# MASTERS
# FINAL ORAL EXAMINATION

## Monday, January 11th
## 11:00a.m. @ 223 Atanasoff

## Brian Nakayama
### Faculty Advisor: Professor Robyn Lutz

## Modeling Technologies and Methods for DNA Origami

The creation of correctly assembling DNA origami often requires several iterations wherein a researcher tries and troubleshoots an incremental design. In each iteration there exists one or more costly failures that often take immense time or materials to find. These failures occur in part due to a lack of in-depth understanding of how DNA origami self-assembles and functions. To aid researchers in developing correct DNA origami designs, this thesis describes the creation of a DNA origami failure catalog as well as models for elucidating as-of-yet only partially understood properties of DNA origami. The failure catalog helps laboratory scientists gather requirements to preempt failures in their origami designs, and helps laboratory scientists troubleshoot their experiments after the implementation of a design by querying the catalog. Use of the catalog then helps verify the properties of new macro and micro models for DNA origami introduced here. These micro and macro models open up future ways to evaluate DNA origami through a mathematically more rigorous framework. By using both captured knowledge of previous design failures and novel theoretical modeling techniques, this work seeks to reduce the gap in understanding between design and implementation of DNA origami.

## IOWA STATE UNIVERSITY
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