

HONORS

UNIVERSITY OF HAWAI'I at MĀNOA

SENIOR HONORS PROJECT HANDBOOK

THESIS AND PORTFOLIO PROJECTS

UNIVERSITY OF HAWAI'I AT MĀNOA

HONORS PROGRAM

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Welcome to your Senior Honors Project!

The culmination of your Honors experience is the Senior Honors Project, which can take the shape of an Honors Thesis or Honors Portfolio, depending on which fits your needs and the requirements of your major. The final decision must be made in consultation with your Honors Faculty Mentor. Your major may opt to require you to complete a Thesis project and your choice may be further dictated by the kind of work that is typical for people in your major. If you have not already done so you must attend a Bridge Session or advising appointment with the Director to gather more information about your Senior Honors Project process.

Choosing Your Faculty Mentor and Committee Member

Your faculty mentor and committee member(s) are crucial to your senior honors project. First, your faculty mentor approves your project proposal before you begin your capstone. During the capstone process, your mentor and committee member offer advice and support, and assess your work during capstone classes. Finally, after you submit your capstone to Honors, your mentor and committee member provide their assessment of the final project to the Honors Council.

Because each student's project is unique, Honors empowers students to select their mentor and committee member(s) according to the criteria below.

Faculty Mentor (one person)

- Can be any faculty member from your major department
- Can be faculty from another UHM department, with approval from your major department
- Invite your mentor to serve before you submit your proposal

Committee Members (at least one, but up to three people)

- Can be any faculty member from any UH department
- Can be a subject-matter expert who is not UH faculty (with no personal relationship to the student). Your faculty mentor sends Honors an email to approve
- Committee members are chosen before the last semester of senior project

Types of Projects

Research Thesis

The research thesis represents original, independent, mentored inquiry or creative work that reflects sustained effort, thoughtfulness of design and excellence in execution, and which enhances the student's area of study. It is the culmination of our Honors students' hard work, persistence, and dedication and is the capstone to their Honors education. Students work closely with a Faculty Mentor and an additional committee member over the course of their senior year to conduct research or carry out creative work as appropriate to their major, and produce a written record of their work.

Creative Theses

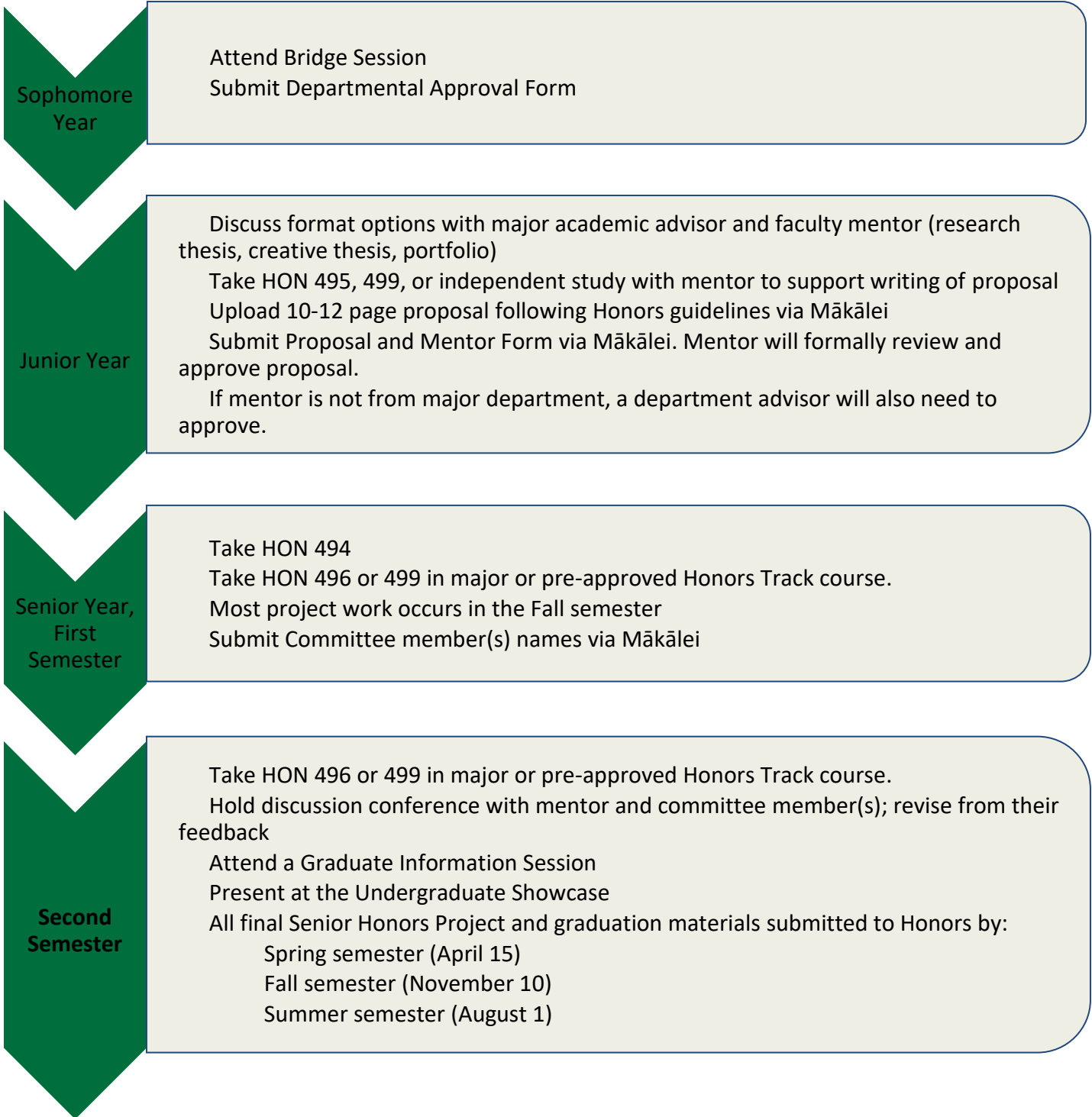
Creative theses are original, well-conceived, and well executed works of visual, music, performance, or other art works that show technical mastery of the relevant genre. They typically have two parts: the documented creative work (performance, visual art, film, screenplay, costume catalogue, etc.) and an accompanying reflection essay discussing the process and significance of the creative work.

