

Denos and Georges Macricostas

From Greece to the US and the world



On the left George, to the right Denos

By Eugenia Anastassiou

Two generations of entrepreneurs of Greek origin have founded, in the USA, companies that have become leaders in their respective fields. In their interviews, Denos and Georges Macricostas (father and son) unveil their impressive careers resulting from hard work, and they talk about the importance of focus and intensity in growing a business and the need to lead by example. Deno and his son Georges recently gave a considerable donation

through the Macricostas Family Foundation for the construction of the West Wing of the Gennadius Library at the American School of Classical Studies in Athens.

The wing is dedicated to the memory of General Ioannis Makriyannis, the famous hero of the 1821 Greek War of Independence. It includes a state-of-the-art gallery, as well as spaces for research, seminars and display areas for the Library's unique collection of artefacts.

Constantine 'Deno' Macricostas and Semiconductor Company Photronics

Do you think there is such a thing as the Macricostas' 'entrepreneurial DNA'—since both you and your son have founded companies which have become leaders in their respective fields?

There is some truth to this statement, as my father was a risk taker and an entrepreneur, in this regard I did take after him, as did my two sisters.

My father came from Smyrni to mainland Greece as a very young boy in 1922. Despite being uneducated, it was through sheer hard work and determination that he was able to create a successful dairy farm, which sustained us through the horrors of the German Occupation and the Greek Civil War. He was never afraid to take risks in business because he believed in his own abilities and it was this he passed down to me.

I learnt a great deal whilst working with my father, as he led by example and he was my idol. Just as I followed my father and worked beside him, so did my son George. He in turn became my shadow, when he was a young boy.

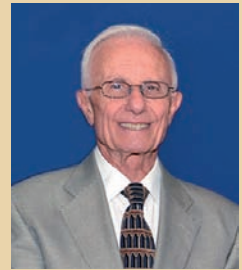
I am not sure if it is up to upbringing or DNA, but we both understand the value of hard work, the importance of focus and intensity in growing a business, as well as the need to lead by example.

You started Photronics Inc in 1969, when the semiconductor industry was in its early stages. What compelled you to go into this relatively new field?

In reality it was a combination of luck, circumstance and background which prepared me to take on the challenge of creating my own business. Primarily being in the right place at the right time, coupled with being at an age with a certain amount of experience behind me and having certain qualities my father had instilled in me—among them, to trust in myself and take risks.

To give you an idea of how the semiconductor industry developed and how revolutionary transistors were at the time,

Deno Macricostas founded Photronics, a photomask company in Connecticut in 1969. He was Executive Chairman of the Company until January 2018. Born in 1935, in Piraeus, Greece, he came to the USA in 1954 to attend Eureka College and Hillyer College, (now the University of Hartford). He met his first wife Aristeia at a Greek Orthodox Youth of America (GOYA) event in Connecticut. They got married in 1958 and they have two sons.



After serving in the US Army, he worked at National Semiconductor, designing equipment for transistors during the boom years of transistor manufacturing. He then became an engineering manager at Qualitron, specialising in making photomasks, which are the master copies of the photolithography pattern used in making microcircuits for electronic devices.

This led to the creation of his own company, Photronics, which he grew to become a global leader in the fields of photomask and reticle technology; the process of circuit design on quartz glass plates used to make microchips. The company was listed on the NASDAQ in 1987 and has expanded worldwide to other locations in the Far East, North America, and Europe. Now in his 80s, Deno shows no sign of stopping; he continues to mentor young entrepreneurs in starting up new businesses.

prior to their use, the prevalent technology in manufacturing radios was vacuum tubes. They had the disadvantage of being expensive, unreliable and having a short life span, whilst on the other hand transistors were reliable, less expensive to produce, and they lasted longer. The technology continued to evolve, with the invention of integrated circuits (commonly known as "chips") by Jack Kilby of Texas Instruments. Integrated circuits transformed the industry and their adoption paved the way for use across a broad spectrum of electronic devices.

I started working for National Semiconductor, at the beginning of the 1960s, when the company was in its infancy, but fortuitously coinciding with the time that transistor technology was beginning to be deployed more widely, particularly in the production of transistor radios. During the 1960s and 70s billions were being sold and National Semiconductor went on to become a multi-billion-dollar company, before it was acquired by Texas Instruments.

