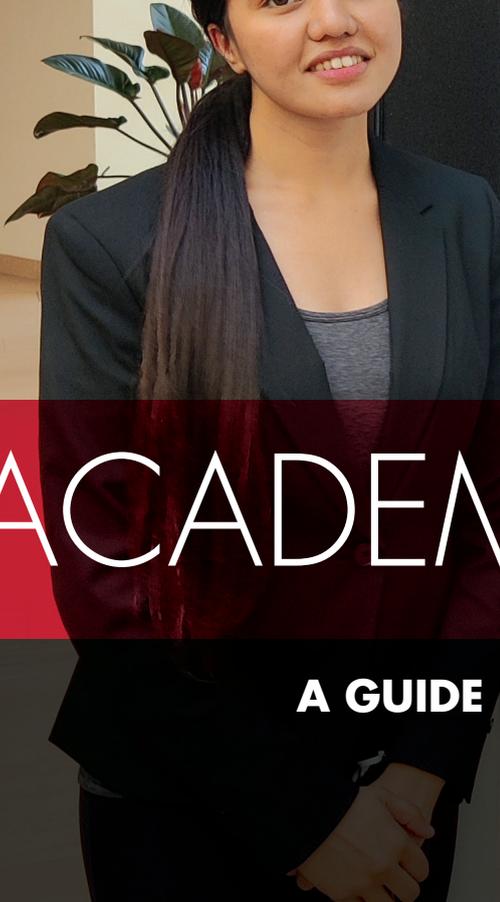


Yaman Thapa '22
 B.A. in Chemistry
 Minor in Neuroscience
 Internship: MIT Summer
 Program in Biology



Introduction

The spinal cord is responsible for transmitting signals from the central nervous system to the muscles and organs throughout the body. It contains the somatic and autonomic nervous systems. There are various conditions (such as neurodegenerative diseases) that can lead to damage to the spinal cord and dysfunction.

The small atlas of neuroanatomy allows us to investigate the gene expression with precision information about the location. STARmap is an RNA sequencing technique designed to visualize the cellular diversity in the spinal cord. The three-dimensional analysis allows us to correlate transcription information with morphology, location and cell-cell communication. STARmap can be used as a tool to further enhance our knowledge on the relationship of gene expression with location, cellular basis of motor function and neurodegenerative diseases.

Figure 2: Sliced spinal cord (cross section).

Figure 3: Raw fluorescence images of 4-cycle STARmap on spinal cord cross section.

Figure 4: Enlarged image of STARmap on spinal cord. The individual dots with varied color correspond to the 4 genes i.e. *Calm1*, *Snap25*, *Actb*, *Malat1*.

Methodology

The STARmap methodology involves several steps: tissue sectioning, fixation, permeabilization, and hybridization with fluorescently labeled oligonucleotides. The resulting images are then analyzed using a pipeline that includes background subtraction, cell segmentation, and gene expression quantification.

Figure 5: Raw fluorescence images of cross section of spinal cord stained with DAPI. The central layer (grey) section in the diagram of spinal cord.

Figure 6: Raw fluorescence images of cross section of spinal cord stained with DAPI. The central layer (grey) section in the diagram of spinal cord.

Figure 7: Raw fluorescence images of cross section of spinal cord stained with DAPI. The central layer (grey) section in the diagram of spinal cord.

Figure 8: Nine clusters of cells were classified through Uniform Manifold 0-Astrocytes I, 1-Oligodendrocytes, 2-Excitatory Neurons, 4-Vascular Endothelial Cells, 5-Astrocyte II, 6-Microglia, 7-Oligodendrocytes precursor cells, and 8-Ependymal Cells.

Conclusion

We identified two neuronal cell types including excitatory (defined by genes, *Vamp1*, *Giral*, *Resp18*) and inhibitory neurons (*Hoxb8*, *Ebf3*, *Hoxb6*, *Sst*) along with seven non-neuronal cells, including oligodendrocytes, microglia, oligodendrocyte precursor cells, vascular endothelial cells, ependymal cell and two subpopulations of astrocytes. The clustering demonstrate high concentration of excitatory neurons and inhibitory neurons in the expected anatomical layer. The high concentration of glial cells surrounding the STARmap allows us to combine spatial transcriptomics data in conjunction to histology to define neuronal transcriptomes. This allows for targeting specific clusters, spatially identifying transcriptional targets.

