Scientific publishing lies at the heart of academic progress. Yet today, the very knowledge base upon which new discoveries depend is under strain from widespread questionable research practices (QRPs) and systemic flaws in the academic publishing ecosystem. Over the past decade, the number of annual retractions has risen sharply, reaching a record 10,000 in 2023 alone. This trend reflects a deeper crisis in academic integrity, fueled by a combination of economic incentives, publication pressures, and the evolving role of technologies, like generative AI. Across universities and research institutions, scholars are caught in a "publish or perish" culture that rewards quantity over quality, often at the expense of ethical rigor. Simultaneously, open access publishing models that were once designed to democratize knowledge to the masses, have become increasingly commercialized. Article Processing Charges (APCs) and Transformative Agreements (TAs) have shifted financial burdens onto researchers and institutions, creating new incentives for predatory journals, paper mills, and exploitative conferences to thrive. Understanding the scope of this problem requires not only mapping the types of misconduct occurring, but also analyzing how the structure of modern academia incentivizes and perpetuates these practices. My thesis portfolio investigates this multifaceted issue through a technical capstone that classifies QRPs in a hierarchical taxonomy and an STS research paper that critically analyzes how economic and organizational incentives (especially within open access models) undermine scholarly integrity. Together, these projects aim to provide a systems-level perspective on the academic integrity crisis and propose pathways toward reform.

The technical portion of my thesis, titled Academic Integrity in Crisis: A Systematic Analysis of Questionable Research Practices, focused on developing a validated taxonomy of QRPs to support awareness, detection, and institutional reform. Our team conducted an extensive literature review and interviewed subject matter experts in scholarly communication, publishing, and library sciences. We identified and classified 81 QRPs across two primary levels, individual and organizational, further grouped by categories such as peer review manipulation, citation gaming, research manipulation, predatory publishing, and conference misconduct. The taxonomy was validated through expert feedback,

case studies, and statistical analysis using publication data. We conducted exploratory analyses, including time series analysis on publishing trends and Welch's t-tests to examine post-AI publication growth, (finding no statistically significant anomalies) suggesting deeper, persistent structural causes. We also examined detection technologies such as Retraction Watch, Papermill Alarm, and CrossRef to assess current efforts to identify QRPs. Ultimately, the taxonomy revealed how institutional incentives, rather than isolated bad actors, are often responsible for perpetuating unethical research behaviors. The findings emphasize that solving these problems requires shifting institutional priorities away from metric-based evaluations and profit-driven publication structures. The taxonomy now serves as a foundational tool for future research, education, and systems-level reform initiatives.

In parallel, my STS research paper, utilizing Actor-Network Theory, explores how various stakeholders like researchers, universities, libraries, publishers, and funding agencies co-construct the scholarly publishing system. Initially aimed at improving access to research, open access models have evolved into a highly commercialized environment where APCs and TAs dominate. These financial models have unintentionally created perverse incentives: elite institutions gain greater access and publishing power, while under-resourced universities face rising costs and limited influence. Publishers, in pursuit of revenue, often prioritize volume over quality, weakening peer review and editorial standards. Researchers, under pressure to publish frequently for tenure or funding, are increasingly vulnerable to submitting to predatory journals and participating in unethical practices. My paper explores how these dynamics are reflected in the University of California's transformative agreements with major publishers and investigates rising APC costs, including a 16.1% increase in UVA's own e-journal expenditures from 2019–2024. By analyzing both qualitative interviews and quantitative pricing data, the paper demonstrates how economic incentives misalign with the academic mission. Drawing from interviews with experts such as scholarly communication professionals and fraud detection founders, the project concludes that integrity reform must address the economic architecture of academic publishing—not just researcher behavior.

Together, these projects contribute to a more comprehensive understanding of how academic integrity is shaped by the systems, incentives, and actors that define scholarly publishing. While we met our objective of creating a validated taxonomy and framing the economic critique of APC-driven publishing, the work also exposed just how entrenched these systemic challenges are. We found that the most damaging QRPs are not simply isolated missteps but manifestations of deeper institutional pressures and power imbalances. Looking forward, I recommend further research into alternative metrics for evaluating scholarly output, deeper quantitative analysis of publication networks, and continued engagement with stakeholders such as libraries and policy makers. The next Systems Engineering team will continue our work by expanding the taxonomy, potentially creating a detection utilizing Artificial Intelligence, and evaluating intervention strategies at the institutional level.