15ος
22.	Κέκος	Δημήτριος	Γεωργίου	663	16ος
23.	Ἐρκέκογλου	Ἀναστάσιος	Γεωργίου	658	17ος
24.	Κοντοῦ	Εὐαγγελία	Ἀναστασίου	658	17η
25.	Κλουτσινιώτης	Βασίλειος	Κων/νου	654	18ος
26.	Σταθερόπουλος	Μιλτιάδης	Κων/νου	638	19ος
27.	Παναγούλιας	Δημήτριος	Ἰωάννου	633	20ος
28.	Σκιαδᾶς	Περικλῆς	Ἀνδρέου	633	20ος

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Class of 1973–74 NTUA Chemical Engineering honors list, with future rheology expert A.C. Papanastasiou ranked first (8.21/10 GPA).

Back row from left to right: Tasos Papanastasiou, Andreas Boudouvis, Androula Papanastasiou, and Haris (end to end). Summer of '82 — 43 years ago

The research group of Professor Chris Macosko (@ 1982) is in front of the Rheometrics System Four that Tasos used to test his integral model and the one that Scriven mentions in his letter. Some people in the photo: Don Landin was corporate scientist at 3M, Dennis Coyle became head of all engineering at GE, Sue Ann Bidstrup Allen is professor and dean at U Pennsylvania, Victor Gonzalez-Romero became President of U Guadalajara, front row left is Libor Matejka, Head of Department at The Czech Academy of Sciences.

UNIVERSITY OF MINNESOTA DOCTORAL DISSERTATION FELLOWSHIP 1982-83

TUDENT'S NAME A. C. Papanastasiou MAJOR FIELD Fluid Mechanics and Rheology (in Chemical Engineering & Materials Science)

The candidate may voluntarily waive the right to inspect letters of recommendation for financial support, thus assuring the recommender that the letter will remain confidential. Refusal to sign the waiver does not place the candidate's application at a disadvantage.

"I voluntarily waive the right to inspect this confidential letter of recommendation. I understand that if I elect not to sign the form my application will not be put at a disadvantage".

A C. PAPANASTASIOU — Signature of Student

04.30.82 — Date

Recommender's Name L. E. Scriven Department Chem. Eng. & Mat. Sci.

The above-named student has applied for a Doctoral Dissertation Fellowship. In your recommendation (to be returned to the student's department), please address the following: 1) the importance of the dissertation to the field; 2) the stage of the student's progress on the dissertation; 3) the student's past performance and overall professional promise.

Please type.

'Tasos' Papanastasiou's dissertation will be a landmark. Since completing his Master's thesis in a completely different area 17 months ago, he has made two major contributions. The first of these is a promising new rheological equation of state for polymer solutions and polymer melts. Last summer he gathered, with the aid of the brand-new Rheometrics System Four Prof. Macosko acquired for the University, a wider range of data than heretofore available on any liquid. The nature of the new equation and its ability to fit all these data created a real stir at last October's annual meeting of the Society of Rheology, where Tasos presented a paper—an uncommonly fast start for a Ph.D. aspirant.

The second is analysis of a potential means of characterizing the heretofore hard-to-measure compressional or extensional deformation of polymeric liquids, by using squeezing flow lubricated by low viscosity liquid. The idea was put forward by Prof. Macosko here and Prof. Winter of U. Mass., and tried out two years ago by Chetraei, a Master's student. The results were promising but there was no reliable theory with which to interpret them. Tasos has now rectified that situation by producing asymptotic analyses of limiting cases and quite recently a full theory of the Newtonian case, calculating predictions by means of the finite element basis functions of computer-aided functional analysis, a type of modern mathematics which is being advanced by others in the research groups of which he is a member.

With these tools and experiences he is now attacking the main goal of his dissertation: computer-aided theory and experimental confirmation of viscoelastic flow in the scientifically fascinating, technologically important process called curtain coating. This project is already drawing the attention of such scientists as Malkus of IIT and Ruschak of Kodak and engineers from 3M in St. Paul and Italy and Agfa-Gevaert in Europe.