Portfolio

An Honors portfolio is a deliberately-crafted collection of experiences, projects and research that are coherently linked and showcase sustained, creative and rigorous undergraduate work. The portfolio format provides a framework to plan, organize, synthesize and reflect on the diverse elements of unique and "outside-the-box" Honors capstone experiences.

Portfolios allow for more non-traditional research and creative work, such as design projects, community-based research, etc. to be considered for Honors. The Portfolio is best for work that is not of sustained length, but has distinct but related components making a quality whole. Through a written reflective essay, and the Portfolio as a whole, you will complete a project that is of equal quality and rigor to the research or creative thesis options.

Requirements & Timeline: Thesis



Research Thesis

Proposal Guidelines

Proposals need to be 10-12 pages (minimum) typed, double-spaced. Use the citation and formatting styles typical for your discipline.

Proposals for the Honors Thesis (Research) need to have the following components:

1. A working title that is descriptive of the work
2. A clear statement of the problem or goal of the study (e.g. the purpose of the study)
 - a. Research Questions or Hypothesis (especially for science-based projects)
3. The significance of the study (why it matters)
4. Any necessary background or definitions for understanding the topic of your study
5. A literature review that is relevant to the topic and which describes the field(s) to which the study is contributing (should be substantive and demonstrate the student's exploration of the topic)
6. Methodology/Research Design
 - a. Should include a discussion of data or evidence to be used, and how student will access or generate this data or evidence
 - b. Role of the Researcher: description of the role the student is playing in the research project (especially if it is part of Faculty Mentor's larger research project)
 - c. Documentation of student's training in the protocols for the research, as needed (e.g. methods course, draft interview protocol, surveys, certification for biohazard, animal research training, etc.)
 - d. Research Ethics Statement, if needed
 - e. Clearance from Institutional Review Board, if applicable
 - f. Timetable for the Research (from present to graduation)
 - g. Resources and Materials available to the student in order to carry out the project.

Research Thesis

Criteria and Evaluation of your Honors Project

The Senior Honors Project is assessed by a Senior Honors Project Committee consisting of the Faculty Mentor and one additional Committee Member. The student's Committee will consider in their assessment of the final project the process of its production (research, drafts, rehearsal etc.) and the final draft. The assessment is made in a written report submitted to the Honors Program.

*Please note that if a project is also part of the requirement for the student's major, such as in Global Environmental Studies and History, the project must satisfy your department before it can be considered for Honors.

Submission of a written thesis that has all of the following elements:

- A clearly stated purpose/problem statement/set of research questions
- A clearly articulated significance
 - What's at stake? So what?
- A sustained study of a topic that uses appropriate sources to explore the topic
 - Sources can include, but are not limited to, primary literary and cultural texts; archives; laboratory results; case studies; surveys; interviews
- A demonstration of the student's clear understanding and articulation of the broader context and conversations in the discipline(s) and field(s) in which project is located (the literature review)
- A solid grounding in the theoretical framework(s) that the project is using
- A clearly explained and appropriate (justified) methodology/research design
- A robust critical analysis of the subject matter (does not merely present data or describe)
- Proofread and revised for appropriate format, grammatical errors, appropriate format for the field
 - As appropriate, contains well-labeled and attributed tables and figures as supplementary material
 - Has a complete Works Cited or Bibliography included in the proper format
 - Please review the required Honors thesis format information on the Honors website
 - Recommended length (25 page minimum)
- Is of uniformly high quality throughout and clearly represents work above what is expected of a typical undergraduate in the major

Creative Thesis

Proposal Guidelines

Proposals need to be 10-12 pages (minimum) typed, double-spaced. Use the citation and formatting styles typical for your discipline.

Proposals for the Honors Thesis (Creative Work) need to have the following components:

1. A working title that is descriptive of the work
2. A clear statement of the problem or goal of the creative project
3. The significance of the project (why it matters)
4. Any necessary background or definitions for understanding the topic of your project
5. A literature review that is relevant to the topic and which describes the field(s) to which the study is contributing (should be substantive and demonstrate the student's exploration of the topic)
6. Design & Creative Process
 - a. A discussion of the student's creative plan, media, justification for this process
 - b. Role of the Student: what will the student's role be for this project?
 - c. Documentation of student's training and ability to carry out the project (coursework, past experience)
 - d. Research Ethics Statement, if needed
 - e. Clearance from Institutional Review Board, if applicable
 - f. Timetable for the Creative Work (from present to graduation)
 - g. Resources and Materials available to the student in order to carry out the project.

