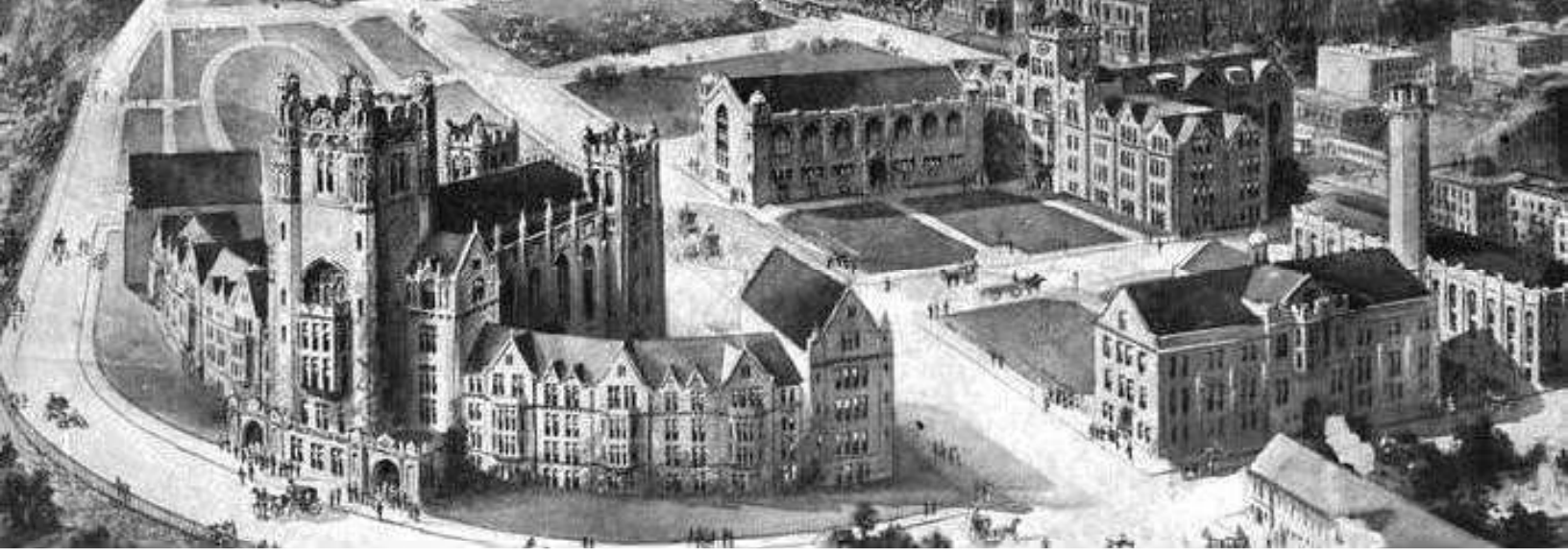


Shepard Hall and Quadrangle - City College of New York (CCNY) 1904

Chemical Engineering Newsletter

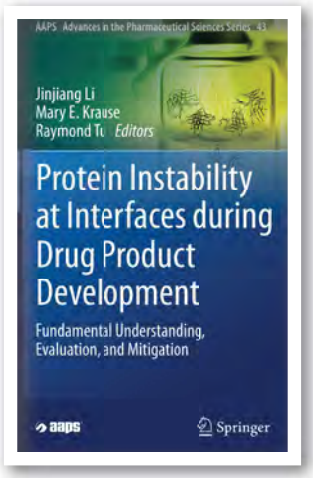
The Grove School of Engineering at The City College of New York 09/2021

Prof. Raymond S. Tu's Many Collaborations Produce Exciting Results

What do the behavior of antibodies at the air-water interface, 'living' muscles from silk, and a boat made of Flex Paste™ have in common? They have all been studied by **Prof. Raymond S. Tu** in his collaborations within CCNY, industry, and even television.

Prof. Raymond S. Tu

Prof. Tu, in collaboration with Prof. Charles Maldarelli, and staff scientists from Bristol Myers Squibb (BMS) and Argonne National Labs published a manuscript in *Science Advances* recently on how monoclonal antibodies approach and adsorb to interfaces (*DOI: 10.1126/sciadv.abg2873*). Monoclonal antibodies represent a growing fraction of next-generation therapeutics, including new drugs for cancer and autoimmune diseases. Understanding how they interact with the interface is critical for their manufacture, formulation, and storage. The findings can be used to define improved methods for the large-scale synthesis and robust storage of protein-based therapeutics. In addition, Prof. Tu also co-edited a new book with his BMS collaborators on protein instabilities at interfaces during drug product development.



