

## Introduction of Professor Rocky S. Tuan written by Professor Christopher Gane

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So many of our formal University ceremonies are about looking back, and celebrating what has been achieved: the conferment of degrees on our graduating students; the award of an honorary degree; the appointment of an honorary fellow of the University. But the installation of a new Vice-Chancellor is different. Today, like the Roman god Janus, we simultaneously look back to record and celebrate Professor Rocky Tuan's achievements as a scientist, and forwards, in anticipation of the benefits that his scientific achievements will bring, and where his leadership will take us in the years to come.

In a message of congratulation on the establishment of the University's Department of Biomedical Engineering, Professor Tuan described himself as 'a practising biomedical engineer'. Behind that modest statement there lies a scientific career of great distinction. Professor Tuan is a world-leading biomedical engineer, globally recognised for his work in stem cell biology, musculoskeletal tissue engineering and regenerative medicine.

Professor Tuan began his journey to scientific eminence at Berea College in Kentucky where he took his Bachelor's degree. Berea is not so well-known outside the US, but while in high school, Professor Tuan attended a presentation by a past President of Berea College, and was inspired by him to pursue his college education in this unique liberal arts college. Berea promises all of its students that they will not be charged for tuition, and in return, they are expected to undertake a service commitment to the college and the community, by participating in the Labour Program, throughout their time as undergraduates. Berea College thus offered the young Rocky Tuan the opportunity of an outstanding undergraduate education, without incurring the burden of tuition which, as he has himself observed, his parents could never have afforded.

Berea left its mark on Rocky Tuan. As well as providing him with a first-rate education in the sciences, it afforded him the opportunity to pursue a broader liberal arts education of a kind that would have been difficult to pursue in the English higher education model that prevailed in Hong Kong at the time. In particular, it gave him space to indulge his passion for music, both informally (while undertaking campus work in the music library) and through more formal music training. Professor Tuan is indeed an accomplished singer, and there seems to have been a time when music might have overtaken or supplanted his interests in science. But that was not to be, because, as he explains, he could not pursue both. One had to give way, and that was music because, as he explains, he was no longer able to find the time and energy to achieve the 'spiritual moments' he found in performing with other like-minded souls.

Berea also provided Professor Tuan with the opportunity to participate in an undergraduate research programme in a biochemistry laboratory at the University of Louisville medical school for two summers, which experience was instrumental in him deciding to pursue a career in scientific research. On graduation, Rocky Tuan went on to complete his PhD in Life Sciences at The Rockefeller University, during which he demonstrated, for the first time, the process by which embryonic chickens derive the calcium necessary for skeletal growth from the eggshell. (How an egg becomes a chicken was indeed a long-standing question, and one which had been posed as early as the fourth century BCE by the philosopher Aristotle.)

Following a Research Fellowship at Harvard Medical School he joined the Department of Biology at the University of Pennsylvania. In 1988 he moved to Thomas Jefferson University (Jefferson) where, in addition to serving as Director of the Orthopaedic Research Laboratory, he held concurrent appointments in the Departments of Orthopaedic Surgery and Biochemistry and Molecular Biology.

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It was during this period that he also established at Jefferson the US's first PhD programme in Cell and Tissue Engineering.

He left Jefferson in 2001 to take up a research appointment at the National Institute of Arthritis and Musculoskeletal and Skin Diseases which is one of the National Institutes of Health of the US. After eight years at the National Institute, he joined the Departments of Orthopaedic Surgery and Bioengineering at the University of Pittsburgh to become the founding director of the newly established Center for Cellular and Molecular Engineering. He subsequently assumed directorship of the University's Center for Military Medicine Research and associate directorship of the McGowan Institute for Regenerative Medicine, which positions he held until his appointment as the eighth Vice-Chancellor and President of The Chinese University of Hong Kong.

The potential offered by Professor Tuan's research achievements can be illustrated by comparing how modern medicine currently deals with osteoarthritis, and how this disease could be tackled in the future.

Osteoarthritis is a common degenerative disease, which can affect any joint in the human body, but which predominantly affects the knees, hips and hand joints. It affects nearly one in six in any given population, with an almost 50% prevalence for individuals over 65, and a slightly higher frequency in women. Just why the degeneration of joint cartilage associated with this disease occurs is not well understood. But its debilitating effects are only too well recognised. As one arthritis charity has succinctly put it: 'Arthritis ruins quality of life.'

At present the consensus is that there is no 'cure' for osteoarthritis. It is managed through pain relief, adjustments to lifestyle, exercise and, where

joints are too damaged to be so managed, by surgical intervention and whole or partial joint replacement. More than 1.5 million knee and hip replacements are carried out globally each year.

Professor Tuan envisages a radically different solution, which is nicely encapsulated in a reflection he has himself offered: 'Wouldn't it be nice if you could make something exactly like your natural joint to restore you back to your old self?'

What this involves is developing techniques to allow the damaged cartilage to be replaced using artificial cartilage, engineered using adult stem cells. Adult stem cells have two important characteristics: They are non-specialised, and they are capable of renewing themselves. Under certain conditions they can be induced to become tissue or organ specific cells with specific functions. They can, therefore, be engineered to create new cartilage to replace the damaged cartilage in joints affected by osteoarthritis.