The big risk

It was through working as an engineering manager at Qualitron, one of National Semiconductor's suppliers, that I learnt not just about technology but also about business too. Mainly through observing how the executives at Qualitron were managing the company

and seeing how it could operate more efficiently. The belief that I could do it better, set me on the course of pursuing my personal "American Dream", and fortunately the pro-business climate in the United States provided the "runway" for that dream to take off.

It was a big risk since I put my house up as collateral and borrowed money through the Small Business Administration to acquire the capital needed to start the business. Our first operation was in the humble location of a large commercial garage bay.

The technological advances of the digital age must have transformed semiconductors. What part has Photronics played in these huge changes?

In all honesty I cannot say that we revolutionised anything because the semiconductor industry is not essentially a revolutionary but an evolutionary one.

To give you an example, the technological driver for the semiconductor industry revolves around the width of the lines for the circuitry on an integrated circuit. When I started making transistors, the line width was the thickness of a human hair. Today it is over a thousand times smaller than the diameter of a hair, only seven nanometres wide—that is just seven billionths of a meter and you need a high-powered microscope to be able to see it.

The smaller the circuitry's lines, the more lines per square inch that can be placed on a silicon chip—for instance, the entire Bible can fit on an area the size of a US dime—this of course allows more transistors to be put on a chip.

In the early days there were hundreds of companies making transistors in the United States, but as technology advanced, the capital investment necessary to keep pace with that development forced companies that were either inefficient or did not invest in technology to go out of business. As a result, while the industry has grown dramatically, it has consolidated over the years and there are fewer semiconductor companies left today.

Keeping pace with technology

Photronics has been able to **keep pace with technology**; but we also focus on customer satisfaction, timing our technology investments right, running our business efficiently, as well as earning the trust of capital markets, whilst taking market share from our competitors. In fact, there are just three major players throughout the world producing photomasks commercially, with Photronics being the largest.

Through the years we have supported some of the biggest names in electronics, including *Micron*, *Samsung*, *IBM*, *Texas Instruments*, *Intel* and *STMicroelectronics*, among others. We have been successful, because through our own research, development and deployment of photomask technology in our manufacturing facilities around the world we have been able to help them get to the next technological node.

Photronics now has a global presence, including in the Far East—namely Taiwan, Korea and China, which are considered to be leaders in semiconductor manufacturing. What has Photronics brought to them?

Early on, we recognised that the semiconductor industry was shifting to Asia, so, if we wanted Photronics to grow and prosper, we had to set up manufacturing there.

In Korea, an organic integrated circuit industry developed with *Samsung* and *Hynix*, which have emerged as two of the major electronics/chip manufacturers in



Visiting the Makriyannis Wing in the Gennadius Library

the world. We made a strategic decision to invest in a Korean start-up photomask company. Today, Photronics owns this business, which has become the strategic supplier to *Samsung* and *Hynix*.

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In the meantime, as flat-panel display screens were being developed, we saw an opportunity to enter into an emerging industry, so, we invested in technology to develop and supply large area masks—as the name suggests, these are photomasks for larger electronic devices. As a result, we have both integrated circuit and large area masks divisions in Korea and Taiwan.

Facilities in China and Taiwan

Photronics are currently building two facilities in China (one to provide integrated circuit photomasks and another to provide large area masks) and with the commitments we have from other Chinese semiconductor companies, we project that Asia will represent nearly 80% of our revenues in the near future.

Over the last two decades, the merchant semiconductor business has also been shifting to Taiwan; it is encouraging to see that this small island nation adopted a policy to lure back its young people who went to study and work abroad, especially from leading universities and technology companies. Taiwan succeeded in reversing the “brain drain” of high-quality engineers, with attractive business incentives and as a

result has quickly become a technology hub. Today it is home to some of the largest semiconductor factories in the world and produces more chips than the United States.

I have always wished that Greece would adopt a policy similar to Taiwan's, as so many talented and well-educated young Greeks remained abroad after they finished their studies. I believe that if they could follow the example of Taiwan and even that of Ireland, which offers significant tax incentives to draw in large international companies, Greece could also advance further economically.

