

**The Genius in Enduring Success:
1% Inspiration, 99% Perspiration *and* Perseverance**

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University Awards is a salute to excellence celebrating the best in NUS education, research and service, recognising, honouring and encouraging our award winners every year.

Today, I would like to speak on “The Genius in Enduring Success: 1% Inspiration, 99% Perspiration *and* Perseverance”.

In preparing my speech, I reflected on my days at the General Electric Company, also known as GE, where I worked for seven years. Thomas Edison founded this company.

The Genius in Enduring Success

To many of us, Thomas Edison was a genius. His life and work embodied the genius in many enduring successes.

Do you know that this genius developed hearing loss in childhood and became technically deaf in his early teens? That he attended school for only three months? That he was taught by his mother and later self-taught because the teachers felt he was not good enough for school?

So, what kind of genius was Edison? Was he a Newton or an Einstein? He certainly wasn't. Nevertheless, Edison was a different kind of genius.

Newton and Einstein belonged to the class of genius defined by extraordinary intellectual and creative power. Edison symbolises another class of genius defined by strong natural talent, distinctive spirit and character.

Edison invented the phonograph, the light bulb, the motion picture camera and many other devices that shape our world today. In fact, he had more than a thousand patents to his name, apparently more than anyone else. Isn't it ironic that someone who was deaf invented the phonograph, the first machine that could record and reproduce sound? In bringing the phonograph to the mass market, Edison created the recording industry.

Edison had the genius of both an inventor and an entrepreneur. He created value to serve community, society, and ultimately the world. GE is an enterprise founded upon Edison's many inventions.

One and a half centuries after Edison invented the phonograph and the light bulb,

GE continues to be one of the largest manufacturers of lighting devices in the world, as well as a major player in the recording industry. Today, GE is one of the largest and most successful conglomerates in the world.

Perspiration

Let me quote Edison's famous saying, "Genius is 1% inspiration, and 99% perspiration." Perspiration is commonly associated with working hard. What drives people to work hard? Is it the carrot? The stick? Or both?

How long can hard work be sustained by carrots and sticks?

An easy answer is "for as long as they last". Yet, we notice that many people, including Edison, work painstakingly well beyond the kind of motivation that can be attributed to carrots or sticks.

To varying extents, I believe we can all identify different times in our lives when we find ourselves working relentlessly and passionately. When we have passion for what we do, perspiration is not a chore, but a necessary as well as enjoyable step towards realising our goals.

So, perspiration is more than working hard, it is working relentlessly and passionately.

Many of us who aspire to realise the genius in ourselves are more than prepared to perspire. But we often wait for the moment of inspiration. My friends and colleagues, waiting for inspiration may not work. Inspiration could also arise *amidst* perspiration. As we perspire, we are more ready to be inspired.

It is comforting to know that genius is lots of perspiration and a dose of inspiration. That means we all have a chance at genius, if we are prepared to work hard and to sweat a lot.

How do we get ready for that flash of inspiration, that sudden creative idea? Let's see if Edison's life can shed some light. Edison worked long hours. He seldom bothered to go home, taking short naps in his lab instead.

Short naps amidst long hours of hard work often laid the ground for Edison's bright ideas. I remember visiting Edison's original lab in New Jersey and reading about how he got his illuminating ideas, sometimes in his dreams. Even in his sleep, his mind was testing new ideas and exploring novel ways of doing things.

When you single-mindedly pursue an idea, the subconscious mind is also hard at work, making connections between the familiar and the unfamiliar, between the established and the unorthodox. This continual interplay between the established and the unorthodox is an essential ingredient for inspiration to arise. Clearly, inspiration does not arise in a vacuum.

Perseverance

There is more to genius beyond perspiration and inspiration. Despite difficulties and obstacles, Edison remained single-minded and steadfast in his pursuit of goals. Edison personified perseverance – the capacity to “stand up again and again after every fall and move forward”.

He once said, "I have not failed 700 times. I have succeeded in proving that those 700 ways will not work. When I have eliminated the ways that will not work, I will find the way that will." Edison seemed to have a great time as he got closer to pinning down something that works. Not only did Edison stand up after every fall, he always managed to learn something along the way.

Edison's work on the light bulb says much about his perseverance. By mid-winter of 1879, Edison had built his first incandescent electric light bulb. Still the lamp burned only for a few short hours.

In order to improve this, Edison tested thousands and thousands of different materials for the filament. He tested carbonised filaments of every plant imaginable, including bay wood, boxwood, hickory, cedar, flax and bamboo. Edison even contacted biologists who sent him plant fibres from the tropics.

Edison recalled that he tested no fewer than 6,000 vegetable fibres, and ransacked the world for “the most suitable filament material”. By the end of 1880, Edison had produced a 16-watt bulb with a special carbonised cotton filament that could last 1,500 hours.

