What would you like to discover and why?

What is discovery? The 20th century French author Marcel Proust said that, "the real voyage of discovery consists not in discovering new landscapes, but in having new eyes." Discovery, then, does not always require the development of a new scientific field, but rather a fresh perspective on what is already known.

I shall begin, as many things do, with crude oil. That unshapely mess that comes out of the sea bed or the ground in some far off place, is a commodity unrivalled in its use, detrimental or not. From the fuel used in cars, to the cosmetics that line pharmacy shelves, its impact is seen everywhere. While it has vast applications in myriad places, its true potential is somewhat untapped. It cannot be denied that the burning of fossil fuels is a wasteful and harmful process - there are thousands of scientists and engineers working on cleaner sources of energy - and reliance on fossil fuels will be the downfall of us all, but this is due in part to *how* crude oil is used. Before I continue, I should discuss what constitutes crude oil.

Crude oil consists mainly of a mixture of hydrocarbons, that is to say, chemical compounds containing atoms of carbon and hydrogen only. While many of these hydrocarbons are very useful in a number of ways, one particular type of hydrocarbon stands out as one that has so much more to offer. These are alkanes. For the most part, alkanes are simply burned as fuel, but some do find use as solvents in a number of processes. What they lack is the ability to be changed into something more useful. Alkenes, for example, are closely related to alkanes, except they have a carbon-carbon double bond, which is an extremely useful portion of these molecules. This double bond can lay the foundations for wonderful chemistry, and allows chemists to introduce new functionality to these hydrocarbons. Alkanes, on the other hand, do not possess a carbon-carbon double bond - they have only carbon-carbon and carbon-hydrogen single bonds. A carbon-hydrogen bond is strong, and therefore alkanes are resistant to changes in their chemical structure meaning that there are very few controllable and synthetically useful reactions of alkanes. What I would like to discover is a cheap, reliable and environmentally mindful method of CH bond activation. In essence, this means that alkanes could be converted into many useful compounds, in the same way that alkenes can. Drawing attention back to the words of Marcel Proust, this type of chemistry would not be a new landscape - enzymes in nature do this process perfectly well - so it is new eyes that scientists need. I have discussed *what* I would like to discover, now for the why.

Perhaps the most obvious reason is that this discovery would leave a lasting impression on the face of chemistry. Synthetic chemists devise routes to target molecules such as medicines and agrochemicals, beginning with a starting material. Many of these starting materials come from natural resources, and introducing the entire series of alkanes to this repertoire would have a powerful influence on how synthetic chemistry operates. The number of different possible alkanes is incalculable, and as a result the arsenal of starting materials available to the chemist would exponentially increase. It would introduce new techniques for synthesising medicines and other products, provide greener methods for the use of fossil fuels, mitigate the environmental consequences of combustion of alkanes, and also help scientists gain a deeper understanding of the action of enzymes in nature. Scientists have been chasing this discovery for over a century, and while progress has been made, there is yet to be an effective methodology for carrying out these processes in a laboratory.

My second reason for wanting to make this discovery is that I often doubt myself, and wonder if I am actually good enough to be a chemist for the rest of my life. I read about famous scientists, see my lecturers every day, and can't help but worry that I will struggle to approach that level of expertise. Making progress on a breakthrough like this would stifle my doubts and cement my confidence as a chemist.

The final, admittedly selfish, reason is that I want to be remembered. I want to leave a legacy. In the same way that scientists today build upon the work of their predecessors, I want the generations of future scientists to build upon mine. After I am long gone, in some distant laboratory, they will use this discovery to further their own research, and I will live on.