•This SOP is an AI generated conglomerate of 10 SOPs I wrote myself for PhD applications. I do not want to do a PhD but it was a good option at the time I applied.

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I am applying to PhD programs in bioengineering to become the kind of engineer who can design and deploy genetic tools and delivery systems at scale. I'm interested in making biology more programmable: engineering organisms and platforms that generate cheaper, richer data, and using that information to build better interventions. In practice that means working on both sides of the stack—improving editors, delivery, and readouts, and using those tools to tackle specific therapeutic, agricultural, and industrial problems.

My path into this field did not start in a classroom. I began college during high school for the intellectual challenge, but after my first post-high-school semester I dropped out to earn money and invest in companies developing CRISPR-based therapies. On my 18th birthday, when I was first legally allowed to buy stocks, I invested in CRISPR Therapeutics, which has since cured sickle cell disease. That early bet reflects how seriously I took genetic engineering long before I had formal training, and it also explains my weak early transcript in civil engineering. *Berkeley SOP*

For several years I worked at my family's company, J.D.S., as a field service engineer on complex mechanical, electrical, and hydraulic systems—MRI and PET/CT systems, heavy industrial machinery, and large hydraulic drives. The problems I was tasked with solving were usually invisible. I had to reconstruct how a system was supposed to function, design tests, interpret subtle signals, and converge on a fault under time pressure and financial stress. Often we were close to bankruptcy, and there was more work than people, so the company had to push us all to solve problems we never had before. That environment forced me to build a disciplined, first-principles problem-solving process rather than rely on checklists. *U Penn Personal Statement*

One of the hardest recurring challenges was fully disassembling and rebuilding hydraulic pumps and valve banks with hundreds to thousands of parts and no reliable manual. To avoid catastrophic failures on reassembly, I created my own documentation system: marking parts, taking photographs, counting turns on critical threaded components, and effectively writing a bespoke manual as I disassembled each unit. *Yale University SOP*

That experience taught me how to systematically track complexity, which maps well onto molecular biology where most of the system is also hidden from direct view. At J.D.S. I eventually led a team refurbishing 40-ton equipment, where sequencing tasks, prioritizing work to reduce downtime, and enforcing safety around high-force hydraulics and high-RPM components were part of daily operations. *Rice SOP*

While working full time, I kept coming back to biology and genetic engineering in my spare time. Reading, following the emergence of base editing, prime editing, and CRISPRa/i, and watching toolkits evolve convinced me that biology was undergoing the same kind of shift that software went through when programming became cheap and composable. Inspired by that trajectory, I decided that staying in heavy equipment was a suboptimal use of my time. I returned to university with a clear goal: become a genetic engineer. I switched into Biotechnology, where I have maintained a 4.0 GPA, in contrast to my earlier performance in civil engineering. *Case Statement of Purpose*

To test whether I actually liked and could handle lab work, I joined Dr. Soumitra Basu's biochemistry lab. We studied the role of RNA oxidation in neurodegenerative disease, showing that oxidation of transcripts for electron transport chain subunits reduces their cognate proteins and disrupts the ETC. *Rice SOP*

In that environment I learned and practiced core molecular biology techniques and realized that I genuinely enjoy the focus and precision required to execute protocols and generate robust data. It also served as a gut check: I could see myself doing this kind of work for years.

Currently I work at Trailhead Biosystems, a startup developing differentiation protocols for hiPSCs. On the MSAT team, I adapt adherent protocols to suspension, run hiPSC culture in both environments, handle QC, and perform molecular characterization to support differentiation method R&D. *Berkeley SOP*

The mentality I developed at J.D.S.—owning problems end-to-end, debugging under constraints, and being comfortable with incomplete information—translated directly. A small example is a change I introduced to our RT-qPCR workflow: by switching primer master-mix preparation from single tubes to 8-well strips, I enabled consistent ClipTip multichannel use across eight rows at a time, which cut pipetting time and reduced error risk. *Yale University SOP*

I gravitate toward these small but compounding process improvements.

My research interests sit at the interface of tool building and application. One strand is "user-friendly" research platforms: engineering model systems that generate cheaper, richer datasets and are easier to manipulate. I am interested in engineering organisms with synthetic circuits that can be turned into editing platforms on demand—for example, circuits that express Cas9, base editors, or prime editors under defined conditions, so that in vivo editing reduces to delivering guide RNAs or simple payloads. *Berkeley SOP*

I have also thought about adding synthetic docking sites or receptors to the cell surface so that gRNAs or other payloads can be targeted and engulfed efficiently.

A second strand is delivery and spatial control. One idea I have explored conceptually is a gene therapy design where a treated cell not only fixes its own defect but also becomes a vector, propagating the therapy laterally to neighboring cells. This could enable tissue- or organ-wide editing from a much smaller initial dose. *Rice SOP*

I am also interested in using synthetic receptors or barcodes unique to each cell type to route payloads with high specificity, effectively turning the organism into a programmable network of addressable nodes.

A third area is measurement and characterization. Having watched the time, money, and complexity involved in high-dimensional QC and molecular characterization, I am curious about building cheaper in situ readouts—for example, adding reporter peptides or proteins to key genes so that differentiation state or pathway activity can be assayed more directly, or engineering iPSCs to respond to cheaper, more stable external signals by redesigning extracellular regions of key transducers. *MIT Proposal of Graduate Studies*

These ideas are still high-level, but they reflect how I like to think: designing circuits and platforms that reduce marginal cost and increase controllability, rather than optimizing one-off experiments.

I am pursuing a PhD because I want to formalize and deepen this way of thinking with rigorous training. I want to learn how to frame questions in a way that makes them experimentally tractable, design and interpret experiments with the right controls, and contribute to toolsets that other groups can build on. My background before returning to school forced me to become comfortable owning high-stakes technical problems and learning new systems from first principles under pressure. My academic and industry work has given me a foundation in molecular biology and cell culture and confirmed that I like the day-to-day reality of lab work, not just the big ideas. A PhD in bioengineering is, for me, the most direct way to turn those experiences and interests into the capability to build and deploy genetic tools that matter.