

## Reflections: With Mino on the Road

Alan Weston

Mino was a great team player and team leader. He inspired his colleagues with his energy, enthusiasm and dedication to finding solutions that would benefit humanity. Self-motivated but selfless, he went to extraordinary lengths to guide and protect his research team in the turbulent and often unpredictable world of NASA funding for advanced technology.

Mino was a true dreamer and a great friend of mine. I will never forget his cheery disposition, his never-ending smile. When I remember Mino, I am struck by the fact that he is the only person I ever met who never got upset, no matter what.

Mino and I shared a passion for small, even tiny spacecraft that could be built and operated at costs that are so low that they will revolutionize space. Mino's background in nanotechnology led him to question the assumptions of the space community, leading him to conceive of architectures that will forever change humanity, for example by orbiting inter linked nano spacecraft that can provide internet access to the poorest and most remote regions of the planet.

Together we pursued this dream, and I have fond memories of meeting with entrepreneurs, scientists, engineers and program managers from NASA and the DoD who were in awe of the breadth and depth of Mino's imagination and intelligence. He drew upon a wide range of concepts and technologies to invent new paradigms that challenged the status quo, sometimes shocking the existing order with the possibilities of his innovations.

Some skeptics and naysayers were quick to reject his ideas, and yet his underlying mathematics were tested and proven correct time and again. We travelled together across the USA and found that our community is ready for these bold visions. I remember meeting with colleagues in the Pentagon who were fed up with the astronomical costs of conventional space systems and were delighted and excited to listen to his vision of applying nanotechnology to pressing current needs in space operations.

It is a great tribute to Mino to see today how NASA and the national space community including the National Reconnaissance Office, DARPA, the Air Force and the Army have embraced his contributions and have begun to implement his vision.

Mino is certainly one of the key motivators and inventors of the ideas and technologies that have led to the explosion of cube-sats that have become a critical enabler to students around the world to gain experience and opportunity in space technology that has been denied them by the traditional approaches. When I look around Ames, NASA and the world today, there are thousands of researchers of all ages from around the world that have the opportunities to expand their horizons and make a real impact on space technology through small spacecraft that Mino pioneered. This lasting contribution is already resulting in a renaissance of enthusiasm and participation in space science and technology that had seemed increasingly out of reach in the last several decades.

Dr. Alan Weston, Director of Programs and Projects, NASA Ames Research Center

Adapted from "Universe of Scales: from Nanotechnology to Cosmology", Symposium in Honor of Minoru M. Freund, Springer Proceedings in Physics, vol 150, 2014

## Reflections: Witness to a Formidable Dialogue

### Robert Dumais

Mino was a brilliant mind and a brilliant light. The depth and breadth of his knowledge were impressive. He had an easy-going manner, coupled with a strong drive to contribute in a scientifically meaningful way to NASA and humankind.

I had set up a meeting at our corporate office in Mountain View, CA to discuss potential collaborations between NASA and the Department of Energy, represented by Dr. Richard Joseph. The discussion rapidly evolved into an impassionate scientific discussion between Mino and Dr. Joseph leaving me in the role of a non-contributing spectator as the two scientists intellectually fed off each other. Sometime amidst the discussion, Dr. Joseph picked up a marker and started putting a complex mathematical formula on the white board. This formula became the centerpiece of the discussion as the discourse continued. At one point the marker was set down, leaving the formula unfinished.

After the two scientists had made their respective scientific points, the discussion slowly subsided. Without missing a beat, Mino in his understated way, walked over to the white board, picked up the marker, and completed the last line of the formula. He turned around with a smile of satisfaction. Both he and Dr. Joseph looked at the white board and nodded in approval. I sat in deep appreciation of what I had just witnessed.

Mino, with his easy manner, erased the white board as if the mental gymnastics were commonplace. We set up a follow-on meeting to continue the collaboration pursuit. Mino headed back to NASA. Just before Dr. Joseph readied himself to leave for the airport, he stated that Mino was truly one of the best and brightest rising stars at NASA.

I remember sitting in my empty office, thinking about how fortunate I was to have witnessed such a formidable dialogue. I feel truly privileged to have had the opportunity to meet Mino and to work with him.

Robert Dumais, President, Logyx LLC

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