



A Collective Human Challenge

TakeAIM Winner 2019:

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Everything is a collective behaviour. Actually, it is probably more accurate to say that collective behaviour is a way of interpreting nature. From physics to biology or economy, every complex phenomenon can be seen as the result of many little components, either molecules, birds or companies which, by interacting and competing with each other, give rise to a global behaviour. Connecting the simple interactions between the individual components to the resulting global behaviour of the system is the core of the understanding of these phenomena.

As humans, we are just the result of a collective behaviour and our components are our cells. Typically, our cells behave cooperatively, for the benefit of the organism. Sometimes, however, some cells start to reproduce and move faster than others which, eventually, might develop into a malign cancer and threaten the entire organism's life. Understanding why this happens and, more importantly, how we can stop such malign behaviour is without any doubt one of the most important scientific challenges which humanity is facing in this century.

With my research, I aim to gain a better understanding of aggressive cancers, such as melanoma, by applying mathematical models of collective behaviour to melanocytes, the cells of human skin. By working in direct contact with experimental biologists, we are able to produce and test hypotheses on the causes of the skin cancer and to calibrate an optimal drug treatment which maximises the effectiveness of a given therapy.

The Smith Institute, enabled by the generous sponsorship of our leading corporate partners, ran the TakeAIM competition in 2019 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition was open to undergraduate and postgraduate students working in the mathematical sciences. First prize was £1,000 of Apple or Amazon vouchers, with second prize winners receiving £200 and 8 runners-up receiving £25 in their choice vouchers.

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