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1 Why Atul?

1.1 Interests

I am interested primarily in theoretical physics. Having learnt about Quantum Field Theory, I have become interested in unification and quantum gravity¹. More recently I have become interested in Quantum Optics, both its theoretical and practical aspects. Other than the fascination with light (and its quanta, the photon), it seems particularly attractive because of its connection with apparently diverse topics such as Quantum Field Theory, fundamentals of Quantum Mechanics and Quantum Computation & Information all of which I have had the privilege of studying in some detail and find interesting in themselves. I am especially interested in Quantum Computation itself. Building a scalable Quantum Computer being the obvious most interesting experimental problem. The more specific area of Quantum Simulation had also been a source of fascination (and sink of effort).

1.2 Training

I've had courses directly relevant here, including Quantum Computation and Information, Quantum Field Theory, Quantum Principles and Quantum Optics, Radiative Effects and Renormalization Group in Relativistic Quantum Field Theory etc.²

I'd even spent a summer exploring Quantum Simulations, together with my colleague which was concluded with verification by an explicit simulation, a method to simulate Schrödinger's equation with harmonic potential (as was described by a paper), and having independently thought of a way of simulating mixed states, exploiting the superposition principle. Having said that, I'd mention that am not interested in spending too much time writing simulations and doing numerical analysis viz. I prefer to solve problems analytically.

Further, I also have laboratory experience in electronics/instrumentation and condensed matter.

2 Why USEQIP?

IQC has rapidly made a place for itself in the list of elite institutes by its quality of work. This programme will give me an opportunity to learn the cutting edge developments in the field, from the very people who've contributed in their creation. The ultimate aim is to gain knowledge and contribute to its expansion, and IQC's academic environment will catalyze the process.

3 Summer Research Position

I don't have a specific project in mind, but I'd like to work on a topic related to foundations of quantum mechanics. A possible problem is that of quantum measurement and how it's dealt with in the context of fields, or more specifically quantum optics with annihilation operators.

I am confident that given an opportunity, I'd be able to make progress in solving the problem I decide to explore and contribute constructively to the research being performed by the group I'm chosen to work with. Working with some of the leading groups of the world at IQC would be a valuable experience which would help me pursue my goals beyond the summer.

¹even though I haven't had formal courses on the latter two

²look at the transcript for performance and other details