Creative Thesis

Criteria and Evaluation of your Honors Project

Creative theses typically have two parts: the documented creative work (performance, visual art, film, screenplay, costume catalogue, etc.) and an accompanying reflection essay discussing the process and significance of the creative work.

Submission of a documented creative work that has all of the following elements:

- Is original, well conceived and well executed (recording, script, composition, etc.)
- Shows technical mastery of the creative form/practice that is used
- Has a written component (typically 10-12 pages)
 - Discusses the purpose and significance of the project
 - What's at stake? So what?
 - Locates the creative work in a broader context of the relevant discipline(s), field(s), and/or artistic genre(s) in which project is located
 - Exhibits grounding in the background and dialogues about the project's subject matter
 - Shows a critical understanding of the process that the creative project entails
- Has been proofread and revised for appropriate format, grammatical errors, appropriate format for the field
 - As appropriate, contains well-labeled and attributed tables and figures as supplementary material
 - Has a complete Works Cited or Bibliography included in the proper format
 - Please review the required Honors thesis format information for the written portion of the creative Honors Thesis (on the Honors website)
- Is of uniformly high quality throughout and clearly represents work above what is expected of a typical undergraduate in the major.

Requirements & Timeline: Portfolio

Sophomore
Year

Attend Bridge Session
Submit Departmental Approval Form

Junior Year

Discuss with major academic advisor and faculty mentor if the Honors Portfolio is the right option
Take HON 499 to help think through and craft an Honors Portfolio proposal
Submit a 10-12 page written proposal for Honors Portfolio project following the Honors Program guidelines via Mākālei
The Honors Portfolio Proposal and Mentor Form must be initialed and signed by the faculty mentor who has agreed to oversee Honors Thesis then submitted via Mākālei

Senior Year,
First Semester

Take HON 494
Take HON 496 or 499 in major or pre-approved Honors Track course to complete the bulk of project
Submit Committee Form via Mākālei

Second
Semester

HON 496 or 499 in major pre-approved Honors Track course to write up Portfolio Statement/Reflection Essay
Graduate Information Session
Undergraduate Showcase
Discuss feedback and revisions with Committee

Submit all Portfolio and graduation materials to Honors
Spring semester (April 15)
Fall semester (November 10)
Summer semester (August 1)

Portfolio

Proposal Guidelines

Before beginning work on the Senior Honors Project, you are required to submit a written proposal that will be a blueprint for your project. You should enroll in HON 499 with the Director to craft this.

Proposals must be 10-12 pages (minimum) typed, double-spaced and use the citation and formatting styles typical for your discipline.

Proposals must also include the following components:

1. Approval from the student's home department and Faculty Mentor that the portfolio is appropriate for the student's project
2. A working title that is descriptive of the work
3. A clear statement of the goals or purpose or work of the portfolio and why the portfolio is the most appropriate form to showcase the student's work in the major
4. The significance of the portfolio (why it matters)
5. A clear description of the portfolio's component parts/artifacts, recognizing that:
 - An artifact is a piece of evidence (written, audio, visual) that represents an aspect of your portfolio. These artifacts must demonstrate how the learning in these experiences goes above and beyond the requirements for the major AND constitutes a coherent overall project
 - The artifacts must reflect student work equivalent to an Honors Thesis, including via rigor and effort
 - EXAMPLES:
 - A report or paper resulting from a UROP, ASUH or other funded project of a one-semester duration related to the student's major
 - A substantive experiential learning activity culminating in a formal presentation, published paper, policy project, etc.
 - An engineering design project that has been extended beyond course requirements;
 - Papers or projects that began in a course, but have been substantially built on and improved
 - A Senior Honors Portfolio will ideally have 3-4 thematically related artifacts
6. Any necessary background or definitions for understanding the topic of your study
7. A literature review that is relevant to the portfolio's overall theme/arc and which describes the field(s) to which the artifacts of the portfolio are contributing (should be substantive and demonstrate your exploration of the topic)
8. A description of your role:
 - Description of the role you are playing in the component parts of the portfolio
 - Documentation of your training in the protocols for the research, or the component parts of the project as needed (e.g. methods course, draft interview protocol, surveys, certification for biohazard, animal research training, etc.)
9. Research Ethics Statement, if needed
 - Clearance from Institutional Review Board, if applicable
10. Detailed Timetable for the Portfolio (from present to graduation)
11. Resources and Materials available to you to carry out the project

Portfolio

Portfolio Components

The component or artifacts included in your portfolio will vary widely according to your project and major field of study, bound by a cohesive theme. Possible inclusions may be:

- Websites
- Performance pieces
- Service-Learning, community-based research, or practicum-based projects
- Entrepreneurial activities
- Computer programs/apps
- Artwork

Statement/Reflection Essay

The Honors Council has established a minimum length requirement of a 10-12 page Portfolio Statement to complement your portfolio artifacts, exclusive of front matter, diagrams, tables, appendices and bibliography. This statement serves to tie together your components/artifacts and provides broader reflection on your undergraduate Honors experience. This statement should be formatted similar to the Honors Thesis format.

