Camille CUNIN

Graduate Student

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Passionate with **biomedical engineering**, **neuroscience** and **nanotechnologies,**
I wish to pursue a research career and lead advances in biological sciences and technologies
to make a difference in the improvement of human health.

EXPERIENCE

NOVEMBER 2019 – MARCH 2020

RESEARCH STUDENT, MGH & HARVARD MEDICAL SCHOOL – THE ALBERS LAB – MASSGENERAL INSTITUTE FOR NEURODEGENERATIVE DISEASE (MIND) – *CHARLESTON, MA* - The Albers Laboratory uses the **olfactory system** of mice and humans to explore early pathologic events of **neurodegeneration**. Amazed by the brain, my curiosity was tickled by this original approach of neurodegenerative disorders. My role was to evaluate the potential of a novel algorithm capable of predicting a progression to **amnestic-MCI** or **Alzheimer's disease** among healthy elderly individuals, according to their performances on both **odor naming** and **odor memory**.

MARCH 2019 – MARCH 2020

RESEARCH STUDENT, MGH & HARVARD MEDICAL SCHOOL - THE TEARNEY LAB — WELLMAN CENTER FOR PHOTOMEDICINE – *BOSTON, MA* - I worked on a challenging project to design a novel, minimal invasive, and **high-resolution OCT-imaging device** to diagnose **Crohn's disease**. My research work mainly consisted in both developing an OCT-TCE device capable of reaching the terminal ileum, determining **imaging criteria** for mapping the **gastrointestinal tract,** finding the best way to **hydrophilic coat** the device and carrying on **ex vivo and in vivo swine studies** before trying the prototype into humans. I had the greatest opportunity to extend my internship for one year in total to keep working on this amazing project, which eventually led me to build the first real-size prototype.

JUNE 2019 – AUGUST 2019

HST-WELLMAN SUMMER INSTITUTE FOR BIOMEDICAL OPTICS, WELLMAN CENTER FOR PHOTOMEDICINE – MGH – *BOSTON, MA* - In parallel with my internship, I completed a three-month program in biomedical optics at MGH. Through **hands-on research experience**, this program trained me in the study and **innovation of biomedical optics** for improving human health and advancing biological sciences. I acquired methods to **conduct research responsibly** and to achieve the skills to **communicate research findings** effectively through oral presentations, **scientific poster presentation** and a large panel of courses on diverse medical and engineering topics.

AUGUST 2018

1-MONTH RESEARCH INTERNSHIP, GRANDS MOULINS STORIONE – *MARSEILLE* - In a mill's laboratory, I performed wheat flour analysis for determination of both protein, moisture, and starch contends by NIR, flour protein contend by nitrogen measurement, and ash contend by incineration.

EDUCATION

SEPTEMBER 2020 – AUGUST 2021

GRADUATE ENGINEERING SCHOOL - Diplôme d'Ingénieure/MS in Engineering Sciences (2nd year), ÉCOLE CENTRALE - *LYON* – Major in Biomedical Engineering & Nanotechnologies.

Syllabus: human physiology and immunology, dynamics of biological and human systems, biotechnologies, microelectronics, microfluidics, tissue engineering and biomaterials, functionalized thin layers and surfaces, nanostructures, nano-systems and biological interfaces, biocomputing and biostatistics, among others.

JOINT DEGREE PROGRAM - MS in Health Engineering - Medical Imaging Signal and Systems, UNIVERSITÉ CLAUDE BERNARD - *LYON* - One-year, research-oriented MS joint-program.

Syllabus: tissue characterization, imaging techniques (US, PET, MRI, CT, X, NIRS), image and signal processing, neuroimaging, machine learning, intellectual property, research protocols, bibliography, among others.

SEPTEMBER 2017 – AUGUST 2021 – GPA: 3.84 (2017-2020)

GRADUATE ENGINEERING SCHOOL - BS in Engineering Sciences (2018) + MS in Engineering Sciences (1st year), ÉCOLE CENTRALE – *MARSEILLE* Top French Graduate Engineering School which offers a rich multidisciplinary program including advanced classes in mathematics, physics, biosystems and engineering, electronics, control engineering of linear systems, chemical engineering, mechanical engineering, advanced chemistry, computer science, process engineering, management, among others.

SEPTEMBER 2015 – SEPTEMBER 2017 – GPA: 4.0 (2015-2017)

HIGHER SCHOOL PREPARATORY CLASSES (CPGE) PCSI/PC*, LYCÉE LOUIS-LE-GRAND – *PARIS* - These two highly intensive years are a specificity of the French system and are a preparation for the highly competitive entrance examinations to French Graduate Engineering Schools (*Grandes Écoles d'Ingénieurs)*.

SEPTEMBER 2012 – SEPTEMBER 2015 – BACCALAURÉAT SSI MENTION « TRÈS BIEN »

HIGH SCHOOL, LYCÉE LOUIS-LE-GRAND – *PARIS* - Graduated from high school with highest honors.