Papanastasiou's progress has been exceptional. His thoroughness and attention to detail and standards of reporting are catching up with his initiative and insightfulness and creativity. He is independent and proud and moody but is learning how to cooperate and even to collaborate. His determination is fantastic and he just grows and grows: the overall promise is tremendous.

This document is the 1982–83 Doctoral Dissertation Fellowship application of A.C. (Tasos) Papanastasiou—an award he received from the University of Minnesota—showcasing his pioneering research in rheology and materials science. The application was supported by a recommendation from Professor Skip Scriven.

COATING FLOWS AND PROCESSING OF VISCOELASTIC LIQUIDS:
FLUID MECHANICS, RHEOLOGY, AND COMPUTER-AIDED ANALYSIS

A THESIS
PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA

BY

ANASTASIOS C. PAPANASTASIOU

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN CHEMICAL ENGINEERING

OCTOBER 1984

Title page of the 1984 Ph.D. thesis by Anastasios C. Papanastasiou from the University of Minnesota, exploring "Coating flows and processing of viscoelastic liquids: Fluid mechanics, rheology, and Computer-aided analysis". https://shorturl.at/VzqoH.

Dedicated

To: Androula and Charilaos
Charitos and Galatia

UNIVERSITY OF MINNESOTA
TWIN CITIES

UMPPPEC
Polymerization and Polymer Process Engineering Center
Department of Chemical Engineering and Materials Science
421 Washington Avenue S.E.
Minneapolis, Minnesota 55455
(612) 373-2300

February 13, 1984

Professor W. Harmon Ray
Chemical Engineering Department
University of Wisconsin
1415 Johnson Drive
Madison, WI 53706

Dear Professor Ray:

You wrote asking for a recommendation for Tasos Papanastasiou for a faculty position. He is a joint PhD student of Skip Scriven and I working on the coating flows of viscoelastic fluids. He should be finished by September of this year, December at the latest. Tasos is a Greek Cypriot. He fought in the Turkish invasion. He was one of the top students at Athens NTU. He is married and has one child. He has an unsmiling, driving personality.

His thesis research will be very significant. He earned one of about five University dissertation fellowships in our department. It is a bit early to tell but he could have a major new strategy for solving flow problems with memory fluids, a task that has stymied Finlayson, Armstrong and Brown, Tanner, Crouchet, in fact, everyone in Non-Newtonian fluid mechanics. He has a marvelous blend of mathematical ability and physical insight. He has mastered the finite element method to such an extent that he works with it on a conceptual basis. I am now struggling just to follow him.

Julio Ottino, now an Assistant Professor at the University of Massachusetts, is my best student so far. At the same stage, Tasos has accomplished more and I believe, been more innovative. He has a similar large ego. He has not been a particularly good collaborator with others here. I believe it is because he is so competitive. He has done a good job in teaching unit, ops lab and recitation. He gives well prepared but not inspiring talks.

A recommendation letter that Chris Macosko wrote for Tasos as he applied for faculty positions.

Professional Years

4

University of Michigan

Meanwhile, Professor Papanastasiou successfully defended his PhD thesis and was awarded his doctorate in October 1984. He then joined the University of Michigan at Ann Arbor as an Assistant Professor of Chemical Engineering. With renewed enthusiasm, he embarked on his academic career, collaborating with dedicated graduate students to explore his wealth of ideas across various fields, including rheology and computational fluid mechanics.

5

Research Projects

A broad classification of the various projects he undertook as a professor, in collaboration with his graduate students, includes the following areas: Viscoelasticity, Viscoplasticity, Polymer Processing, Solidification Problems, Computational Fluid Mechanics, and Stability Analysis

6

Teaching

Professor Papanastasiou was also a distinguished educator. His courses on fluid mechanics and rheology at the University of Michigan were highly attended, renowned for their clarity and the deep insights they offered students. Over the years, his meticulously prepared lecture notes accumulated enough material to form the foundation for not just one, but two textbooks on fluid mechanics.

From left to right: Evan Mitsoulis, Tasos Papanastasiou, John Vlachopoulos, and Antony Beris at Lake Morey in 1983, during the Workshop on Numerical Methods in Vermont, USA. At the time, Tasos, Evan, and Antony were graduate students.