Listed on NASDAQ

In your long career and as the founder of Photronics, what have been the great milestones, both professionally and in developing the company?

There were many milestones in the development of Photronics as it grew from its first location in a local garage to a global company. Certainly, taking the company public in 1987 and having it listed on NASDAQ was an important milestone which gave us capital to expand, whilst also validating our efforts and vision through the public investments entrusted to us.

Proactively expanding to Taiwan and Korea were also important milestones as those positioned us to serve and participate in the Asian market. Our current expansion into China is also an important step which will shape the future of the company.

Professionally, I am also proud of the work I have done helping other small businesses to get off the ground. Both as an investor and as a mentor to young entrepreneurs, I have helped many companies develop across various industries.

George Macricostas and collocation company RagingWire

How did you spot the “gap in the market” and realise the potential of companies “co-locating” their computing systems into cohesive, cost-effective data centre platforms?

When I was at Photronics in the late 1990s, we looked at outsourcing our Data Centre needs, but we only found providers catering to the Dotcom industry.

At that time, business enterprises were starting to outsource their websites, but they were holding most of their back office “mission critical” applications and supporting hardware—in other words, the data and IT equipment that were crucial to running their business—in their own Data Centres. The companies would build and run their own, but they often lacked the expertise, scale, and budget to meet their requirements.

In some ways Data Centres followed the same path as the semiconductor industry, where the cost to build your own became more expensive than to outsource it to a specialised provider. In addition, RagingWire could also offer clients a path for growth within our facilities, so rather than build their own capacity for the future, they could “pay as they go”.

Back then we believed that enterprise companies would outsource their facilities-based infrastructure needs to Data Centre providers while embracing selective application outsourcing, thus creating further demand for facilities like ours. Today, businesses and individuals have generally accepted “the Cloud”, although the issue of security is still a concern for sensitive information.

RagingWire is considered to be one of the companies that ‘helped create the data centre collocation industry’; now a multi-billion-dollar global industry. Do you think of yourself as an innovator in this industry?

We were innovators in that we could see the IT outsourcing trend early, which ultimately led to Data Centres housing the “Cloud” as we know it today. I would say that we viewed ourselves as logistics optimisers with additional focus on client experience.

We designed, built, operated and maintained energy efficient Data Centres, and we developed automation via custom built software to integrate multiple disparate software packages into a single view, to serve our clients’ needs via a secure portal and to serve our own staff’s requirements to run the business. We patented some unique electrical designs and implemented innovative mechanical cooling and humidification designs to lower our total cost of ownership.

You started RagingWire in 2000 and guided it through two recessions while achieving rapid, sustainable growth and a profit. How did you accomplish all that in such a relatively short period of time?

The 2000-02 recession was the worst, but I listened to people who advised me, specifically my father, and I implemented their recommendations quickly. The second recession was much easier, given that we had cash flow and were operating profitably by that time. However, our profits were cut by 55% as we worked with our clients to give them some concessions, which helped us greatly when their business picked up again.

From the beginning, we worked incredibly long hours and focused on keeping our costs down, as well as providing an excellent service for our clients, whilst leveraging their endorsements to bring in more business by industry referral. Our mantras were “to do more with less” and “to delight our customers”.

We reduced our monthly expenses, set realistic financial goals and ultimately achieved them by attracting new clients, whilst growing revenue with our existing clients. We found that two thirds of our sales were organic, as our clients expanded and grew with us.

In 2014 originally, NTT acquired 80% of RagingWire, and since January 2018 it fully owns it. How do you feel about ‘letting go’ of the company you created?

By 2014, we had around 300 clients and over 50 megawatts of live critical load supporting client equipment in multiple buildings in two states, and we were building even more capacity.

My experience at RagingWire lasted almost 18 years, and it was time for me to move on to the next chapter. I had



George Macricostas was born in 1969, in Connecticut. As Senior Vice President of Photronics, George was responsible for all aspects of the company’s global IT infrastructure, primarily coordinating the acquisition, building, and re-engineering of 12 world-class Data Centre facilities located in North America, Asia, and Europe. George co-founded his company RagingWire in 2000 to solve a problem he came across: available data centres were not catering for business enterprises.