ACADEMIC INTERNSHIP PROGRAM

A GUIDE FOR EMPLOYERS AND STUDENTS



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FOR EMPLOYERS

Academic Internship Program

The Career Planning and Development Office oversees the academic internship program at Caldwell University. Students may pursue internships for academic credit under the guidance of a faculty advisor, following established policies and procedures.

Employer Roles and Responsibilities

Employers agree to serve as internship supervisors for Caldwell University student interns. Specifically, they will:

1. Provide the student with an offer letter and position description upon the hiring of the intern. This consists of the name and title of the work supervisor, the organization's location and contact information, and the job duties the student will perform. The employer also certifies the firm's hiring policies are non-discriminatory.
2. Provide the student with an orientation that includes familiarizing the student with all company policies and procedures. Students have the right to know corporate policy on ethical standards and sexual harassment issues.
3. Provide a safe work environment and adequate supervision.

4. Meet with the student periodically to discuss their performance as an intern and complete all required forms, including midterm and final evaluations of the student.
5. Create/maintain an employer account and internship listings on **Handshake**, the Career Planning and Development job search platform for students seeking jobs and internships.

Job and Internship Postings on Handshake

The Career Planning Office partners with **Handshake**, an intuitive and innovative college recruiting platform that allows you to manage all your recruitment activities with Caldwell University on any device. Use it to update job postings, view applications, and more. Go to: **caldwell.joinhandshake.com** to get started!

The Career Planning and Development Office is a member of the **National Association of Colleges and Employers (NACE)** and abides by NACE ethical standards for professional conduct regarding employment and internship practices. All employers and third-party organizations recruiting Caldwell University students and alumni are expected to follow the **NACE Principles for Professional Practice**.



Akwasii Osei-Du '22

B.S. in Financial Economics

B.S. in Computer Information Systems
with a concentration in Business Systems

Internship: Credit Suisse



Nicole Alfano '23

B.S. in Marketing

Internship: Dogtopia

FOR STUDENTS

Benefits of Internships

Why consider an internship? There are many reasons, from “trying out” possible careers, building a professional network, gaining real workplace skills, and finding out what you do, and do not like to do when you are at work.

If you want to help yourself get a job after you graduate, do an internship. An internship is important because it can equip you with new skills and opportunities you would not receive otherwise. Interns not only gain technical knowledge within the industry of their choice, but they also learn how to interact with professionals in a workplace setting, and develop essential career readiness skills like time management, organization, adaptability, problem-solving and teamwork.

Students may pursue internships for experience, academic credit, or both. Career Planning is here to help you find opportunities related to your interests and goals.

Career Planning and Development Office

Aquinas 109

www.caldwell.edu/careers

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Academic Internship Program at Caldwell University

- Students interested in pursuing an internship for academic credit work with a Faculty Internship Advisor and the Career Planning and Development Office. Students must receive approval for the proposed internship, develop learning objectives and goals in consultation with the Faculty Internship Advisor, work under the supervision of the employer and complete related academic assignments.
- All academic internships require departmental approval. To be eligible, students must have completed 30 credits and maintain an overall GPA of 2.5. To earn credit for an internship, students must follow established policies and procedures, begin the process well before the semester for which they plan to register, and then register for the appropriate credit-bearing course by the appropriate semester deadlines. Note that internships are a required component for several programs of study at the University.
- Students are eligible to earn up to three credits per semester for an internship experience and a maximum of nine credits per academic major, subject to departmental approval. To earn three credits, students must complete a minimum of 120 hours at the internship site. A two-credit, 80-hour option is available for certain majors, subject to departmental approval.



Prabuddha Bastola '23
B.S. in Computer Science
B.S. in Business Administration
Internship: PSE&G



Jacklyn Modhu '21
B.S. in Computer Information Systems
Internship: Amazon



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B.S. in Nursing
Internship: UPMC Western Maryland



Cindy Herrera '22
B.A. in Criminal Justice
Minors: Criminal Forensics,
Psychology, Pre-Law
Internship: New Jersey State Police

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- Innovative Advocate Group, Inc. (IA Group)
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