From left to right: Georgios Vlastos, John Vlachopoulos, Savvas Hatzikyriakos, Evan Mitsoulis, and Tasos Papanastasiou, at the ICR 1992 (11th International Congress on Rheology, August 17-21, 1992) in Brussels, Belgium. The group is pictured in the city's central square, likely during a break from the conference proceedings.

Group meeting at the University of Michigan. Professor Tasos Papanastasiou, distinguished by his beard, is seated in the second row, with Georgios Georgiou to his left. In the front row, Andreas Alexandrou sits on the right. Together, they co-authored the seminal book *Viscous Fluid Flow*.

To Papanastasiou's left is James O. Wilkes—longtime professor, department chair, assistant dean, and department historian. On the podium stands Liz Batesole. Also in the front row are Nitin Anturkar and Rosemary Wesson, PhD candidates under Papanastasiou's supervision. Even further right in the second row is Joe Green, another PhD candidate under Papanastasiou.

Tasos and Andrula visiting the home of Chris Macosko's family just before Christmas, with the undecorated tree in the background. Andrula is holding baby Harris, who was born that year. One of the rare photos where Tasos is caught smiling!.

Years in Greece

7

Return to Greece

Professor Papanastasiou felt a deep sense of duty to his family and to the education he had received in Greece. He believed that he should return—not necessarily to Cyprus, but at least to Greece—where universities were creating new positions to attract young professors from the Hellenic diaspora.

8

Aristotle University of Thessaloniki

When the opportunity arose in early 1991, he submitted his application and was soon appointed Associate Professor of Chemical Engineering at the Aristotle University of Thessaloniki. However, due to his commitments to his graduate students in Michigan, the transition process took another two years.

9

The passing to a new era

Although this new and promising chapter was cut short, his passing in March 1994, while untimely, became a catalyst for the acceleration of the establishment of the Hellenic Society of Rheology (HSR). His legacy lived on in the many individuals he influenced, and his work continues to inspire. In honor of his contributions, Prof. Georgios Georgiou organized the first scientific meeting of the Society—a landmark event. The International Symposium on Rheology and Computational Fluid Mechanics, held on July 4-5, 1996, in Nicosia, Cyprus, was dedicated to the memory of the distinguished rheologist, Prof. Tasos Papanastasiou. This symposium marked the inaugural gathering of the HSR, celebrating both his enduring impact and the future of the field.

10

1996 Nicosia

A family photo at the conclusion of the International Symposium on Rheology and Computational Fluid Mechanics. Among the founding members of the HSR, we can spot his brother, Professor Panos Papanastasiou, as well as Professor Chris Macosko, one of Tasos Papanastasiou's advisors of his doctoral thesis: "*Coating Flows and Processing of Viscoelastic Liquids: Fluid Mechanics, Rheology, and Computer-Aided Analysis.*"

Demetrios Papageorgiou
Savvas Hatzikyriakos
Dimitris Vlassopoulos
Tadeusz Pakula
William Schultz
Panos Papanastasiou
Nikolaos Gatsonis
Andreas Boudouvis
Eric Brasseur
Chris Macosko
Andreas Alexandrou
Nikos Malamataris
Epameinodas Leontidis

John Tsamopoulos
JRA Pearson
Christos Xenophontos
Georgios Georgiou
Evan Mitsoulis
Avraam Isayev
Andreas Karageorghis
Evdokia Achilleos
Matteo Pasquali

Last Day of the first HSR Meeting. The congress has officially concluded, but the spirit of scientific inquiry remains alive. Participants continue their lively discussions in the outdoor space of the congress center, exchanging ideas and insights as they reflect on the event's proceedings. This informal setting fosters deeper connections and collaboration among the attendees, highlighting the enduring impact of the conference.


Chris Macosko
Panos Papanastasiou
William Schultz
Georgios Georgiou
Christos Xenophontos
JRA Pearson (Keynote Speaker)
Evan Mitsoulis
John Tsamopoulos
Avraam Isayev

Scientific Contributions

1

Papanastasiou Viscoplastic Model

The subject of viscoplasticity initially seemed straightforward enough to handle numerically, thanks to the well-established Bingham plastic constitutive equation and its associated models, such as the Herschel-Bulkley and Casson models. However, the presence of yield surfaces introduced significant challenges in obtaining numerical solutions, requiring the introduction of an additional unknown—the position of the yield surface.