Specifically, this should include:

- evidence of solid grounding in and engagement with the relevant existing scholarship or creative work in the student's field
- evidence of a deliberate and thoughtful design of the portfolio's various components/artifacts and reflection on this
- mastery of and experiential engagement in the skills/content knowledge of a topic appropriate to the student's field of study
- discussion of the individual components and how they contribute to the portfolio's cohesion and purpose
- discussion of how the individual components build on each other to showcase your intellectual growth, creativity, etc.
- relevant scholarship and other work that illuminates the portfolio's purpose and significance
- the process of creating the portfolio, and how it deepened your knowledge of the subject
- potential future directions for the portfolio work

Presentation of Portfolio

The presentation format you select for your project may vary according to the specific contents of your projects and norms of your academic field, and will be decided after consultation with your faculty mentor and committee member. You may want your portfolio to remain available to demonstrate your work in future endeavors, such as job and graduate school applications. If you prefer and have the necessary knowledge and skills, you may design your portfolio without the use of a hosting site, or you can use one of the sites below.

- Weebly
- WordPress
- Google Sites
- ICS Portfolio hosting pages

There is no specific requirement for the layout you select beyond the inclusion of the stated Portfolio requirement pieces. Please ensure that all artifacts hosted or linked on your portfolio are accessible to the Honors Program faculty and staff as well as your faculty mentor (i.e. not password protected).

Portfolio

Criteria and Evaluation of your Portfolio Project

The Senior Honors Project is assessed by a Senior Honors Project Committee consisting of the Faculty Mentor and one additional Committee Member. The student's Committee will consider in their assessment of the final project the process of its production (research, drafts, rehearsal etc.) and the final draft. The assessment is made in a written report submitted to the Honors Program.

*Please note that if your project is also part of the requirement for your major, such as in Global Environmental Studies and History, the project must satisfy your department before it can be considered for Honors.

The Committee will evaluate the project using the following criteria and evaluation:

- Honors Portfolio Project proposal
- A 10-12 page reflection essay that clearly states the purpose and significance of the portfolio project and should be formatted similar to the Honors Thesis
 - Proofread and revised for appropriate format, grammatical errors, appropriate format for the field
 - As appropriate, contains well-labeled and attributed tables and figures as supplementary material
 - Has a complete Works Cited or Bibliography included in the proper format
- Components/artifacts that are evidence of sustained study or work on a topic, skill, or theme as determined by student and Faculty Mentor, accompanied by an introductory description
- Represents work equivalent to or exceeding the work expected in a Senior Honors Thesis
- Is of uniformly high quality throughout and clearly represents work above what is expected of a typical undergraduate in the major.

A project consisting of any or all of the following will **NOT** be awarded Honors:

- A portfolio does not get submitted
- A portfolio is submitted, but:
 - Does not have a (strong) reflection essay
 - Reflects poor or no research or creative work on the part of the student as evidenced in the essay or accompanying components/artifacts
 - Does not provide a linking thread for each of the components/artifacts
 - Is not submitted electronically
 - Is submitted electronically but Faculty Mentor/Committee Member/Honors Council do not have full access to all artifacts/components
 - Is poorly designed or incomplete (does not reflect equivalent work to a Senior Thesis)
 - Is badly written (many typographical and grammatical errors, little evidence of proofreading or revision)

Formatting and Submitting your Honors Project

Written portions of projects must be formatted accordingly:

- All pages single sided
- 1-inch margins on all sides of page
- 12-point font
- All pages double spaced (single-spaced for any block quotations)
- All pages numbered, except for special pages described below (cover page, etc.)

Please save your file as LASTNAME_FIRSTNAME_SENIORPROJECT.pdf

The format and order of pages should be as follows, as appropriate for your Thesis/Portfolio:

1. Cover page: The cover page is center aligned, no page number.
2. Acknowledgements (optional): The acknowledgments page should be paginated using lower-case Roman numerals (i, ii, iii, iv, etc.). We strongly recommend that students thank their mentor and committee member(s) individually.
3. Abstract or Précis and Keywords: A short summary of your project with a maximum 250 words. Paginated in lower-case Roman numerals. Include two to three keywords at the bottom of the page in bold.
4. Table of contents
5. List of Tables and/or Figures (optional, if used): The list must refer to correct captions/titles of figures and page numbers. Paginated in lower-case Roman numerals.
6. References / citation style: Follow the established style manual in your discipline, which may be one of the main styles (APA, Chicago, Harvard, MLA, etc.) or one appropriate to your discipline.
7. You can use chapters or sections to break up your text, as appropriate to your discipline. Students should check with their Faculty Mentor for further direction on this. Paginated 1, 2, 3, etc.