HONORS, AWARDS, ACADEMIC ACHIEVEMENTS

2021 (Aug.) Graduation year (*Diplôme d'Ingénieur* (MS) in Engineering Sciences + MS in Health Engineering)
2020 (Apr.) Fundamentals of Neuroscience (3 certified parts) – HarvardX online classes
2019 (Sep.) Best slam talk runner-up award for people's choice — at Wellman Scientific Day - MGH
2019 (Aug.) HST-Wellman Summer Institute for Biomedical Optics at MGH
2018 (Nov.) Bachelor of Engineering Sciences
2017 (Sep.) Grand-prize winner of the ECM Innovation Challenge – Dyson Award
2015 (July) Graduation from high school with highest honors

RESEARCH PROJECTS

2020

HIGH-EFFICIENCY NANOWIRE-BASED SOLAR CELLS (GaAs//ITO/Si), ÉCOLE CENTRALE DE LYON & INSTITUT DES NANOTECHNOLOGIES DE LYON (INL), *LYON* – To gain research experience in microelectronics and nanotechnologies, I joined a project sponsored by the European Commission. The INL's role is to investigate methods for assessing performances of semiconductor nanowire-based solar cells made of GaAs//indium tin oxide/Si junctions. This project aims at developing strategies for nanowires fabrication to achieve efficiencies above the Shockley-Queisser limit. I am exploring annealing strategies to reduce the Schottky barrier revealed by EBIC microscopy at the GaAs/ITO interface. Another major part of my project consists in evaluating the potential for cost efficient production of these GaAs/ITO NW-based solar cells compared to planar Si solar cells.

2020 **SELECTIVE LOSS OF EPISODIC MEMORY OF ODOR PERCEPTS PREDICTS PROGRESSION TO AMNESTIC MCI OR ALZHEIMER'S DISEASE, ALBERS LAB, MIND**, MGH – *CHARLESTON, MA* – The objective of this project was to evaluate the potential of a selective deficit on episodic odor memory for predicting cognitive decline among cognitively normal elderly individuals. I started by screening for existing olfactory-based approaches used to detect early stages of AD in pre-clinical but asymptomatic individuals, gaining knowledge on both neurobiology and neurodegenerative disorders. Then, I statistically analyzed odor naming and odor memory scores collected on a longitudinal cohort and compared these results to the performances of other odor screening tools. As only a handful of studies incorporated a task of working memory and episodic memory of odor percept in their screening, this novel algorithm holds a lot of promise.

2019-2020 **OCT-TETHERED-CAPSULE-ENDOSOCPE DEVICE FOR DETAILED VISUALIZATION OF THE TERMINAL ILEUM, TEARNEY LAB, WELLMAN CENTER FOR PHOTOMEDICINE**, MGH – *BOSTON, MA* – This 1-year internship has provided me with a broad experience of biomedical research and conception of optical medical devices. I learnt how to conduct research protocols, carry on animal studies to test prototypes, perform H&E histology and confocal microscopy to evaluate tissue damage, and collect data to validate my experimentations. I developed a tailored method to hydrophilic coat the final device and learned to accurately present my work through weekly meetings, mid-term advancement calls, scientific poster, slam talks, seminars.

2018 **IOT PROJECT – LI-FI**, ÉCOLE CENTRALE – *MARSEILLE* - For six months, I worked closely with researchers on Li-Fi, a derivative of optical wireless communications. I investigated how to use LED bulbs to transmit data and position between devices through variations of light intensity. I imagined three scenarios for Li-Fi implementation in the context of the Internet of Things, modelized the light distribution and underlined the limitations of the technology in terms of signal loss, data security and interferences with external signals.

2015-16 **DAMPING OF LIQUID SLOSHING BY FOAMS**, LYCÉE LOUIS-LE-GRAND – *PARIS* - In my undergraduate preparatory classes, I worked on the damping effect of a beer foam on top of a liquid. I built a model to describe the foam contribution to the damping coefficient through vicious dissipation on the wall of the container and validated my model through resonant frequencies measures and experimentations in the lab.

OTHER INNOVATIVE & START-UP PROJECTS

2020 **GLOBAL STARTUP WEEKEND COVID 19**, APR. 24-26 - *TAIWAN* – During this Global Online Startup Weekend, 70 countries around the world called for developers, marketers, nurses, doctors, students, scientists and anyone with an idea to tackle the challenges created by the global COVID-19 pandemic. From Taiwan, I enrolled friends from San Francisco, London and Paris to work on a common project aiming at finding solutions to tackle education-related issues during lockdown in France. Our project ranked #11 among 140 other projects.

2017 **DEEP LEARNING PROJECT**, ÉCOLE CENTRALE DE MARSEILLE - The purpose of this AI project was to build a reinforcement learning robot, capable of autonomous driving on an unknown track and able to avoid obstacles. Familiar with Raspberry PI technology and robotics, I volunteer as project manager for this project to oversee the different parts, from robot prototype to Arduino technology and deep learning coding.

