Prof Zhang has authored and co-authored many impactful papers. In his recent papers, he and his collaborators solved Japanese mathematician Shigeru IITAKA's 46-year-old problem in birational geometry, with the discovery of a new method – the generalised Minimal Model Programme (MMP), among other research breakthroughs to problems that have been unanswered for decades. In Dec 2016, he was invited to present his research findings at The Legacy of Emmy Noether and Gottingen Mathematics Conference, held in Sanya, China. Prof Zhang was also conferred the Osaka University Global Alumni Fellow title in June 2016 and the Faculty of Science Outstanding Scientist Award 2016 for his research accomplishments.

Prof ZHANG De-Qi

Department of Mathematics

"I ventured into algebraic geometry as this field is relevant to many real-life happenings which are subject to various parameters or variables. In this field, we are guided by geometric visualisation and algebraic rigour to prove/confirm discoveries. We can also predict or simulate future possible occurrences by solving these equations. From the perspective of pure mathematics, we work towards confirming the existence of a solution and structure of the solutions space.

Most equations can be approximated by polynomials, the focus of my research. The solution space of polynomials has a nice geometrical structure: it can be embedded into the compact projective space P^n (the union of the complexified Euclidean n-space C^n with a boundary at infinity). One purpose of my research is to find a minimal such n to put our solution space in P^n. The smaller the n is, the simpler to handle the situation (since there will be lesser coordinates involved).

This field is a challenging one, requiring understanding of many mathematical areas. For instance, semi-definite programming can be formulated and solved with algebraic geometry. It is also interdisciplinary, interacting with theoretical physics. Physicists can accurately predict the number of rational curves in a Calabi Yau quintic space (a solution space of a degree-5 polynomial equation) by using the duality principle in physics. Mathematicians complement this by providing rigorous proof of these predicted formulae.

In investigating solutions spaces or complex spaces, we need to predict certain principles or theorems. This requires experience and rigorous proof. On various occasions, I know certain predictions are true but I could not provide convincing proof. One also has to discover new theories, the process of which could be more enjoyable (and also painful) than the proven theorems themselves.

Nevertheless, I find great satisfaction, for instance, when a decade-long conjecture is solved. The solutions could be used in other areas of mathematics, like number theory, i.e. the structure of integers or the relationship amongst the numbers, etc.

I hope to extend beyond complex numbers, to work on real numbers which are strongly connected with semi-definite programming and which offer immediate applications in solving real-life problems.

To succeed as a researcher, we should be aware of our strengths and weaknesses and find the niche areas of our interest. Deep results take time but have lasting effect."