

# OURCS Summer Research Project

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California  
Lutheran  
University

## Abstract



**Newsletter:** An equitable opportunity for undergraduate research is elusive to many students because these highly sought-after positions are limited and not widely promoted. Our goal was to increase awareness of these opportunities through the creation of the STEM Research at CLU newsletter. The first edition of this newsletter will contain articles celebrating the work that research driven CLU faculty have completed, which is intended to give students a starting point for their research aspirations. With the increase of awareness research positions will become more competitive allowing for a stronger pool of research candidates.

**Textbook:** Organic chemistry is notoriously difficult subject for some students to adequately comprehend. To assist these students, a supplemental textbook is being developed. This textbook will contain practice problems and show practical applications of common organic chemistry reactions. Our goal is to add context to these reactions by including specific information about how the synthesized products are useful. By including interesting facts about each reaction, we hope to reinforce the student's knowledge and comprehension.

## Example Articles



**Dr. Michael Gagliardi**  
Senior Lecturer  
Dr. Michael Gagliardi has been a Professor of Mathematics at CLU since 2011. His primary focus is on an interdisciplinary approach to the study of mathematics, which has been a central theme of his research. He has published several articles in the field of mathematics, including a recent article in the *Journal of Mathematical Sciences*. He is also a member of the American Mathematical Society and the American Association of University Professors.

**Dr. Akiba Yashinski**  
Associate Professor  
Dr. Akiba Yashinski is an Associate Professor of Chemistry and Director of the Center for Environmental and Energy Research at CLU. He has a Ph.D. in Chemistry from the University of California, San Diego. His research interests include the synthesis of new materials and the development of new catalytic systems. He has published several articles in the field of chemistry, including a recent article in the *Journal of Organic Chemistry*.

**Dr. Yashinski has received a number of awards and honors for his work in the field of chemistry, including the 2018 American Chemical Society Award for Distinguished Achievement by a Young Professional. He is also a member of the American Chemical Society and the American Association of University Professors.**



## Newsletter



**Purpose:** For many students, research opportunities can be elusive. Our goal was to make these opportunities more equitable by enlightening STEM students to the benefits of undergraduate research while celebrating the accomplishments of the faculty involved. To do this, we created the first edition of the STEM Research at CLU Newsletter. Our newsletter provides a starting point for students who may be unaware that research opportunities exist. We include articles about professors in various fields including various STEM disciplines, communications, sociology and the CLU Psychology Masters program. This newsletter provides students with a point of reference for which professors conduct research and the nature of that research.

STEM Research at CLU NEWSLETTER	STEM Research at CLU NEWSLETTER
Interviewer: _____ Date: _____	<b>Type of programs:</b> McNair, Allies in Stem, OURCS, etc
Faculty name: _____	<b>Research Program, you can ask for:</b>
Area: <i>Science Technology Engineering Mathematics</i>	1. (Important aspects you would like to want us in the Newsletter such as <b>projects, collaborations, publications, symposia, awards, future plans</b> )
Department: _____	2. Emphasis: on Students or on projects
Field: _____	
Faculty education: (if it is not available on the website)	
Faculty professional experience: (Things to highlight):	
Professional Appointments:	<b>Information in the newsletter (format preference):</b>
Years of Experience in the field:	1. short paragraph and no pictures/schemes
Accomplishments:	2. Short paragraph and a picture or scheme (similar to an abstract)
Number of mentored students:	3. Extended version: With several paragraphs pictures and schemes (similar to a scientific article)
	4. List of accomplishments (publications, awards, events) and projects
	<b>Additional information:</b>

**Methods:** Using the CLU directory and OURCS database we compiled a list of CLU faculty involved with research. This info was used to contact professors and invite them to a Zoom interview where we went over the information included in the forms pictured above. This information was used to write the articles which were sent to the interviewee and my mentor for approval before being added to the newsletter. The newsletter is currently in formatting stage and is almost ready to be published.