Professor Papanastasiou, in his seminal paper "Flows of Materials with Yield" (1987), published in the *Journal of Rheology*, approached this problem with a novel perspective. Recognizing that real Bingham-like materials, which exhibit a yield stress, may display exponential stress growth prior to yielding, he proposed a simple yet powerful modification to the original Bingham model. By introducing an exponential term to control stress growth, he provided a more accurate representation of the material's behavior. The brilliance of this modification lies in its applicability to both yielded and unyielded regions, effectively eliminating the need to explicitly solve for the yield surface's position. As the exponent m approaches infinity (or a large value depending on the problem's scaling), the modified Bingham plastic model seamlessly transitions to the ideal Bingham plastic model, retaining the model's simplicity and elegance.

Flows of Materials with Yield

TASOS C. PAPANASTASIOU, *Department of Chemical Engineering, University of Michigan, Ann Arbor, Michigan 48109*

Synopsis

Steady, two-dimensional flows of Bingham fluids are analyzed by means of a modified constitutive relation that applies everywhere in the flow field, in both yielded and practically unyielded regions. The conservation equations and the constitutive relation are solved simultaneously by Galerkin finite element and Newton iteration. This combination eliminates the necessity for tracking yield surfaces in the flow field. The analysis is applied to a one-dimensional channel flow, a two-dimensional boundary layer flow, and a two-dimensional extrusion flow. The finite element predictions compare well with available analytic solutions for limiting cases.

INTRODUCTION

A plastic material exhibits little or no deformation up to a certain level of stress—the yield stress. Above this yield stress, the material flows. Many metals yield at strains of less than 1%. Concentrated suspensions of solid particles in Newtonian liquids show a yield stress followed by nearly Newtonian behavior. These materials are often called Bingham plastics, after E. C. Bingham (1916),[1] who first described paint in this way in 1919, and were first analyzed by Oldroyd,[2] Reiner,[3] and Prager.[4] Paint, slurries, pastes, and food substances like margarine, mayonnaise, and ketchup are good examples of Bingham plastics.[5] A list of several materials exhibiting yield was given recently by Bird et al.[6] Production of composite materials usually involves processing of fiber suspensions that often exhibit yield behavior.[7,8]

To model the stress–deformation behavior, several constitutive relations have been proposed,[9,10] and different yield criteria have been used.[11] The state of affairs is empirical and relatively undeveloped, partially due to the difficulty of obtaining accurate,

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2 Modeling of Viscoelasticity

Professor Papanastasiou recognized that polymeric liquids possess a 'memory,' a phenomenon that is best described by integral constitutive equations of the K-BKZ type, rather than by simple differential equations like the upper-convected Maxwell model. This insight was pivotal in understanding the complex behavior of polymeric fluids.

PSM Model: In 1983, during his PhD work, he proposed the Papanastasiou-Scriven-Macosko (PSM) model, a factorized K-BKZ integral constitutive equation. This model, which was a breakthrough in the field, has since become well-known and widely adopted in rheology and fluid mechanics.

To tackle the challenges posed by the complex integral constitutive equation, he introduced Streamline Integration (SI) as a method for particle tracking. Additionally, he developed a specialized Newton-Raphson iterative scheme to handle the integral-differential equations efficiently.

Impact of the PSM Model: Over time, the PSM model has gained significant recognition in the scientific community, with its increasing citations reflecting its widespread adoption by research groups around the world. This model continues to shape the study and analysis of polymeric liquids, leaving a lasting impact on the field

3 Computational Rheology

Professor Papanastasiou has made significant contributions to the development and application of computational methods for solving rheological problems. His work often bridges the gap between theoretical rheology and practical engineering applications.

Streamline Finite Element Method (SFEM): He has contributed to the development and application of SFEM for solving viscoelastic flow problems. This method is particularly effective for handling convection-dominated flows, which are common in polymer processing and other rheological applications.