RagingWire set out to design, build and operate world-class, cost-effective data centres in which multiple tenants would be offered dedicated, secured deployments within a common facility.

With intensified use of the web and the data demands of electronic devices growing rapidly, companies increasingly needed to house their critical IT systems in protected, reliable data facilities. In this way, RagingWire eventually became both an innovator and a leader in this sector.

In 2014, Japanese communications giant NTT saw RagingWire’s great potential and acquired an 80% stake, and in January 2018 it acquired 100% ownership of the company.

Among other things, George is one of the finalists in the 2007 Ernst and Young Entrepreneur of the Year competition and a member of the board of directors of the Jane Goodall Institute, a US environmental and wildlife organisation.

no desire to take the company public, as I wanted a more immediate exit in order to focus on my family and have a more balanced life. RagingWire happily consumed all my time, which started as a passion and became my obsession.

I feel great about having “let go” of the tremendous weight of responsibility, and I am happy spending time with my family, my friends, and pursuing my hobbies with equal passion. I am grateful to all my past fellow co-workers, clients and vendors for having played a vital role in RagingWire’s success.



Georges Macricostas explains how the Macricostas family decided to make the donation and unveils the connection with General Makriyannis

What inspired your family to make such a generous donation to create the Makriyannis Wing in the Gennadius Library in Central Athens?

It was completely accidental, my neighbour founded a non-profit organisation called CyArk which captures 3D digital images of heritage sites around the world through advanced laser technology and then uses the digitally preserved data to create educational media, including virtual tours.

I gave CyArk a grant to go to Greece and they partnered with the American School of Classical Studies, which houses the Gennadius Library; the staff there helped them to get access to several important archaeological sites.

It was on a visit to Greece for a tour with CyArk, that I discovered that the American School had a set of the original paintings of the 1821 War of Independence that General Makriyannis had commissioned, among their collection. Unfortunately, owing to lack of funds for constructing a display area in the Gennadius west wing, they and other artefacts were kept in storage and away from public view.

In addition, there was also family connection with Makriyannis, my grandmother Anastasia Armaos Macricostas was from the village of Krokilio in Fokida, Central Greece; the neighbouring village, Avoriti, was the General's birthplace. In fact, to this day Krokilio keeps Makriyannis' name alive, by holding a festival in his honour every other year, to celebrate his life and accomplishments.

Through the Macricostas Foundation, we support the Makriyannis Association who are also involved in maintaining the village of Krokilio in the absence of government support. The Foundation has supplied additional funds to the Association to take on maintenance and beautification projects in Krokilio.

However, the Makriyannis paintings are truly exceptional and are also an important part of Greek history. This ultimately inspired us to help make them and the other historical items in the Library's collection available for public display, in this aesthetically pleasing oasis in the middle of Athens. So, we decided to support the organisation's efforts by sponsoring the naming

of the wing for General Makriyannis, whilst also honouring my grandmother and her village of Krokilio.

In giving the donation in honour of General Makriyannis, do you recognise relevance for Greeks of the present generation? What can we learn from him?

Makriyannis' role during the Greek War of Independence, his efforts to force the adoption of a constitution, his contribution to Greek literature with his evocative memoirs, played a significant part in the early years of our modern nation.

Greeks of the present generation can be encouraged by Makriyannis' selfless drive to continue to work for the good of the nation, even after the war was over. Where many of the heroes of the 1821 Revolution "sat on their laurels" or pursued personal gain, Makriyannis remained active, working to establish a constitution for the citizens of Greece.

Greeks today can also be inspired by his willingness to sacrifice himself for what he believed in, putting the good

I always remember one of his sayings: "We have to stop saying 'I' and start saying 'we' if we want to build our village and live in it together". I wish politicians in Greece, the United States and throughout the world would do more to follow this example —the world would certainly be a better place

of the country above his personal welfare. At one point, he was even jailed and sentenced to death for his convictions but was released eventually and ultimately succeeded in the campaign for Greece to adopt a constitution.

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