Furthermore, **Prof. Tu** along with Prof. Xi Chen won a $600K grant from the Air Force Office of Scientific Research entitled "Silk-based Materials into 'Living' Muscles" this summer. The grant will enable their team to examine the molecular mechanism of water responsiveness in silk fibroin proteins. Subsequently, spores will be incorporated that can reproduce as a function of external stimuli to control the water responsiveness in an active manner.

In addition, **Prof. Tu** and several CCNY chemical engineering students ran an experiment to see if a boat constructed from chicken wire and Flex Paste™ could stay afloat in Lakeview Marina in New Jersey this spring for a segment on *Inside Edition*. Prof. Tu along with the students spread Flex Paste™ on a chicken wire frame to make the boat. Then they put their engineering skills and the company's "Flex Seal" claims to the test. Prof. Tu, looking a little shaky in the boat, gave it an '8 out of 10' rating.

The City University of New York

Department website: www.ccny.cuny.edu/chemeng

MESSAGE FROM THE CHAIR

Prof. Ilona Kretzschmar, Chair

Dear Alumni and Friends of the Department,

I hope that my letter finds you well and in good health. I am delighted to report that we are back on campus with roughly 90% of the ChE courses being taught in person. We started off the semester with the first lectures online to get everybody oriented for the semester. Since then, lectures have been in-person and students and faculty have been enjoying the return to in-person interaction. We have even had a student/faculty research round table for our undergraduate students in Steinman Plaza. Undergraduate laboratories are also back to in-person and our research is thriving. If the COVID-19 pandemic has taught us one thing it is that we need to collaborate, innovate, and adjust to new challenges with an open mind. As you saw on page 1, Prof. Tu has excelled at making innovative adjustments during the pandemic!

Jean Tom, BMS

In April 2021, we added two new advisory board members: Dr. Jean Tom, the Executive Director of Chemical and Synthetic Development in the Global Product Development and Supply Organization of Bristol-Myers Squibb (BMS), and our very own Dr. Amos Avidan (ChE PhD '80) who also appears on page 3. We thank Prof. Stan Sandler (ChE BE '62) and Dr. Nitin Kumar (ChE PhD '01) for their service on the EAB over the past five years!

The 2020 Katz Lecture in memory of Prof. Maria Flytzani-Stephanopoulos (L) (1950-2019) of Tufts University was presented by Prof. Charles Sykes (R)

On a more sober note, we held our delayed 2020 Katz lecture this spring in memory of Prof. Flytzani-Stephanopoulos of Tufts University, who sadly passed away a few days after our nomination as the 2020 Katz lecturer. Her long-time friend and collaborator, Prof. Charles Sykes, kindly agreed to give the 2020 Katz lecture on May 10, 2021 in Prof. Flytzani-Stephanopoulos' stead and memory. The event turned out to be a beautiful occasion, especially since Prof. Flytzani-Stephanopoulos' department and students joined us for the virtual lecture celebrating her significant contributions to the field of catalysis, including single atom catalysts for reactions of interest to fuel processing.

In this newsletter, you will find information about a new scholarship established by one of our distinguished alumni, an innovative unit operations lab, ChE senior design at CCNY, new instrumentation in the ChE Department, and most importantly the revival of our newest fundraising effort "The Next Century Challenge!" The Next Century Challenge is focused on alumni participation with the aim of raising enough funds to enable every one of our ChE students to attend at least one professional national conference during their time in our program. As you will see on page 4, we have a history of sending our students to conferences, but lack of funding remains an impediment to giving every student this opportunity.

Enjoy the Newsletter and I look forward to hearing from you!

- Ilona Kretzschmar

Prabhakar Nair ChE BE '75

Chair's Alumni Highlight: After Prabhakar graduated from CCNY in 1975 with a BE in Chemical Engineering, he obtained an MS in Chemical Engineering at the Illinois Institute of Technology in 1982, followed by an MBA at Northwestern in 1989. Prabhakar spent the bulk of his career at UOP, a leading Refining/Petrochemical technology development and licensing firm. While at UOP, he served in technology, technical services and sales/marketing roles. He commissioned UOP licensed process units in Ecuador, Portugal, Israel, Brazil, South Korea and China. Later, he served as UOP's resident representative for over 16 years in Indonesia, Singapore, and India. Currently, he is at LanzaTech, a pioneering firm in the field of gas fermentation technology, where he leads the global business development activity that includes licensing of LanzaTech's technology and establishing collaborative partnerships in various industry sectors. From his time at CCNY, he recalls "The ChE class was barely 40 students. So, our engineering classes were small with great ability to interact closely with our professors." He fondly remembers: "the enlightening lectures from Professors List, Yerushalmi, Shinnar, Williams, Gluckman, and Patel. It was a solid ChE background that I obtained at CCNY that truly positioned me well for the career at UOP and beyond." If you are interested in Prabhakar's career, please, check out his LinkedIn profile at https://www.linkedin.com/in/prabhakar-nair-151a22/ or e-mail him at Prabhakar@nairsonline.com.