Slip Boundary Condition: He has explored the effects of slip boundary conditions in rheological flows, particularly in the context of polymer melts and suspensions. His research helps understand how slip at boundaries influences flow behavior and processing.

Open Outflow Boundary Condition: Professor Papanastasiou has developed and analyzed outflow boundary conditions for numerical simulations, ensuring accurate and stable solutions in open-flow systems. This is critical for modeling processes like extrusion and coating.

Inversion of the Unknown: His work includes advanced numerical techniques for solving inverse problems in rheology, such as determining material properties from flow data or optimizing processing conditions.

Truncated Domains: He has contributed to the use of truncated domains in numerical simulations to reduce computational cost while maintaining accuracy. This is particularly important for large-scale industrial applications.

3-D Streamline Finite Elements: Professor Papanastasiou has extended streamline-based methods to three-dimensional flows, enabling more accurate simulations of complex geometries and flow fields encountered in rheological applications.

Design Problems: His research includes the application of computational rheology to design problems, such as optimizing the shape of dies in extrusion or improving the performance of mixing devices. These contributions have practical implications for manufacturing and processing.

Compound Matrix Method for Eigenvalue Problems: He has applied the compound matrix method to solve eigenvalue problems in rheology, particularly in the stability analysis of viscoelastic flows. This work helps predict phenomena like flow instabilities and transitions to turbulence.

4 Graduate Students – PostDocs

1. R. Wesson (Professor, Louisiana State University)
2. A. Alexandrou (Professor, University of Cyprus)
3. G. Georgiou (Professor, University of Cyprus)
4. N. Malamataris (Instructor, University of Houston)
5. Z. Chen (Research Engineer)
6. N. Anturkar (Research Engineer)
7. M. Alaie (Research Engineer)
8. K. Ellwood (Research Engineer)

5 Three decades after his passing

Today, three decades after his passing, the contributions of Papanastasiou are often taken for granted. Research groups worldwide build upon his pioneering work, treating his breakthroughs as a well-established foundation while pursuing new frontiers. Yet, few pause to consider how the progress of rheology and computational modeling might have faltered had his groundbreaking research been delayed or never materialized. His innovations not only revolutionized our understanding of complex fluid behavior but also laid the groundwork for advancements that continue to shape the field to this day. The true impact of his contributions extends far beyond citation metrics, particularly in an academic landscape that often repackages fundamental ideas in new forms. Nevertheless, the depth and originality of his work remain undeniable, standing as an enduring cornerstone of modern rheology.

Speech by Panos Papanastasiou

Inaugural Ceremony of
the “Tasos C. Papanastasiou Award”
Friday 13, June 2025
HSR2025, Syros Island, Greece

Panos Papanastasiou is Tasos' brother and Professor in the Department of Civil and Environmental Engineering of the University of Cyprus, research partner of NIREAS Water Research Center, and research parner and member of the Board of Directors of Phaethon Research CoE on Intelligent, Efficient and Sustainable Energy Solutions of the University of Cyprus. He served as the founding Head of the Department of Civil and Environmental Engineering from 2002-2008 and the founding director of the Program of Architecture from 2004-2006. He served also as Dean of the Engineering School from 2009-2014.

He received his first degree in Civil Engineering from the NTU of Athens in 1984 and his M.Sc in 1986 and Ph.D in 1990 in Civil Engineering from the University of Minnesota. He is Editor-in Chief of journal Geomechanics for Energy and the Environment (Elsevier). He served as Associate Editor for the journal Rock Mechanics and Rock Engineering (Springer). He is in the Stanford University list that identified the top 2% of scientists worldwide in the areas of Geosciences, Energy, Engineering

