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Asia's Rising Scientists: Matthew Chang

Associate Professor Matthew Chang is leading a team of interdisciplinary scientists to reprogram living organisms to perform useful functions for humans.

Matthew Chang

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AsianScientist (Nov. 24, 2017) – With the advancement of molecular tools in biology, scientists can now tinker with the fundamental building blocks of life to reprogram organisms and direct their behaviors and functions in ways that benefit humankind. This is the domain of synthetic biology, and Associate Professor Matthew Chang has spent most of his research career pushing its frontiers.

As the director of the Synthetic Biology for Clinical and Technological Innovation (SynCTI) program at the National University of Singapore (NUS), Chang works at the interface of biology and engineering, stewarding a multidisciplinary team to develop solutions in medicine, manufacturing and sustainability. His lab seeks to create living medicines for a variety of diseases by precisely editing the genomes of bacteria that live within the human body.

In this interview for Asia's Rising Scientists, Chang shares his aspirations to engineer biology for the good of society.

1. **How would you summarize your research in a tweet (140 characters)?**

Reprogramming cells to perform new, useful biological functions to understand life and solve challenges in our society.

2. **Describe a completed research project that you are proudest of.**

I have a number of research projects that I am very proud of. We are relentlessly working to continue to advance these 'completed' projects, as there is really no true 'completion' in science.

Of course, many of these projects have led to important discoveries, developments, patents and publications, but I always try to remind myself that the final destination of most of the research projects results in creating a positive impact on our society. I think

that some of our ongoing research projects have great potential to reach such final destinations in the not-so-distant future and our research team is putting in their best efforts to make that happen.

We are currently working to reprogram a group of microbial cells (microbiome) that naturally live within us to help our body maintain or even restore balance. In line with this research direction, an increasing number of studies are now proving that microbiome imbalance is strongly correlated with a wide range of human diseases.

Our research team has shown that several key diseases, including some forms of infection and cancer, could benefit from microbiome modulation approaches in preclinical models, which I am particularly excited about.

I believe that our work so far has made a solid contribution to the development of new microbiome-based therapies.

3. **What do you hope to accomplish with your research in the next decade?**

The biggest dream of mine as a scientist is to be able to witness how our work saves and enriches people's lives. In parallel, I anticipate with optimism and excitement that our research will be able to offer the scientific community an array of biological tools and platforms that can make the engineering of biology faster, and more systematic and affordable.

I believe that biology can be harnessed to a greater degree to solve many of the issues confronting our society, and by making the engineering of biology faster and cheaper, more people around the world can directly benefit from biological science.

Associate Professor Matthew Chang with the SynCTI team at NUS. Credit: Matthew Chang

4. **Who (or what) motivated you to go into your field of study?**
I have a long list of individuals—teachers, mentors, colleagues and friends—who directed me to science and inspired me to dive into the field of synthetic biology. In particular, I drew inspiration and motivation from William Bentley, Freshteh Toghrol, Hyunmin Yi and Jay Keasling, to name a few, whose guidance, friendship and mentorship greatly shaped my scientific mind and love for research.
Most importantly, I am deeply indebted to my mother who inscribed in me the importance of integrity, education and hard work.

5. **What is the biggest adversity that you experienced in your research?**
Being able to do research entails finding and putting together an array of essential ingredients, including funding, space, facility, management and, most crucially, people. All these components present opportunities that enable us to achieve research excellence. However, the lack of any of these critical ingredients also stymies research; this happens at an alarming rate in the academic world, as academics are presented with a constantly evolving set of challenges to overcome before any form of research success can be attained. I am among the researchers experiencing this adversity.

6. **What are the biggest challenges facing the academic research community today, and how can we fix them?**

The academic research community is increasingly finding itself confronted by an extensive and diverse collection of challenges coming from many different sources. One big challenge is the escalating cost of practicing science.

Scientific research in general is turning into a very costly endeavor on every front.

Another very worrisome phenomenon is the rapid lack of sustainable funding models for academic research, particularly for basic science.

As a result, many academic researchers, including myself, must devote a large portion of their time writing as many grant proposals as possible with the resignation that most of these proposals would eventually fall into the rejection pile.

Personally, I think that it is now undeniably critical for our academic research community to come together to find a way to do science in a more sustainable manner, and to create an inclusive, viable community that will transform the current practice of academic research.

7. **If you had not become a scientist, what would you have become instead?**

I did a short stint in a management consulting firm early in my career and I enjoyed the nature of the work there, which gave me opportunities to learn about diverse intellectually-stimulating areas and meet with many fascinating individuals. But science definitely gives me more of such opportunities!

8. **Outside of work, what do you do to relax?**

Like many academic researchers who face a hectic schedule on a daily basis, when I step into my office every morning, I try to remind myself to stay focused and productive as much as possible, so I often find myself in need of guides to relaxation.

Fortunately, I came to realize through experience that there are several ways for me to unwind! In particular, I fall into relaxation when I meditate, read, exercise, play the piano and, most importantly, travel with my family. Sometimes, daydreaming works like a charm as well!

9. **If you had the power and resources to eradicate any world problem using your research, which one would you solve?**

Even now in 2017, roughly 16,000 children under the age of five die every day, which corresponds to almost 6 million deaths every year. About half of the deaths result from malnutrition, and could be prevented or treated by simple, low-cost interventions.

I believe that our scientific community can and should come together to reduce this number dramatically and help as many children as possible through innovative science and collaboration.

10. **What advice would you give to aspiring researchers in Asia?**

Find your passion in science, dream big and make a good plan to realize the dream. Seek out and work with people who bring out the best in you, and most importantly, enjoy!

This article is from a monthly series called Asia's Rising Scientists. Click here to read other articles in the series.

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