In our journey to learn, discover and serve, it is important to persevere because inevitably we encounter failure. In this journey, failure is not fatal. Succumbing to failure is!

Persevering through failure is essential to create enduring success. The real failure is when we give up trying. As writer and genius Samuel Johnson once said: “Great works are performed, not by strength, but by perseverance”.

Part of the genius in enduring success lies in perseverance and perspiration.

Modern-day Edison

Koichi Tanaka, the young Japanese scientist who won the Nobel Prize for Chemistry last year, could be regarded as a modern-day Edison.

While Nobel Prizes in the sciences are usually won by researchers with PhDs, working in prestigious universities, Tanaka took a different path.

Tanaka graduated from Tohoku University in 1983 with a bachelor's degree in electrical engineering, and not chemistry. He then joined Shimadzu Corporation, which manufactures, among other testing equipment, mass spectrometers.

As the most junior of engineers, Tanaka was volunteered by his senior colleagues for the unglamorous role of preparing samples for analysis. Perhaps, his colleagues

wanted to stick to the more conventional engineering problems that they were familiar with.

Rather than quitting from the unfamiliar, the determined Tanaka plunged headlong into the field of chemistry – a world away from his engineering training – until he was so well versed in chemistry that everyone in the team could be confident of his competency.

And so it was befitting that one fine day, after he had perspired over mixing countless samples of large protein molecules with different chemicals, Tanaka was illuminated by a spark of inspiration. He fed one of his reject samples into the mass spectrometer. Aiming a laser pulse into the mixture, he observed a peculiar spike. This unexpected observation reinforced Tanaka's perseverance in mixing even more samples with his now-famous chemical matrix comprising the unlikely combination of glycerin and cobalt powder.

For his discovery of this novel chemical matrix based on these highly dissimilar constituents, Tanaka the electrical engineer won the Nobel Prize in Chemistry. His work paved the way for the mass spectrometry of much larger proteins – leading to a revolution in protein research and drug synthesis. This unlikely Nobel Laureate was the first ever to win the Nobel Prize in the natural sciences without a doctorate or a master's degree, without formal training in research, and certainly without formal training in chemistry beyond high school! Perhaps, being an outsider to chemistry, he was more disposed to experimenting with unorthodox approaches, and to persevere.

Tanaka's determined pursuit reminds me of what the eminent biologist Louis Pasteur said, "In the field of observation, chance favours only the prepared mind." Paraphrasing Pasteur, in the pursuit of excellence, inspiration favours only the persevering mind in a perspiring body!

Like Edison's light bulb, Tanaka's discovery led to the invention of MAL-DI technologies. MAL-DI stands for Matrix Assisted Laser Desorption/Ionisation. Tanaka's invention gave Shimadzu a new generation of state-of-the-art mass spectrometers highly sought after worldwide.

In 1989, 13 years before winning the Nobel Prize, Tanaka won his other noteworthy research-related award. This was the Encouragement Award from the Mass Spectroscopy Society of Japan.

If only Encouragement Awards would turn into Nobel Prizes every 13 years ...

Today, we are giving several awards in research. Let's see ... going by this 13-year rule, could we have homegrown Nobel Laureates as early as 2016?

Celebrating Perspiration, Perseverance and Inspiration

University Awards celebrate, recognise and honour the pursuit of excellence. In our journey to excellence perspiration, perseverance and inspiration all play a part.

Today, I am delighted to have presented several University Awards.

The Outstanding Educator Award is presented to faculty members who have excelled in engaging and inspiring students in their discovery of knowledge.

The Outstanding Researcher Award recognises researchers whose work have significantly impacted and expanded the boundary of knowledge, positioning NUS at the forefront of their particular areas of expertise.

The Young Researcher Award acknowledges researchers whose work show promise in extending the frontiers of knowledge in their respective fields. This is our version of the Encouragement Award that Tanaka received when he was a young researcher.

The Outstanding Service Award honours sustained contributions of distinction by an individual in the service of the University and society.

Through perspiration and perseverance, our award winners exemplify the best of education, research and service. My warmest congratulations again to all of you.

Even as NUS celebrates success, we must re-affirm our commitment to the pursuit of excellence built upon inspiration, perspiration and perseverance.

When each member of our NUS community pursues excellence in his or her area of strength, we create the opportunity to realise our potential and to add value to NUS. Through the NUS community, our added value will be multiplied and, over time, extended to society. The sum of our efforts will propel our NUS community to broader and higher levels of excellence.

As I mentioned in the beginning, Edison had the genius of both an inventor and an entrepreneur.

Edison understood the genius underlying the process of creating enduring success. For Edison, one enduring success was the creation of a global enterprise that thrives on knowledge and innovation.

I hope that Edison's example will inspire and challenge us to pursue and realise our personal enduring successes.

By nurturing modern-day Edisons in our midst, we can help build NUS into a global knowledge enterprise and an enduring success with a good dose of inspiration, and lots of perspiration and perseverance.