Panos Papanastasiou

Professor

University of Cyprus

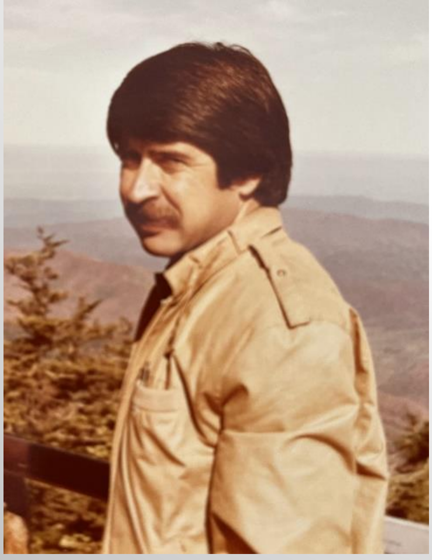
The Life of Tasos Papanastasiou

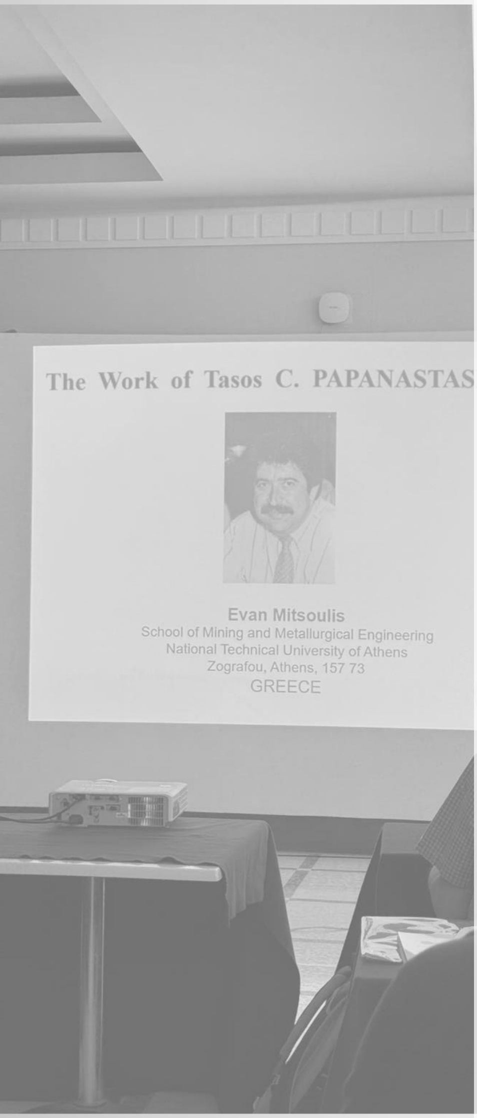
On behalf of the extended family, I would like to thank you for the great recognition and the enormous honour to our beloved Tasos, with the establishment of the Tasos C. Papanastasiou Award.

Representing the family at the event today is the youngest of his two sons, Yiangos. Yiangos is a professor in the Business School of Rice University in Houston. He received his first degree in engineering from the University of Cambridge, a PhD from the London Business School and he also served as Associate Professor with tenure at Berkley University in California.

Tasos' eldest son, Charis, graduated in applied mathematics from National Technical University of Athens and holds an MSc in financial mathematics from Cass business school in London. He now works as Chief Risk Officer for Revolut. He was unable to travel because his wife is expecting their first child these days. Tasos' wife Antroula had long planned a trip to Iceland with friends and will arrive in Syros this afternoon. From my family my wife Ioanna is also with us – I would like to note that we named our first-born child in 1999 after Tasos, her name is Anastasia.

We are particularly grateful to the Board of Directors of the Hellenic Society of Rheology for this decision and especially its president, Professor Yannis Dimakopoulos, with whom I have had very good communication over the recent months.





We would like to express special thanks to the speakers for establishing the award, who are also the members of the Evaluation Committee, Professors Dimitris Vlassopoulos, Antonis Beris, and Ioannis Tsamopoulos.

We would also like to thank the Cyprus Chamber of Commerce and Industry and its president, Mr. Stavros Stavrou, for placing the award under its auspices and providing financial support.

It would be a great omission on my part not to thank Professor Evan Mitsoulis and my colleague Professor George Georgiou for their long-standing presentation of Tasos' scientific work. I would also like to pay tribute to the memory of Andreas Alexandrou, who passed away seven years ago, one of Tasos' coworkers and later the first Dean of the Engineering School of the University of Cyprus. His contribution was very important to the creation of the Engineering School based on solid and sound principles of good governance.