* Please see our sample templates starting on page 29 *

Graduation Info & Checklist

To successfully graduate with Honors from UH Mānoa you must:

1. Complete required coursework and make sure to complete the Graduation checklist
2. Maintain cumulative and major GPA of at least 3.2
3. Give one public oral presentation at the Undergraduate Showcase in your final semester
4. Submit your completed Senior Honors Project and other materials by the stated deadline. Ensure all files are saved and submitted in the following PDF format:
Lastname_Firstname_DocumentName, ex. Cruz_Julia_Personal_Statement.pdf
 - This includes:
 - Completed Senior Honors Project (PDF digital copy)
 - Final oral presentation document at the Fall Forum or Spring Symposium
 - Academic Curriculum Vitae (CV) (PDF digital copy)
 - Personal Statement on “My Experience in Honors” (max. 500 words) (PDF digital copy)
 - Completed online Exit Survey

All students will submit their materials via Honors Mākālei

The Senior Honors Project Award

A student’s evaluating Committee may recommend an exceptional project for submission to the Honors Council, which will determine awards for the most outstanding Honors projects in each semester cycle. These projects should represent excellent work that stands out, even among other Honors work.

- Such a project must demonstrate at least one of the following criteria at a level higher than an Honors Project and approaching master’s level work
 - Makes a significant contribution to the field or community and/or
 - Demonstrates analysis at a high/sophisticated level and/or
 - Uses innovative methodology
- In addition, the student should have demonstrated a high level of independence and initiative for the project, as determined by their Committee

Honors Candidacy Evaluation

The Honors Council reviews the complete file of each candidate for Honors. In cases where a student’s GPA falls below the 3.2 minimum and/or in cases with mixed or negative evaluations the Honors Council will convene to review for extenuating circumstances. The Council will also review exceptional projects endorsed by the Faculty Mentor/Committee to determine recipients of the Honors Project Awards.

Commencement

Once the required documents have been received students will be issued an Honors cord that may be worn at the Commencement ceremony. The names of all Honors Degree candidates will be listed in the Commencement Program and these students will be given special acknowledgement during the graduation ceremony.

Upper Division Honors Program Graduation Checklist

First half of the semester: (planning)

- Meet with Honors director to discuss & submit plan/schedule for completion
 - Copy your committee on this plan
- Register for the Spring or Fall Undergraduate Showcase
- Complete Honors graduation form (emailed by honors@hawaii.edu)
- Update & complete Mākālei account checklists as much as you are able
 - Mentor/Committee form
 - Graduating Semester, Honors Major
- Meet regularly with your mentor and committee member
- Schedule the submission of your completed first (smooth) draft with your mentor/committee (ideally, no later than March 15/October 10)
- Schedule the conference/defense/discussion of your completed draft with your mentor/committee (ideally, no later than mid March/late October)

Second half of the semester: (execution)

- Meet with Honors director to discuss progress toward completion
- Submit first complete draft on designated deadline to committee
- Hold conference/defense/discussion of first draft with committee
- Recommend also running ideas or portions of draft oral presentation during this time
- REVISE (discuss your revision schedule with committee)
 - If extension is needed, a detailed plan/calendar for extension must be approved by committee and submitted to Honors Director for consideration
- Format draft (if you haven't already) into the template required by Honors
 - Attribute all images/illustrations (do not use unless you have permission)
 - Is it 25 pages—for thesis format (not including bibliography/works cited)?
 - Proofread? Correctly formatted when saved a pdf file?
- Submit final draft to committee (ideally 3-5 days before it is due to Honors on April 15/November 10) to give them time to look over
- Submit project to Honors Mākālei by April 15/November 10 deadline
 - Upload CV/resume and personal statement, complete exit survey and Scholarspace permissions
 - Honors will solicit your committee for their evaluation of your thesis via Mākālei
- Practice oral presentation Undergraduate Showcase for Research and Creative Work
- Present at Undergraduate Showcase and Upload presentation materials via Mākālei

Pick up your Honors cords for graduation!

Think about submitting something for *Mānoa Horizons!*

Template and Sample Pages from Student Projects

Title Page

Use the standard template provided to create your project tile page. Follow this template closely.

Examples from Completed Projects

The next set of pages are examples of title pages, front matter, illustrations, and works cited pages from recent student projects.

As you can see, there is variation dependent on the student's discipline and topic. However, each student made sure to have the basic components of their project criteria highly visible, easy for the reader to find, and well organized.

The required criteria for their project have been clearly met and it is straightforward to evaluate their contributions and focus on their research strengths.

For more information on what to include in your final written work, please check the "criteria and evaluation" section for your thesis format (research, creative, portfolio) in this handbook.

Title of Thesis

A Senior Honors Project Presented to the Faculty of the
Department of [your department], University
of Hawai'i at Mānoa

In Partial Fulfillment of the Requirements
For Bachelor of [Degree] with Honors

By [your name]
[date]

Committee:
[First and last name], Mentor
[First and last name]
[First and last name]

Promoting Biodiversity in a Pinch: The Influence of a Hawaiian Coastal Refuge on Ghost Crab
(*Ocypodidae*) Size and Density on O‘ahu, Hawai‘i.

A Senior Honors Project Presented to the Faculty of the Department of Biology
University of Hawai‘i at Mānoa

In Partial Fulfillment of the Requirements
For Bachelor of Science in Marine Biology with Honors

By Jessica Tritsch
15 April 2021

Committee:
Dr. Kathleen Cole, Mentor
Patrick Nichols

Acknowledgements

I would like to thank those who have made this project possible. I am thankful to have been admitted into the internship program known as OPIHI (Our Project In Hawai'i's Intertidal). I would like to thank and extend my appreciation to my faculty mentor, Dr. Kathleen Cole. I would like to thank my committee member and course instructor, Patrick Nichols. Patrick Nichols made this project plausible with endless guidance and mentorship throughout the year. Special thanks to *Biologist*, Kaua Fraiola at the U.S. Fish and Wildlife Services who provided valuable information on James Campbell National Wildlife Refuge.

