

## **Acceptance speech – Technical University of Lodz, Lodz, Poland**

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By

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Honorable Rector, Technical University of Lodz, Members of the Senate,  
Distinguished Guests, Ladies and Gentlemen:

It is with great humility and gratitude that I accept this honor you have kindly bestowed upon me today. It is by far the most significant honor I have been conferred upon and I shall forever treasure it. I want to express my sincere appreciation to everyone and all the academic bodies as well as institutions involved in the process of conferring this highly prestigious award of Doctor Honoris Causa upon me at this memorable ceremony.

I take this as recognition of the collective efforts of my numerous mentors at the University of Mumbai, India and at McGill University, Canada as well as the hard work put in by my research students, associates and collaborators at the National University of Singapore as well as many around the world. I have learnt much from both my senior mentors and my junior students and associates. It has indeed been an absolutely delightful journey of well over three decades of teaching, advising as well as learning from and working with many of my bright, enthusiastic, diligent and conscientious research students and associates.

Also, I wish to record the support and encouragement I received from my family members, in particular from my wife Purnima. Likewise, my postgraduate students, research associates and research collaborators have generously provided assistance whenever it was needed. I wish to say a

big “Thank You” to them all and accept this honor on their collective behalf.

May I take this opportunity to say few words about a few general topics of my interest as well as my research and professional activities over the years. Briefly, I would like to point out unanticipated implications of some buzz words we hear all the time, namely, globalization, R&D, and innovation. They all have major impact on today’s academia. Of course, this is a topic worthy of a massive book. Thankfully, I have only a few minutes to cover them.

Although the word globalization itself was not coined until about mid-eighties, academic institutions have been functioning in a global environment for at least five decades. When I first landed at McGill University in Montreal from India as a graduate student some four decades ago, I was surprised to find myself in a global village; staff and students represented some 30 countries; and that was just in the chemical engineering department. The university, of course, boasted of students from over 120 countries. Education and research at universities have always benefited from the exchange and intermingling of people and talent from diverse nationalities, varied cultures with various ways of thinking, etc. Over the recent decades the flow of talent has expanded to a much larger group of first world countries. In the old days human talent was more mobile than economic resources and flowed in the direction of high finance. Today, finance is more mobile and it flows where the talent pool can be found. Indeed, I distinctly recall meeting with a renowned professor of Osaka University in Osaka ,who predicted precisely what we see today way back in 1980- after his return from China which had just opened up to the world around that time. He had recognized the role a large pool of human talent can play in global development.

Let me share a few thoughts about one of my favorite subjects: that is R&D. R&D is often treated as an expense. In fact, it should be viewed as an investment in the future of the economy. The rate of return on R&D is hard to compute except possibly in an industrial setting. Various economic studies have tried to quantify this return. A rate in the order of 25-30% has been claimed by various studies for industrial R&D in the west. For basic research, almost always funded by governments, the rate of return is very difficult to compute without making some serious

unverifiable assumptions. Still, some economists have boldly estimated rates of return that are truly massive, 50% to over 100%.

I am pleased to point out that Singapore, where I have been based since 2000, despite its small population and economy relative to most first world nations, is embarking on an enviable R&D trajectory leading to expenditures as high as 3% of GDP by 2010. More interestingly, it is expected that about two-thirds of this outlay will come from industry and businesses. If the 3% goal cannot be attained in a short period it is likely to be due to a faster growth in Singapore's GDP – a happy problem indeed!

Innovation is central to R&D. While in academia we like radical or revolutionary innovations, industry typically is conservative and prefers incremental innovations. In academia we focus on “R” in R&D while industry prefers to emphasize “D.” Since the time scales of research in academia are much longer than those of industry, there is some incompatibility between the two. The challenge is to bridge the gap and those who succeed can make major impact on the economic returns of R&D. I believe that academic research in engineering cannot continue to follow the old “closed loop” approach, namely, research in academia by academics and for academics.