I would also like to thank Professor Andreas Boudouvis, former rector of the National Technical University of Athens, for his support and long-standing friendship with the family.

Finally, I would like to congratulate the first recipient of the award, Professor Pavlos Stefanou, for his great scientific work. It was a great pleasure to meet him.

Tasos had many friends and colleagues, as evidenced by their enduring appreciation, such as this event – I apologize if I forgot to thank someone by name, but we are grateful to you all, even for your presence at the Rheology Meeting.

And now I come to the difficult part. The organizers asked me to talk to you about Tasos' life. At first, I thought it might seem a little strange to the conference participants, but then I thought that sharing some of my experiences from the difficult years, not only for Tasos' life but also for many others here, might be of interest.
Many say that it is not only what someone has achieved in life that matters, but also where they started from and life experiences. I remember my Ph.D. advisor, Ioannis Vardoulakis (now deceased), once telling me, also knowing Tasos that 'what you have achieved would be rare and even unthinkable in German society'. Tasos left us early, but he had already come a long way, with many difficult times but also many happy moments and great experiences.

We were born in a small village in Paphos to a farming family. Our father, Charilaos, the son of a priest, was orphaned by both parents at the age of 12, with two younger siblings to care for. In order to survive, he took on difficult jobs. One that he told us about, was that he came from Paphos to Nicosia on foot and for work, accompanied mule and donkey trails loaded with wheat, from Aglantzia village in the outskirts of Nicosia, to Kyrenia over the Pentadaktylos mountain range and back every day, more than 80 km. He returned to the village, married my mother Galatea in the neighbouring village, and became the village's agricultural guard, a low paid civil servant job. My mother worked hard in the fields, growing a little of everything in our orchard for food, as there were no supermarkets and money at the time, wheat which she harvested with a sickle, some vineyards for grapes and raisins, and the constant laborious care of 8-10 goats for cheese and some income.

Life was unimaginably hard in those days. Of course, all the children helped during the days when the schools were closed, also taking on external work to contribute to the family's income for covering their school tuition fees.

My mother gave birth to eight children, five girls and three boys. Tasos was the sixth in line and I was the youngest. My father gave some symbolic names to the children. My second sister was named Elli after the ship destroyer Elli, which was sunk by the Mussolini air force in 1940 during World War II, just nearby in the port of Tinos Island, a few days before she was born. He named my third sister Eirini which means peace in the middle of World War II and my fourth sister Eleftheria which means freedom. My father, who had only completed elementary school, loved Greece and the Greek civilization and history very much. He enjoyed learning by reading all of our schoolbooks. He was considered the most educated man in the village.

Life was not just hard those years – it was also often burdened with misfortunes and tragedies. In 1958, the family lost my first cousin, a young EOKA fighter, in an ambush by British colonial soldiers outside the village. Five years later, we lost the hero's sister, a high school student, from gunfire from the Turkish Cypriots parish in Paphos City. Four years later, a third child from the same family was also lost when he was injured in service in a blockade during the inter-communal clashes and later died during surgery in Germany. In less than a period of ten years, we had lost three first degree cousins from the same family. Tasos, six years older than me, experienced these events intensely.

Although our parents were farmers, with an education of some elementary school grades, they had a strong vision and ambition for their children. They wanted to educate them so that they would have a better future and not suffer like them with manual labour in the fields.

They did not want to keep the children in the village to help out in the fields, as was the norm those days. The village teachers at the time probably played a role in shaping the goals, because we were the best students. Perhaps also the encouragement of some government officials when my father hosted them at our house.

Two of my sisters moved from the village and graduated from high school in Paphos in 1958. At that time, there were tuition fees in high schools, not insignificant for the families' income. My third sister, a young girl from the village, studied to be a teacher in Athens in 1960. Not even the children of the richest families attended universities at that time. The beginning was made and then six of us studied in Athens between 1960-1984. There was no university in Cyprus at that time. Of course, with many financial difficulties, but my mother was a persistent driving force. It helped a lot that three of the children, including Tasos, we had scholarships from the Greek Scholarship Foundation, IKY. My third brother and two sisters retired as Heads in Education.

