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January 28, 2014

The Selection Committee
Undergraduate Research Opportunity 2014
Institute for Quantum Computing
University of Waterloo, Canada

Sir/Ma'am,

My task here, is to honestly tell you about me and my motivation, to assist you in the selection of the right candidate.

1. Outlook to life

I try to analyse everything. I try to think about what I should or shouldn't do. I think if religion is required for this purpose or not. What is it to do the right thing. Why be moral. And they all become relevant to this very process of application. If my objective were simply to get through, it would be in my interest to not help my colleagues with the application. Instead I put in my best effort to help (even pursue) every eligible person I knew. Why, for I sincerely believe that the best amongst us should get to go, for that is the right thing to do. I've felt a little lonely with this school of thought. Then I was introduced to the philosopher Immanuel Kant and he made it logically consistent to say that to be free, is to be moral. He went on to say that being moral does not guarantee happiness, just guarantees you deserve it.¹ At this point, I buy it.

2. Goal for the Summer

I am focussed. Quantum Computing, revolutionary as it is, stands at the bleeding edge of physics, mathematics and engineering, the fields closest to my heart. I am interested in looking at the theoretical and practical difficulties of building such a device, specifically with the problems of de-coherence and memory cloning. At this stage I don't know enough, however I am actively learning all the physics necessary, with as much depth as I can, so that my tools are sharp enough to attack the problem when its project time.

I am inspired. I'll write here whatever comes to my mind, as an answer to the question of what is it about science that really interests me, my real passion. I could start by stating some of the things I find extremely fascinating and yes, without too much surprise, we have relativity (special). This is to say that not only is the formalism, as given in Landau's

¹Groundwork of the Metaphysics, Immanuel Kant

Classical theory of fields, astounding, the thought process, the journey, the tiny radical change that brought the theory into existence to stand up to every experimental test is remarkable. How Einstein was able to realize the inherent bias of our Newtonian experience, and was able to follow it to its root, simultaneity, is proof of the fact that true progress in the field of physics has often hinged on not formalism, but the astute observation of experimental facts and development of a consistent insight, which then is stated with the language of mathematical precision. Why I started with relativity was because with the introduction of quantum mechanics, one can see the phenomenon of entanglement. The apparent instantaneous interaction regardless of the distance between the entangled parts, without violating the postulates of relativity, makes studying nature, one of the most fascinating activity a human could participate in. That said, even in relativity, the concept of existence of world lines themselves, was found to have a classical bias! This is one of the radical change in our understanding, upon which quantum mechanics is built. And this is not special to developments in modern physics. Maxwell's formulation that connected optics experiments, which practically have nothing in common with wires and magnets, was again an example of this.

I believe. I thus find it reasonable to believe that at any given point of time, there are always new discoveries, waiting to be unravelled. But let's face it. I am a student and I don't know enough. However I will always have more to learn, thereby will always be a student. Upon this realization I have put my faith in the possibility that I too will innovate. I have, not surprisingly, the popular final goal of creating a usable quantum computer. This is the obvious motivation for my special interest in IQC; it is completely focussed on my own area of interest. Further, IQC consists of multi-cultural, multi-specialization teams with members that are passionately curious, diligent, skilled and inspired. Being with a set of such people will be of unparalleled importance in development of fundamental understanding and creation of an intuition for mysterious world of quantum objects. Witnessing state of the art experiments, and participating in discussions with eminent scientists who probably know more about quantum computation than anyone else today, would be an experience I would cherish all my life. Brimming with innovation, IQC is the dream place for anyone aspiring to make a contribution in this field. And I believe I can.

3. My weaknesses

I have a messy memory. I won't say I can't remember things, it's just that I can't choose what to remember. I forget names, numbers, passwords and even equations, but I tend to remember people, actions (mine and others) and concepts, to enumerate some. I can't restrict to syllabus. Then there are times I am not able to finish the syllabus; get stuck at learning a concept in reasonable depth. I'm bad with numbers. Doesn't imply I am bad at Mathematics; I'm bad at a part of arithmetic. I can't score. With these, I have very rarely been able to score as much as I should.

Further, it's mostly because if there's an interesting problem I can't solve, it swallows all my time. I need regular rest. Working obsessively for too long renders me useless for a short duration. Vacations help. I work on alternate problems in this time, else I get bored. I'm irrational. I have some beliefs I can't rationally justify, eg. I am a Vegetarian except eggs.²

4. My strengths

I work hard. I didn't acquire this, was just capable of it. I have worked hard despite continuous failures at numerous occasions and have eventually succeeded. I find it hard to leave problems unsolved. I am sincere. This helps me do everything simultaneously as close to the way I like, as possible. I am critical. I tend to analyse and accept only when I think there's nothing wrong. Useful in science, not so much socially. I am decisive. I make choices and stick to them. I am hyper organized. It is more of a requirement as I can't choose what to remember. I have a strong will. I am almost always able to do what I want to, even I don't feel like. Eg. Eating healthy food. I am a geek. I am good with computers.³

To conclude, I would thank you for your time and hope that the best⁴ candidate is selected.

Sincerely,

Atul Singh Arora

²However, I ensure that, no intention thus produced, is morally incorrect.

³Look at my CV for supporting evidence

⁴'best', however you define it