Even academic research should not be only of “academic” interest; it should have a real world purpose; it must address a problem that is of medium-term or long-term interest to industry. Of course, there is always a finite degree of risk in any real research. Without risk there is no research needed. Once a problem is solved successfully, there needs to be a mechanism to transfer it to industry for the social good. I think this can occur more readily if industry has a commitment and involvement from get go. Close industry-academia interaction is, in my opinion, the key to success of most engineering research. It is more easily said than done, however. Happily, I am currently involved in directing a Technology Centre supported by the Singapore Economic Development Board and the National University of Singapore that is engaged in carrying out strategic R&D of industry interest in the region.

Finally, may I say some words about my own research area, which indeed led me to interact very closely and vigorously for nearly three decades

with the Lodz Drying Group led by Professor Strumillo and with Professor Stefan Kowalski of Poznan University of Technology. I have always been very impressed with the high quality of engineering education and research carried out by the various Polish universities and I consider myself highly privileged that I have been blessed with such opportunities.

When I started my academic career at McGill University in the early 70's with Professor Murray Douglas as my mentor, we identified the need to develop a more efficient drying section for the massively energy-intensive paper drying section. The paper drying section consumes over 40% of energy used in the papermaking process. With the price of oil in single digits until the first energy crisis of the 70's, there was little incentive to worry about dryers of any kind. However, the sharp increase in the price of oil in the 70's triggered industrial interest in thermal drying. Indeed, aside from initiating research in new paper drying technologies, we thought it was time to get experts together from around the world from all industrial sectors where drying appears as a key unit operation. It turns out it covers almost all industrial sectors from agriculture, foods, pulp and paper, ceramics, wood to pharmaceuticals. The idea of the biennial International Drying Symposium (IDS) series was born out of this vision. With the oil price now in triple digits, I believe it is high time to revisit all drying operations and try to make them more efficient.

This brings me to my long-standing and extremely fruitful and enlightening collaboration with Professor Strumillo and his associates. He was the key figure who encouraged me to proceed with the IDS Symposium series when I first proposed the idea way back in 1977. He provided me with important contacts in his network. He even provided me with the opportunity to invite and work with several of his bright Ph.D. students, Dr. Tadeusz Kudra, Dr. Zdzislaw Pakowski and Dr. Stefan Grabowski, to McGill to work closely with me during the 80's. Their presence at McGill opened for me a window to the excellent research in drying being carried out in Poland and also in the former USSR and Eastern Europe. Technical literature from this region far exceeded what was available in English at that time.

I must record with gratitude that a number of contributions I was able to make to industrial drying R&D benefited from outstanding support of

academics and close friends from Poland. The list is too long to enumerate here.

Poland is blessed with a large number of very highly reputable world-class universities- some hundreds of years old and others like Lodz Technical University, rather young. Indeed, one thing I have in common with Lodz Technical University is that we were both born in the same year! Your university can be aptly proud of the global impact your esteemed faculty have made in many areas of engineering research in general and in drying R&D in particular. It is therefore an exceptional honor for me to be recognized by your academic community.

As for my own research contributions in drying, they have spanned diverse industrial sectors, from paper, grains, ceramics, foods to wood utilizing diverse drying equipment. In drying R&D it is important to consider transport phenomena as well as material science. It is necessarily interdisciplinary. In active collaboration with Professor Douglas at McGill, we developed a new superheated steam drying process for newsprint that can also be modified for other paper grades. The concept was successfully tested at the pilot scale in Finland. Although mill scale dryer can be designed with this concept, we are still awaiting adoption by industry since the dryer section will be radically different from what industry uses today. The advantages of lower net energy consumption and better product quality still cannot overpower the concern of risk in a radical innovation. Maybe it has to wait another decade of escalating fossil fuel costs and legislative restrictions on carbon emissions around the globe. For want of time I shall not discuss other research themes I have been pursuing.

In closing, may I reiterate my gratitude for this exceptional honor your esteemed institution has bestowed upon me today. I shall continue to strive hard to remain worthy of this award!

Thank you, Ladies and Gentlemen, for your attention!