I would like to thank the University of Hawai'i's Honors Program that provided endless support over the last four years which led me to this achievement. Special thanks to my lower division advisor, Dr. Siobhán Ní Dhonacha and my upper division advisor, Dr. Vernadette Gonzalez. Both of these advisors provided encouragement and support in developing this project.

Finally, thank you to my friends and family who provided personal support throughout this research project.

Abstract

In an effort to preserve ecosystem biodiversity, marine protected areas (MPAs) are established following governmental regulations. Protected areas are based on the fundamentals of the spillover effect, leading to the areas adjacent benefiting from the conservation. To better understand the significance of the refuge, ghost crabs (genus *Ocypode*, Hawaiian name Ōhiki), which tunnel deep into the sand and leave behind burrow holes, were used as an indicator species. The goal of this research was to compare the size, abundance, and density of ghost crabs inside and outside of James Campbell National Wildlife Refuge (JCNWR) to better understand the conservation success towards increasing beach biota. First, the sandy locations along the site were mapped using a GPS, then transects were randomized both inside and outside JCNWR. Within each transect, the burrow holes were counted, and the diameters were measured to estimate body size and abundance. The total number of burrows per unit area was used to calculate population densities. The results show no significant difference in ghost crab size, abundance, or density when comparing these variables inside and outside the refuge. The results suggest the refuge may not have a significant impact on the population metrics for ghost crabs, as they are an important component to the food web that the protected shorebirds prey upon. Ultimately, the findings from this research can aid in conservation efforts at JCNWR to better protect the terrestrial crab.

Keywords: biodiversity, marine protected area (MPA), spillover effect, conservation, refuge, ghost crabs, *Ocypodidae*

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IMPACT OF SEA LEVEL RISE ON AGING POPULATION'S ACCESSIBILITY TO ESSENTIAL SERVICES IN HONOLULU, HAWAI'I

A THESIS SUBMITTED FOR PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR

UNIVERSITY OF HAWAI'I AT MĀNOA
HONORS PROGRAM

04/2022

By
Dingyi Liu

Thesis Committee:

Dr. Suwan Shen, Chairperson
Dr. Jiwnath Ghimire

For everyone who supports me on my journey. For communities in Honolulu, Hawai'i.

Example

ACKNOWLEDGEMENTS

I cannot thank Dr. Suwan Shen enough for her awesome mentoring. Dr. Shen always give me very professional advice and kind encouragement when I struggled with my work. This thesis cannot be done without her patience, kindness, supervision, and knowledge. I also thank Dr. Jiwnath Ghimire for reviewing this thesis.

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ABSTRACT

Demographic studies have shown two trends: (1) elderly population is growing as a consequence of longer life expectancy; (2) population in low elevation coastal zones will significantly increase. One of the potential risks of living in low elevation coastal zones is the projected sea level rise. As sea level rises, more and more frequent flooding can cause disruptions and damage to the roadways in coastal areas. Seniors could be especially vulnerable to such disruptions given their need for emergency services, which could also increase because of the adverse impacts climate change has on health. This study aims to investigate the impacts of sea-level rise on the aging population's accessibility to essential services and its implication for long term adaptation planning using Honolulu, Hawaii as a case study. Using Cohort Change Ratio (CCR), the study projects the elderly population in each Traffic Analysis Zones (TAZs) in future decades. Road segments and essential facilities (grocery stores, police stations, fire stations, and hospitals and clinics) at risk under different sea-level rise scenarios (1.1 feet, 2.0 feet, and 3.2 feet) are identified. Network connectivities from each TAZs to nearest essential services are analyzed. The results show that while the physical impacts on infrastructures are mild, some vulnerable communities' access to essential services will be greatly affected even under 1.1 feet sea-level rise scenarios. Especially some areas with a high projected density of the elderly population will be cut off to essential services due to transportation bottlenecks. For the rest of the population, sea level rise could significantly reduce the number of people with timely access to essential services. The results not only urge transportation network planners to take actions to make sure transportation connectivities

to vulnerable elder population at-risk are protected, but also suggest that over the long-term land use planning would be one of a key factors to adapt to climate change. These findings have broad implications for other coastal locations with similar development and growth patterns, and the methodology used could be easily adapted to be used in a variety of other metropolitan areas across the country to conduct similar vulnerability analyses to aid in adaptation planning in practice. Also, audience will learn the emergent needs of sea level rise adaptation planning.

Key words: Elderly population; Accessibility; Coastal road infrastructure; Sea level rise adaptation

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**The exocyst complex is an insulin-sensitive regulator of
amyloid precursor protein (APP) trafficking and
beta-amyloid generation in neurons**

A Senior Honors Project

Presented to the Faculty of

the Department of Anatomy, Biochemistry, and Physiology

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In Partial Fulfillment of the Requirements

For Bachelor of Science in

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ABSTRACT

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by the loss of cognitive function, language, and memory. Despite decades of AD research, there are still no effective therapies, and the pathogenic mechanisms are not fully understood. One prominent histopathological hallmark of AD is the accumulation of amyloid beta ($A\beta$) peptide plaques. Neuronal generation of the $A\beta$ peptide arises from proteolytic processing of the amyloid precursor protein (APP) by β - and γ -secretases, and regulation of APP intracellular trafficking plays a key role in the balance of amyloidogenic APP processing.