## Textbook



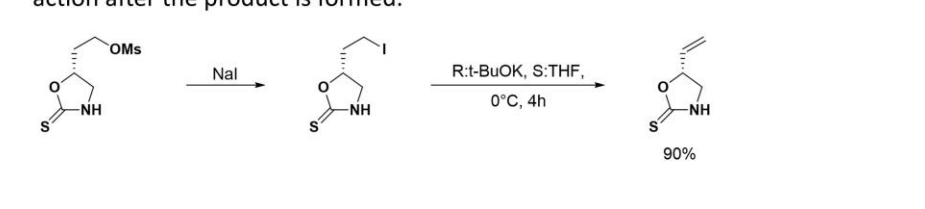
**Purpose:** Organic chemistry is often referred to as a “barrier subject”. This stigma often bars students from pursuing degrees in fields such as chemistry and biology which require a year of organic chemistry as part of the curriculum. To assist these students, we are creating a supplemental textbook that includes additional practice problems and real-life applications. The reactions are being collected from published papers which allow for accurate reaction conditions such as the time, temperature and % yield. Additional facts about the reactions are included to assist in reinforcing comprehension. The context our book provides helps students understand why the reaction mechanism is important, rather than providing another task with a purpose that is not fully understood.

Example 6.21-2: E2 elimination of primary alkyl halides to form alkenes, using a bulky base.

Reference: Yin, Wei; Qiao, Chunhua *Journal of Heterocyclic Chemistry* **2013**, *50*, 6, 1290-1293

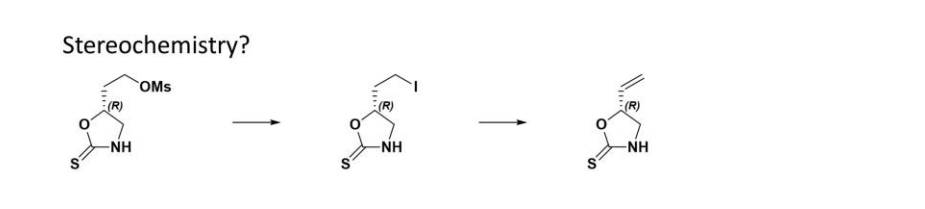
Title: Synthesis of Epigallocatechin gallate (EGCG) from (R)-(+)-4-Hydroxy-2-butyrolactone

Reaction scheme (this section includes the substrate, product, reagents, solvent, temperature, chemical yield, reaction time, other additives and special conditions), include the step for the synthesis of the substrate, and the subsequent reaction after the product is formed.



Applications: This article describes the synthesis of Epigallocatechin gallate (EGCG), a molecule that exists naturally in turnips and cabbage and is known for its antioxidant and antiviral activities.

Additional notes  
If this is a total synthesis, is the example a final product or an intermediate?  
Final product

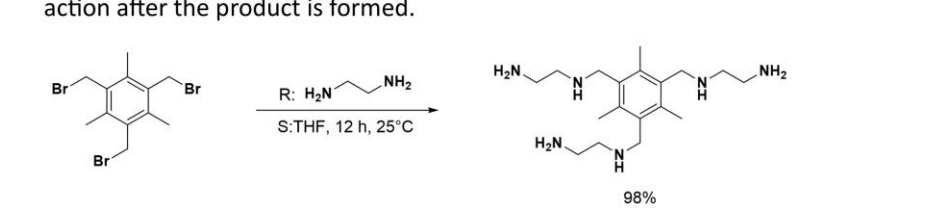
Stereochemistry?  


Example 6.5-4: Primary alkyl halide into amine when treated with RH2NH2

Reference: M. Sawicki et al. *European Journal of Medicinal Chemistry*, **2008**, *43*, 2768-2777

Title: Bisphosphonate sequestering agents. Synthesis and preliminary evaluation in vitro and in vivo uranium (VI) chelation

Reaction scheme (this section includes the substrate, product, reagents, solvent, temperature, chemical yield, reaction time, other additives and special conditions), include the step for the synthesis of the substrate, and the subsequent reaction after the product is formed.