In order to do this, the stem cells are provided with nutrients, and a 'scaffold' or framework to enable the engineered tissue to take shape. The all-important scaffold is provided through advanced 3-D printing methods. Professor Tuan's work has shown that both cartilage and bone can be artificially engineered in vitro, and, most importantly, be transplanted into a living damaged joint, to effect its repair.

A further dimension to Professor Tuan's work is that artificially created tissue can be used to explore the pathology of arthritic tissue damage. The causes of joint degeneration in osteoarthritis are not well understood, and the creation of tissue analogues provides a new avenue through which the disease can be researched and better understood. Building on his earlier work, Professor Tuan has recently received a major grant from the National Institutes of Health in support of a project to engineer a three-dimensional

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'micro-joint' to replicate, on a small scale, a fully functioning human joint, which will be used to study and test treatments for arthritic joint disease.

Professor Tuan's work is important, also, in relation to the treatment of military personnel who have suffered blast injuries that require limb amputation. It has been observed that muscle at the amputation site often converts to bone as it heals, which can make it difficult to fit a prosthetic replacement, and painful for the user of that limb. What causes this is not yet fully understood, but what happens is that the wound site attracts stem cells at a much higher density than is found in bone marrow and normal muscle tissue. Professor Tuan has, however, also found that these extra stem cells appear to have the ability to stimulate nerve growth, and thus might be used to induce the restoration of peripheral nerve function.

One of the striking features of Professor Tuan's scientific career is his ability to hold down not one, but two or even three appointments concurrently. This is, of course, a mark of recognition: everyone wants a piece of Rocky Tuan. It is also a testament to his energy, industry and capacity for leadership. And it has provided the opportunity for Professor Tuan to tell a couple of jokes at his own expense. In delivering a keynote address at the University of Michigan in 2013 he referred to his list of appointments and observed: 'I got a lot of titles.... That just means that I can always avoid meeting with anyone—I just tell them that I am at a meeting doing my other job....' And more recently, in delivering the Chappel Lecture at the University of Guelph he explained: 'This is one of my weaknesses—I just don't know how to say "no".'

Professor Tuan's ability to contribute on multiple fronts should stand him in good stead as he confronts the demanding role of University Vice-Chancellor. Harold Shapiro, former President of

Princeton, has described the role of a University President in these terms:

'On the one hand, this position involves the nurturance, safeguarding and sponsorship of a venerable—some would say sacred—public trust. In any case it is, in part, an ethical endeavour in that the president provides leadership to an institution that deals with matters society believes to be important, and is an enterprise based on the belief that the future is of ethical significance. On the other hand, the position also involves its share of shallow, frivolous, sentimental and occasionally demeaning activity. Whatever else it may be, the presidency of a university is a very human endeavour and, therefore, a very humbling and humorous experience.'

It is inevitable, then, that when a new University Vice-Chancellor is appointed questions such as 'What will he be like?' and 'How will he step up to all these challenges?' are asked. The answer seems to be that he will be like he has always been. There is seriousness, a reflection on what it means to be the Chief Executive of a globally significant institution. There is warmth, and humour. And there is an approach to leadership that is fit for the purpose of leading an academic community—an enterprise often described as akin to 'herding cats'. For Professor Tuan, 'leadership' is about persuading others that what you want to achieve is what they also want to do, through a process of give and take imbued with mutual respect and recognition of the contribution that each individual, properly motivated, can bring to our collective enterprise.

Something can also be learned from his reflections on moving on from his career as a research scientist and research leader. Professor Tuan acknowledges that he is relinquishing something, giving something up. But, as he explains

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it, relinquishing something is as much about 'handing on' as it is about 'giving it up'. And everyone who is successful in a leadership role knows that there comes a time to do just that. Look around; make sure that all is working well; and entrust it to those who follow on, as indeed his predecessors at this University have done.

Professor Rocky Tuan has turned his steps homeward, acknowledging his deep sense of 'belonging', of 'being from Hong Kong'. Professor Tuan's father and mother were veterans of the second Sino-Japanese war and the civil war in China, who came to Hong Kong as refugees in 1949. Like so many of that generation they had to build new lives from nothing. And through their hard work they laid the foundations of the success story of modern Hong Kong. Rocky Tuan feels an abiding sense of gratitude to those whose hard work laid those foundations and sowed the seeds from which his own personal and professional success sprang. From these sentiments there comes the desire to contribute to Hong Kong; to repay something of what he received.

Just now we noted Harold Shapiro's elegant description of the complex, multi-faceted role of a university president. Let us conclude with a lighter version of the same picture. Imagine, if you will, a university community, assembled to meet its new vice-chancellor. The Chair of the Search Committee steps forward, and introduces not one person but a group of five people—a boxer, a priest, a firefighter, a child psychologist and a Nobel laureate. The most senior member of the University Senate steps forward: 'Hold on. Is this a joke? You promised to present the new President.' The Chair of the Search Committee is unrepentant: 'Well, you laid down so many demands and conditions that we couldn't find one person who could satisfy all of them. So we have appointed all these five people. But, hey, we're still within budget.'

Professor Rocky Tuan, in whichever of these roles you think best suits your talents, we welcome you as our new Vice-Chancellor. And we are grateful that when the Search Committee came knocking you still had not learned to say 'No'.