The exocyst is a highly-conserved eight-protein complex that acts as a Rab GTPase effector to guide subsets of intracellular transport vesicles to their destination for vesicle fusion. Assembly and targeting of the exocyst is controlled by a variety of protein kinases and small GTPases through mechanisms that are often cell type-specific. For example, adipocytes and muscle cells use the exocyst for dynamic exocytosis of GLUT4-containing vesicles in response to insulin signaling. We hypothesize that the exocyst plays a key regulatory role in the neuronal intracellular trafficking of APP, which if true, would reveal new potential targets for AD therapeutics.

Using a transgenic SH-SY5Y cell line that we generated to express APP containing several familial AD mutations leading to high levels of $A\beta$ production, RNAi silencing of each exocyst subunit led to dramatic decreases in sAPP and $A\beta$ secretion, with intracellular accumulation of full-length APP. In addition, we observed the same results with RNAi silencing of Exoc3L2, an uncharacterized exocyst gene homolog linked to late onset AD through genetic studies. We show in human SH-SY5Y neuroblastoma cells

differentiated into neurons, and in primary mouse hippocampal neurons, exocyst subunits were co-localized with APP on intracellular vesicles via high-resolution imaging. We confirmed these findings using proximity ligation assays (PLAs), a novel technique to measure protein-protein interactions within the cell, showing that APP and Exoc5 protein co-localized within 40nm. However, after 15 mins of insulin treatment, this APP-Exoc5 interaction was greatly reduced, while the association of Exoc5 with GLUT4 was increased. These experiments show for the first time that the exocyst plays a key role in APP trafficking and A β secretion in neurons, and this activity is directly regulated by insulin signaling.

Keywords: Alzheimer's disease, amyloid-beta, APP, exocyst, insulin signaling

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Example



Figure 2. This photograph gives a representation of the type of ghost crabs in this research that inhabit James Campbell National Wildlife Refuge. These ghost crabs (*Ocypodidae*) consist of various species and are seen in numerous locations throughout Hawaii and elsewhere. This particular photo was taken at Waimanalo, Oahu, courtesy of Keoki Stender Marine Life Photography, <https://www.marinelifephotography.com/marine/arthropods/crabs/ocypode-pallidula.html>.

The ghost crab population metrics will be compared inside and outside of the wildlife refuge, that is respectively “closed” and “open” to human traffic, for the purpose of inspecting possible disturbance effects on beach biota and the success of the protection conducted by the refuge. Furthermore, ghost crab population metrics have been measured in previous years and that data will be used to compare any changes occurring with time. Ghost crabs create burrow holes when hiding during the daytime, therefore measuring how many active burrow holes are present in a given area can lead to findings about the difference in size and density inside and outside James Campbell National Wildlife Refuge. Ghost crab density plays a role in determining human traffic impacts on other biota, for example the endangered and endemic

