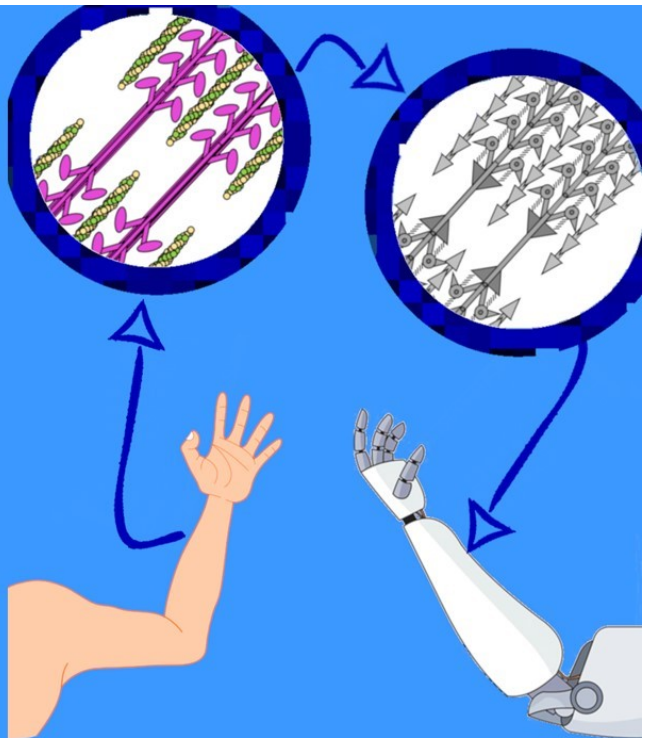
Taking inspiration from nature's smallest machines to inspire better robotics



TakeAIM Runner-up 2020:

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How do animals perform such a variety of complicated motions so well, when our robots are so inflexible? If you asked most people this they may say it's something to do with the brain, and this is certainly part of the answer, but brainless organisms can achieve similar movements! Indeed, even our brain isn't powerful enough to control every process happening within us – a vast amount of simple control must be passed off to tiny 'molecular motors', the basis for all our movement.

There are hundreds of thousands of independent molecular motor units in a single muscle cell! Like rowers in a boat they work together to allow us to move and adapt, making decisions with little to no input from the brain. Instead, they form a mechanical computer where simple computations are controlled by the shape and organisation of these tiny motors.

Our research seeks to leverage the inherent intelligence of molecular motors. We're taking inspiration from nature and modelling parallels of these molecular machines at a tangible scale. We intend to demonstrate that building simple control into the body of a robot will lead to a smarter, more efficient and intelligent generation of machines. The inbuilt feedback and independence of these new machines would allow them to work more adaptably with less computer input. These can then pave the way for better prosthesis, versatile and dextrous industry fabrication or even modular building blocks for extraordinary machines of scale and complexity only before seen in science fiction!

The Smith Institute, enabled by the generous sponsorship of our leading corporate partners, ran the TakeAIM competition in 2020 to make visible the crucial role that mathematics will increasingly play in all aspects of our lives. The competition, also celebrating it's 10th anniversary in 2020, was open to undergraduate and postgraduate students working in the mathematical sciences. First prize was £1,000, with three second prize winners receiving £400.