[redacted]

I am pursuing graduate education in chemical engineering because I want to work in a field that directly impacts society. I value practicality over abstraction, and engineering is ideal because it applies the concepts of math and science to real-world problems. In addition, I crave an immersive and focused academic experience that builds on my rewarding undergraduate career. A PhD program will allow me to pursue my research interests to a much greater depth while also expanding my future career opportunities. Furthermore, I hope to continue improving the teaching ability I have already developed in my past extensive tutoring and current biochemistry preceptorship. Finally, joining a community of other like-minded individuals will be a valuable chance for collaboration and personal growth.

Introduces theme of practicality that later recurs

Brief discussion of career goals and rationale for pursuing a PhD. Could be strengthened by a more concrete projected career path.

While I possess the passion for math and physical science that typically characterizes engineering students, I also maintain substantive interests in economics, biology, history, and public policy. My undergraduate history reflects this, as I have pursued degrees in chemical engineering and economics as well as minors in mathematics and biochemistry. The choice among these seemingly disparate fields was daunting until I discovered a common link.

Highlights atypical experience and perspective

In particular, each is involved in the analysis of complex adaptive systems. The area of economics I find most compelling is macroeconomic theory. Macroeconomics is concerned with how governmental economic policies impact the actions of individual market actors and thus the overall state of the economy. As such, it studies a complex system with many moving parts and feedback mechanisms. My interest in biochemistry is very similar, but stronger because the results of system analysis are more objective and practical. The metabolism of an organism depends on the flux patterns within different constituent pathways. The macroscopic outcome is influenced by the interconnected and tightly-controlled mechanisms of gene regulation, signaling, and protein folding that also comprise a complex system. Mathematics, principally differential equations and statistics, is important for characterizing these types of systems.

Brings together unified research vision from broad set of disparate interests

Follows up on theme from opening paragraph

I feel that chemical engineering, with its emergent focus on biotechnology and metabolic engineering, provides the most effective platform for continuing my education. The tools it uses, such as kinetics, thermodynamics, transport phenomena, and mathematical modeling, are directly applicable to the complex biochemical systems I am interested in. In addition, engineering maintains a focus on practical applications, such as enhancing the efficiency of biofuel and pharmaceutical production methods. I am applying to your institution in particular because MIT has a critical mass of this variety of biochemical engineering research, represented in the labs of

Specific research interests, tied back to ChemE focus

Ties briefly to specific research and labs at MIT.

[redacted]

[redacted]. My background in economics and experience in industry also serve to provide me with an appreciation for the limitations and hurdles that new technologies must overcome to be viable on a large scale.

Follows up on value of non-ChemE experience to future work

While my research and internship experiences have largely been outside my proposed field of study, they demonstrate my work ethic, intellectual curiosity, communication skills, and capacity for both independent and team work. The [redacted] program I participated in at the [redacted] during the summer between my freshman and sophomore years was my first real exposure to academia. There, I investigated the effectiveness of doped titania films for the photocatalytic degradation of herbicide contaminants in water supplies. I acquired familiarity with laboratory techniques, research methods, and technical writing. I am currently involved in a publication effort based on this work, which we intend to submit to [redacted].

Effective framing of broad background outside of proposed area of future study

Brief explanation of research focus

Practical skills and reference to publication

My research experience in economic fields is also applicable. I spent approximately six months acquiring, merging, and characterizing electricity generation data in the [redacted] to support a larger effort to understand the industry marginal cost curve. During this time, I taught myself to use the statistical software STATA, effectively communicated my assumptions and methodology, and applied chemical engineering principles to fill in missing estimates for nitrogen and sulfur emissions in the data sets. My [redacted] work on state finance responses to the Great Depression and New Deal programs has further developed my independent research capacity and solidified my understanding of econometric regression analysis.

Specific actions to support larger project

Transition from academic research experience to industry experience

The industry experience I have from two summer internships with [redacted] also shows my ability to adapt to new situations and effectively manage demanding learning curves to make useful contributions within a short timeframe. These experiences were also valuable in understanding the distinction between economics and business. In my first summer with the [redacted] division, I learned to calculate economic vectors, evaluate fuel oil blending, perform numeric diffusion analysis, use process simulation software, and apply VBA to mechanize Microsoft Excel spreadsheet optimization operations with minimal guidance. I was able to evaluate a proposed reaction process change and show that, even using generous assumptions,

Specific actions, demonstrates initiative

[redacted]

the proposal was not economically justified because little reaction conversion benefit would be achieved. In my second summer, I joined the [redacted] department to work on harmonizing cash flow analysis assumptions across the company. Because my economics curriculum did not include finance, I acquired all my background in cash flow analysis in the first few weeks of my internship, exceeding my supervisor's expectations. I successfully worked with many experts in different divisions to understand the current areas of misalignment and prepared recommendations for how the harmonization effort should be framed in the future.

Supports reference in topic sentence to learning new things quickly

Highlights coordination role in team

Finally, my extracurricular activities support my leadership ability, attention to detail, and responsibility. I have been a part of the [redacted] for the past two years. My particular role is [redacted], which means I am in charge of planning the student-run engineering career fair we sponsor each year during [redacted]. Fulfilling my duties requires superior organization, prompt and professional communications with employer representatives, and a strong understanding of the policies and procedures of the various on- and off-campus organizations whose services are needed for the event. Apart from the obvious benefits the career fair provides students, it also serves as [redacted] largest fundraising event. All proceeds support student engineering organizations in their outreach, project, and professional development activities.

Transition to extracurricular experience.

Demonstrates communication, organization, and management skills

Shows impact of role

My leadership experience in [redacted], has also been extensive. As secretary last year, I had the responsibility of managing meeting minutes and club documents as well as maintaining records on over fifty active members for internal and national reporting purposes. As executive vice president this year, I manage the listserv and organize industry representative visits as well as [redacted] sessions, which provide students with formal training and practice to develop effective people and presentation skills. As such, I have expanded the role of vice president beyond what it has been in previous years.

Specifies and quantifies organization tasks

Highlights new contribution to group

I believe that a graduate chemical engineering program is the best choice for me to achieve my educational and personal goals. I possess the analytical abilities, communication skills, tenacious work ethic, and attention to detail that are essential for success in this field. Professors, graduate students, and industry mentors who know me well and whose judgment I trust strongly support my decision to proceed. As such, I respectfully request your consideration as you select next year's entering class.