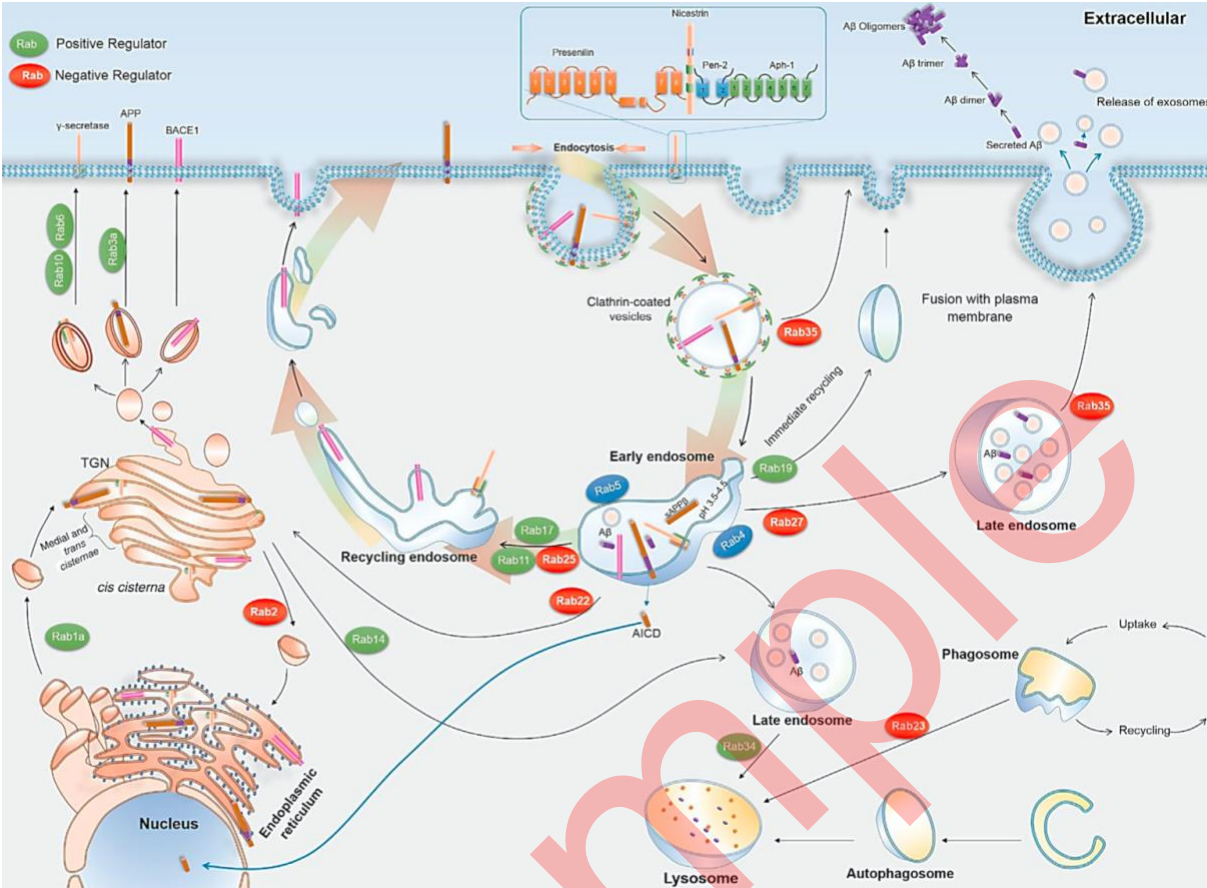


Figure 2. Regulation of APP processing by Rab GTPases. Schematic of Rab GTPases involved in trafficking of APP throughout the cell. Full length APP and its secretases are trafficked from the Trans Golgi Network (TGN) to the plasma membrane for insertion. APP may be cut by γ -secretase at the plasma membrane or be internalized and sorted into Rab5+ early endosomes where it encounters BACE1. Fragments of APP may be transported to the late endosome for degradation by lysosomes or exocytosed in various cleaved forms. BACE1 is recycled in Rab11+ recycling endosomes for reinsertion to the plasma membrane¹⁵.

involving the coordination of Rab GTPases and a variety of Rab effectors, guanine nucleotide exchange factors (GEFs) and GTPase activating proteins (GAPs)¹⁴. APP and its secretases are internalized via clathrin-mediated endocytosis and delivered to Rab5+ early endosomes¹⁶. From the early endosome, further trafficking to the recycling endosome, lysosome, or plasma membrane are coordinated by Rabs¹⁵ (Fig. 2). Numerous studies implicate defects in Rabs that regulate the endolysosomal system in AD pathology^{17–20}. In 2011, the U.S. government and National Institutes of Health set

rising by a rate of 3.3 mm per year on average (Cazenave and Llovel, 2010). Ongoing global warming will accelerate the speed of sea level rise (Nerem et al, 2018). Sea level rise adaptation empowers coastal communities to reduce the potential negative impact of sea level rise (Tol et al, 2008). In particular, transportation infrastructure is exceedingly vulnerable with even a minimal increase of sea level rise (Oawald and Treat, 2013). Studies have examined the vulnerability of transportation networks under sea level rise (Lu and Peng, 2011; Sun et al, 2020; Bloetscher et al, 2012). However, there is a lack of research exploring the impacts of vulnerable transportation networks on the aging population under sea level rise scenarios.

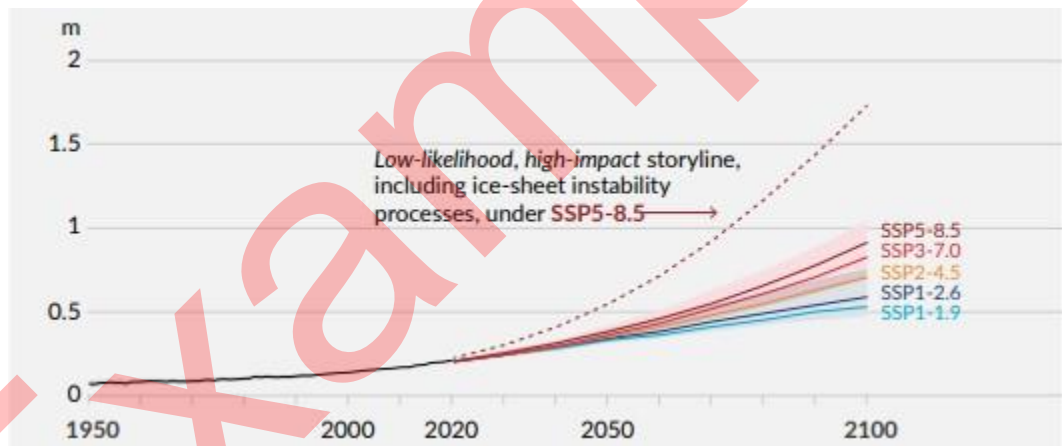


Figure 1. Global mean sea level in the past and as projected for the 21st century (IPCC, 2021)

Figure 1 shows the global mean sea level changes in meters in the past (1950-2020) and projected from 2021-2100, relative to 1900. The projection sea level rise are based on five illustrative scenarios, SSP 1-1.9, SSP 1-2.6, SSP 2-4.5, SSP 3-7.0, SSP 5-8.5 (IPCC, 2021).

The purpose of this study is to evaluate the impact of sea level rise on the accessibility of the aging population to essential services and facilities (i.e. grocery

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