2017 **36H CHRONO**, ÉCOLE CENTRALE DE MARSEILLE Through this thirty-six-hour entrepreneurship challenge, I first learned how to brainstorm ideas, to manage a team and to build a business plan. Our project consisted in launching a company providing services to improve employees' wellbeing through diverse activities tailored to their needs and availabilities. Through this project, I acquired a large amount of knowledge on entrepreneurship, which will help in the future, as I will probably launch my own startup(s) and/or lab.

2015 **PIEZOELECTRIC SENSORS & LEGO® MINDSTORMS®**, LYCÉE LOUIS-LE-GRAND - In high school, I joined an Engineering class to program an autonomous robot capable of collecting as many items as possible on a playing area. I built technical Lego® accessories and provided some of them with piezoelectric sensors to trigger specific release levers. With this strategy, my robot was the only one to collect all items in record time.

PUBLICATION, ABSTRACT, POSTER

Dhilla Albers A, Keim A, Cunin C, Hyman BT, Gomez-Isla T, Blacker D, Das S, Locascio, J, Albers, MW, Selective loss of episodic memory of odor percepts is associated with progression to amnestic MCI or Alzheimer's Disease in cognitively normal seniors, (2021), *in prep.*

Song, D, Cunin C, Tearney GJ, Location-aware Optical Coherent Tomography (OCT) Tethered Capsule Endomicroscopy (TCE) of the Small Intestine, Endoscopic Microscopy XVI, part of SPIE BiOS 2021, PW21B-BO103-16, *abstract*.

Cunin C, Optical Coherence Tomography Tethered Capsule Endomicroscopy for detailed visualization of the terminal ileum, HST-Wellman Summer Institute for Biomedical Optics, (2019), *poster*.

ONLINE COURSES – MARCH – JUNE 2020 – *TAIWAN*

- HarvardX - Fundamentals of **Neuroscience** (3 certified modules)
- AdelaideX - Essential Human Biology - **Cells and Tissues**
- MITX - Introduction to **Biology** - Secret of Life
- EPFLX - Fundamentals of **Biomedical Imaging** - Ultrasounds, X-ray, positron emission tomography (PET) and applications
- IBMX - Introduction to **Data Science** & **Data Science Tools**

LANGUAGES

- **FRENCH**: Native
- **ENGLISH**: Fluent (TOEFL iBT score: 100)
- **GERMAN / SPANICH**: Intermediate
- **PROGRAMMING LANGUAGES**: Python, Matlab, HTML, CSS, JavaScript…

ASSOCIATIONS & VOLUNTEERING *for an exhaustive list, please visit https://camillecunin.github.io/#asso*

FRENCH TRANSALATOR – APR. 2020 - NOW – N95DECON, INC., a California public benefit corporation, has been formed to support the work of a collection of volunteer scientists, engineers, clinicians, and students from universities across the United States as well as other professionals in the private sector to help disseminate scientific information about personal protective equipment decontamination, including N95 respirators during COVID-19 pandemic (https://www.n95decon.org/).

RESEARCH VOLUNTEER – MAY – NOV. 2019 – VISUAL ATTENTION LAB - HARVARD MEDICAL SCHOOL-BRIGHAM & WOMEN'S HOSPITAL – For a few months, I took part in weekly studies to help understand the mechanisms by which attention selects specific items, as well as to evaluate the potential of AI for use in differential diagnosis. This included studies of how to terminate searches without finding the target and studies of the processing of visual stimuli before they are selected by attention for further, more complete analysis.

STUDENTS REPRESENTATIVE – 2019 - NOW – CENTRALE MARSEILLE ALUMNI (AIECM) – As an elected representative of my year group, my role is to hold our school year together after graduation, for instance by organizing regular events and seminars to feed the alumni network.

PRESIDENT - 2017–2018 – CENTRALE GLISSE – To provide watersports for all, I relaunched this association to offer École Centrale's students the possibility to practice nautical sports (windsurf, kitesurf…), usually costly, at a more accessible price including lessons and facilities. Through this project, I not only developed management skills, but I also learned canvassing to find watersport teachers and sponsors.

JUNIOR ENTREPRENEUR - 2017–2018 – PROJECT MANAGER & WEB SPECIALIST AT KSI CENTRALE MARSEILLE - As a project manager, my role was to identify clients' needs, to write specifications, to draw up provisional budget and planning, as well as to draft commercial proposals. My experience as a Junior Entrepreneur strengthened my ability to organize information, to identify priorities and to work efficiency to meet deadlines. As a quality controller, I took part in the quality process by reviewing and validating every study related to web development and computer-related topics.

HOSPITAL VOLONTEER - 2017–2018 – CHEER UP! - I used to periodically visit children suffering from cancer at the hospital to talk about their projects and help them fulfill their dreams. As a first experience with the clinical world, I experienced the in-hospital world and realized how important innovation in the biomedical field is.

PORTFOLIO *to find a detailed version of my CV and my portfolio, please visit https://camillecunin.github.io/*

REFERENCES

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