My mother and father, although he did not talk much, were very proud of Tasos. Special moments at that time were the celebrations for the National anniversaries, on 25th March, 28th October, and 1st April. They were happy when we went together by bus to the city of Paphos and we watched Tasos as the school flag-bearer. The same when he distinguished himself in the entrance exams for the Universities and a little later when he was selected as a reserve officer in the Army. He also graduated with the highest grade from National Technical University of Athens.

As I was six years apart from Tasos, except for the summers and school holidays, we did not live together. By the time I joined his school, Tasos would graduate and move on to other places.

It was evident from Tasos' actions as an older brother that he loved me very much. Let me give you some examples. When I was not sent to the best school for two years due to some family obligations, Tasos put a lot of pressure on my father and managed to convince him to transfer me to the best school from which himself had graduated.

He was very generous with me and with everyone. The only time we lived together in Paphos was when I was in the first grade in high school, and he was a second lieutenant in an army unit in Paphos. When he got his first salary of around 20 pounds, he gave me 5 pounds for pocket money, 25% of his monthly salary. This was the first time that I felt rich. When he was a student at NTUA, he went with IIASTE to Sweden in the summer. I remember upon his return he brought me a very beautiful pair of jeans as a gift, it was my first pair of jeans and I had it for few years. Later, from America, he brought me as a gift in Athens my first programable calculator, a TX instrument 59.

In the summer of 1974, Tasos was a 3rd year student at NTUA, he returned to Cyprus for vacation. With the start of the Turkish invasion, he was immediately called up as a reserve second lieutenant in the army. The first battles he took part in were in the Paphos enclave to capture the Turkish Cypriot parish. The tragic irony was that on the opposite side, the enemy side, was his best friend, a Turkish Cypriot, Vetat, with whom he had grown up working together in the fields of the two families. He didn't even know it, after the battle, he saw him amongst the hostages and of course Tasos helped him. Then Tasos' unit was urgently transferred from Paphos to the front line west of Nicosia towards the city of Morphou.

We had no news of Tasos' fate for almost three weeks, so my father, together with my sister Eirini, a schoolteacher, who had her first car at the time, set off through Troodos mountains to find his unit. Finally, asking around, they located them south of Morphou, so they returned to the village with the good news. A few days later, when Tassos came back on leave, he was very sad, some guys he knew from his unit in Paphos, had been killed. The fight was uneven, they were equipped with World War II rifles to face modern Turkish tanks in a flat terrain.

When I went to study in Minneapolis, Tasos and his family were already in Michigan, but his many friends welcomed me and helped me. I visited them several times, sometimes driving 15-16 hours from Minneapolis to Ann Arbor. Crazy things you do when you are young. We had a great time with the children and their friends. Tasos loved his children and his wife Androulla very much and dedicated many hours to them despite the demands of being a young University Professor. He never put work before family time.

When I started working for Schlumberger Research Centre in Cambridge England, Tasos visited me in the first year, in 1991. He gave a presentation in the seminar series of the Research Centre. The next day, Antony Pearson who was a Professor at Imperial College and Scientific Advisor of Schlumberger knocked on my door. Though he always rather reserved and distant, he told me to be proud of my brother, that his work is pioneer and remarkable. Until then, I had not realised how great Tasos' research work was. Antony Pearson was later the Keynote lecturer of the 1st meeting of the Hellenic Society of Rheology in Nicosia in 1996. Though I am not in the field of rheology, on few occasions I came across presenters using the Papanastasiou model - such as in a recent research project meeting at SINTEF in Trondheim, Norway.

The decision of the Hellenic Society of Rheology, to establish the Tasos C Papanastasiou award 30 years after his death, is the best confirmation of his legacy. It made us very happy and proud.

I tried to convey to you what I had in my memory about Tasos. The kind of person Tasos was, is best summarized in the inscription on his Tomb, as experienced and conveyed by his wife Androula.

'Beloved Husband, Son and Brother,
Loving Father and University Professor,
Brilliant Scientist and Writer
Simple, Noble, Generous and Upright Man'

I THANK YOU ALL again.

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30 Years

HSR

1996–2026

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