MSc in Mathematical and Theoretical Physics — University of Oxford

I would like to undertake a Master of Science in Mathematical and Theoretical Physics, as I am very dedicated to pursuing a research-related career in this field. This is why I have chosen to go to the University of Oxford, not only for its well established academic prestige but also for its unique postgraduate programme that combines the most up to date theoretical physics with its mathematical foundations. The opportunity to read among a wide variety of subjects and to follow a specific pathway that suits my research interests is what excites me the most about this course.

My interest in theoretical physics and applied mathematics began during my double degree program at the École Centrale Marseille, in France. Although I had already studied classical mechanics, thermodynamics and electromagnetism in Brazil, at the University of São Paulo, these courses were more oriented towards their practical applications to engineering, with many laboratory sessions and experimental activities. The French curriculum, on the other hand, had a greater mathematical rigor and a more in-depth study of physical concepts. Many exchange students did not adapt to the theoretical approach of the classes, but I was enthusiastic about understanding the mathematical tools and physical systems in more detail (TODO: remove?). There I was able to learn complex analysis, continuum mechanics and quantum mechanics, for example, which will be fundamental to the degree I am applying for.

Most of these subjects were very challenging, not only because they were graded on oral presentations, unlike in Brazil, but also because some of their prerequisites were not met by exchange students. One particular demanding course — "Molecular Structures and Properties" — motivated some of the Brazilians and me to create a study group in order to catch up with the rest of the class. We reviewed the week's lessons, rehearsed for the oral assignments and discussed advanced exercises, which were kept in a shared folder along with other subjects. These activities later expanded to all exchange students and then to the rest of the school, and some of my lecture notes are still being used nowadays, over six years after they were taken. In the end, I was able to get one of the best grades in the class while helping others pass the exam.

Being in contact with more advanced physics topics sparked my curiosity to go further on what was being taught in class. It all started with the book "QED: The Strange Theory of Light and Matter" by Richard Feynman, which opened my eyes to other counterintuitive behaviors of subatomic interactions. While being a great introduction to the field, the popular science writing did not fully satisfy my appetite for a thorough understanding of small particles. This led me to the online textbook "Quantum Mechanics for Engineers", from the Florida State University, for an extensive and self-contained explanation of quantum physics. Later, I started studying the "Quantum Computation and Quantum Information Theory" course from the Carnegie Mellon University, since I wanted to have a better comprehension of quantum computers. More recently, following my desire to expand my knowledge about the cosmos, I have read the "Astrophysics for People in a Hurry" book from Neil deGrasse Tyson, an educational text that presents some of the concepts of astrophysics in simple terms.

In order to succeed at this Oxford master course, I believe that, besides my motivation, independence and resilience are required as well. This is where my work experience helps me the most. When I joined a technology startup as a software engineering intern, I had to understand the system's architecture without much support from the small team. Because of my outstanding performance, I was invited by the chief executive officer to co-found a big data company in the development of an analytics database. In the early days of the business, when our only client was threatening to leave the platform, we spent two months working more than twelve hours a day non-stop, including weekends and holidays, in order to deliver all requested features. This dedication was essential for maintaining the client, and demonstrates

that I can face any amount of stress to achieve my goals.

Recently I have left my position as tech lead of the organization in order to pursue a career in science. My desire to understand the fundamental laws of the universe outgrew my aptitude for programming, and after reviewing that all my free time activities were focused in expanding this passion, it was a straightforward decision to join the Mathematical and Theoretical Physics master's degree. Since I wish to get a more broader comprehension of nature, I intend to choose the Generalist Theoretical Physicist pathway. I am particularly curious about general relativity and quantum field theory, as I believe these are both groundbreaking theories that will follow up on my educational background and reading interest.

Why take this course

Career goals and future

1/ Intention (I would like to study XYZ) + why I decided to apply to this specific university. 2/ What sparked my interest (quantum) + education (ECM, USP) + how it relates - absorb ideas 3/ commitment to subject beyond degree 4/ experience and how it relates to application (independence/leadership revmob, endurance/innovation beluga) - sustain/reasoning 5/ Purpose for doing course (quantum computing = future) - intended pathway, specific areas of interest, specialization 5/ Career goals? What will be used from this course, how does it help? Future

1. Intro: Intention (I would like to study XYZ), why I decided to do a master's (motivations for applying). What I have done until now (relevant experience and education), 2. Motivation + understanding for the area of study 3. Commitment to the subject beyond requirements of the degree course 4. Capacity for sustained and intense work + reasoning ability 5. Ability to absorb abstract ideas and at a rapid pace 6. Intended pathway through the programme 7. Specific Areas of interest & intention to specialise in 8. Conclusion

Why are you applying? / want to join this univ How your studies/school link to what you are applying to Wider reading -> outside curriculum related to degree Other things / support -> trips, reading, museum, etc Hobbies, interests

What degree What first authors attracted you to the subject? Topics you like Schools/subjects contribute Career in mind

You know what you want to study (love subject, passionate, what inspires you) Make everything relevant (I love academia, they don't care about work experience, how xp makes you a good student, no general work xp), evaluate things Intro - unique thing about yourself, personal, powerful, passion and relate to subject, better than any other candidate Intro, book read, talk about subjects (A level), degree, work xp (1 par) linked to subject. Specific examples (of how subjet/xp help or is important to degree), give quotes, chapters, names, authors, researches, ... Reading (mention text read, actually read) Conclusion - what to do in the future, what want to study specifically Redraft and redraft and redraft, get many people to read it Question every single sentence and paragraph – what does it mean?

1. Why study that subject in that university, 2. Academic achievements, 3. Extracurricular achievements Passionate about the subject Highlight academic achievements Extracurricular: Leadership, determination. Keep brief (admissions $\rightarrow$ academic)

Hardworking, ambitious / creative open-minded Tell your personal story, moments where you really

wanted to learn about it. Questions you want to answer, make statement personal to you Communicate intellectual property, how teachable you are, when you don't know the answer you are willing to ask/learn, hungry for knowledge

80% academic, interests, achievements, relevant extracurricular, 20% unrelated extracurricular Discard information not needed

Evidence of achievements to support, richness, details, truthful, honest, knowledge of subject, promote yourself, NO: negativity, yourself/teacher, tutor, avoid franchise, not cliché, not too abstract quoting favorite lines of literature Really positive doc, emphasis good applicant

Person really interested in course, what they have done in their lives, where they want to go in their studies Impress passion for subject, care for personal statement, skills for being a good student Be specific, tell about you, not general statement Teamwork, commitment (long period of time), voluntary work (qualities), how they thought the subject would be Start early! Particular interest in a subject, evidence that. Not just list experiences

Why do you want to study this course? Why have you chosen this particular university? What initially sparked your interest in the area? (where it first developed) What experiences do you have? (first or second hand) - studies / articles What is your overall purpose for doing this course? (quantum comp = future?) What skills are required, and do you have them? (previous experiences) - eg resilience, patience, ... What specific techniques or specialized skills do you have? - eg techniques What you will get out of this course? (purpose, how this course will help you in the other areas you want to improve on) What are your future career goals, and how will this course help?

State your intention right at the start (I would like to study X at Y because I'm interested in developing the Z skill) Adopt the 'hourglass' structure (start generally, narrow in the middle with specifics, expand out again about interest/ in the field and) Be sure to 'talk up' the institute you're applying for (facilities, renowned for department) - no generic things State what you have learned from your experiences Don't overuse 'passion', 'enthusiastic', or 'interested' Don't sound like a 'know it all' Be as authentic and as genuine as you can (no cliché, overused)