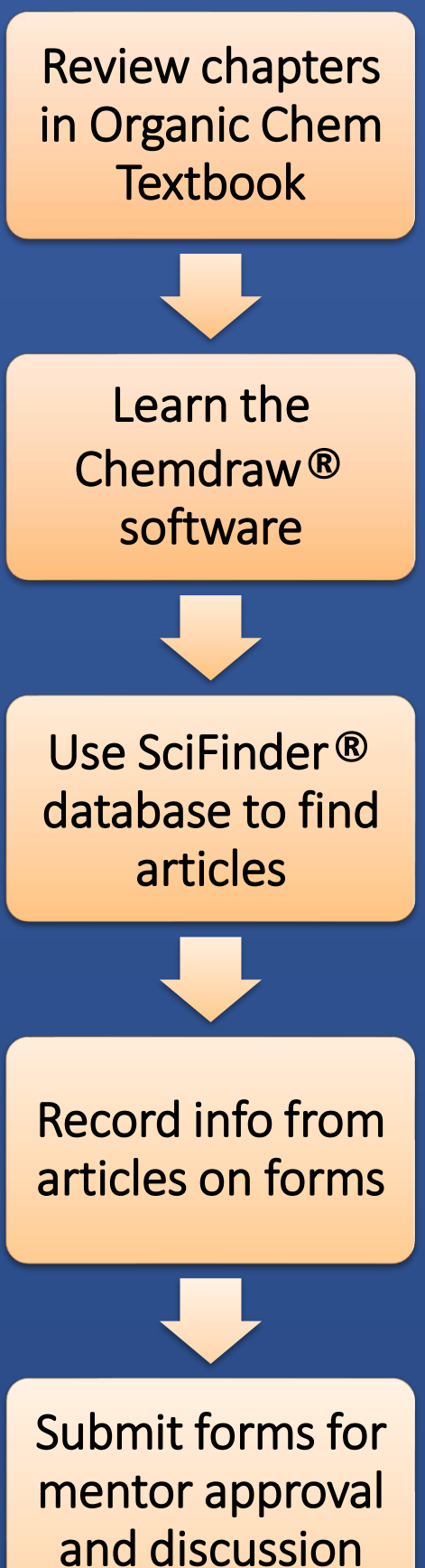


Applications: This study was used to test treatments for uranium poisoning. 60% of the uranyl ion (UO<sub>2</sub><sup>2+</sup>) is typically excreted from the body naturally through urination after exposure. The other 40% requires treatment with specific ligands for uranyl chelation.

Additional notes  
If this is a total synthesis, is the example a final product or an intermediate?  
Final product

Stereochemistry?  
Not specified

**Methods:** Chapters containing desired reactions were reviewed and familiarity with the SciFinder® database and Chemdraw® software commenced in preparation for article review. Data from articles containing the desired reactions was recorded using the forms pictured above. Focus was put on finding articles with specific reaction conditions such as temperature, time, % yield and interesting facts about the reaction. These forms were submitted for approval and discussed during weekly meetings



## Future Work



- The first edition of the STEM Research at CLU newsletter is expected to be published by then end of Fall semester 2020
- The newsletter is expected to be an annual summer project
- Future editions will be expanded to include articles featuring current and former students with a focus on the student's experiences in undergraduate research and how it has affected them
- My involvement with the Organic Chemistry textbook is expected to conclude upon my graduation in Spring 2020, but the Organic Chemistry Textbook is a long-term project that will feature multiple cohorts of authors continuing my work.
- Publish date for the textbook is expected to be Spring 2021

## Acknowledgements



- Thank you to Dr. Jesus Cordova Guerrero for your guidance and support over the course of these projects
- Thanks to Crystal Cendejas, Kayla Klussman, Morgan Lakpour, Jessica Nasr, and Alexia Rangel for collaborating with me on these projects
- Thank you to OURCS for your assistance and for this opportunity
- Special thanks to the Swenson Fellowship for funding the projects

## References



- M. Sawicki et al. *European Journal of Medicinal Chemistry*, **2008**, *43*, 2768-2777
- Yin, Wei; Qiao, Chunhua *Journal of Heterocyclic Chemistry* **2013**, *50*, 6, 1290-1293

These articles are samples and do not reflect the final product. We are currently in the process of formatting all the articles for publication and these were early drafts created solely for presentation purposes.