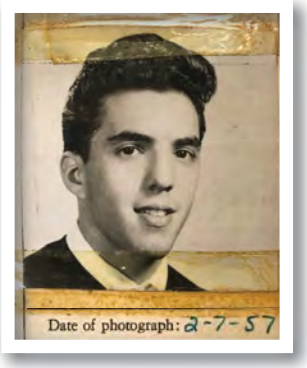
The Martin & Beatrice Sherwin Endowed Scholarship Fund

Dr. Martin B. Sherwin (ChE BE '60, PhD '67) has established The Martin & Beatrice Sherwin Endowed Scholarship Fund at The City College of New York's Grove School of Engineering. The scholarship is named after Dr. Martin B. Sherwin and his late wife Beatrice Sherwin. Dr. Sherwin is an illustrious alumnus of the Chemical Engineering Department of The Grove School of Engineering and carries the distinction of being the first doctoral candidate to be awarded a Doctor of Philosophy (PhD) in Engineering at the City University of New York. Beatrice Sherwin was a Hunter College alumna whose many talents led her to a wide range of careers including international copyright agent, educator, and certified public accountant. Dr. Sherwin decided to establish the Fund in recognition of his long and rewarding career made possible by the chemical engineering education he received at CCNY.

Dr. Martin B. Sherwin and Beatrice Sherwin in Strasbourg

The Martin & Beatrice Sherwin Endowed Scholarship Fund will provide tuition for one full-time chemical engineering undergraduate student for up to five semesters (given renewal criteria are met). The first Martin & Beatrice Sherwin Scholar will be announced in Fall 2024.

Dr. Martin B. Sherwin is a recipient of the David B. Steinman Medal in recognition of a distinguished career exemplifying the ideals of CCNY alumnus David B. Steinman (1906), the internationally-renowned builder of bridges who was determined to strengthen and protect the profession of engineering. Martin joined the Chemical Engineering Department in September of 1955 after graduating from Lafayette High School. He excelled in his studies and was taught by esteemed Profs. List, A.X. Schmidt, Kolodney, Meyers, Patel, and Pfeffer, and graduated with a BE in Chemical Engineering in February 1960. His next move brought him to Scientific Design Inc., where he started as a process engineer while also working on his MS degree at The Polytech Institute. From 1964-1967, Martin returned to CUNY for his PhD under the supervision of Profs. Reuel Shinnar and Stanley Katz. Upon graduating and full of fresh ideas, Martin became one of the founding members of Chem Systems Inc., and quickly rose to the position of Vice President of R&D. He led the team that developed the world's first commercial maleic anhydride from butane project, and was one of the liquid-phase methanol process originators. He left Chem Systems, Inc. in 1980 to become the Director of Engineering at W.R. Grace & Co.'s Research Division. During his 17 years at WRGC, he further climbed the corporate ladder to become Executive Vice-President, then Corporate Vice-President, and finally President of the Commercial Development Division. His contributions to chemical process technology through the development of artificial organs, environmentally friendly insecticides, gas-separation membranes, and important petrochemical processes led to his election to the National Academy of Engineering (NAE) in 1998. He is also a Fellow of AIChE and was named one of the 100 Chemical Engineers of the Modern Era by them in 2008. He completed eight years as Treasurer and Council member of NAE June 30 of this year and is now enjoying retirement in Florida.



Martin as a lower Junior in 1957

Alumnus Dr. Amos Avidan Joins the ChE EAB as One of Two New Members

Amos A. Avidan (ChE PhD '80)

As of May 2021, the Chemical Engineering Department's External Advisory Board (EAB) has two new members: Dr. Amos A. Avidan (ChE PhD '80) who recently retired from Bechtel, and Dr. Jean Tom of Bristol Myers Squibb. Amos was recruited to CCNY after earning his Bachelor's from the Technion in Haifa to pursue a PhD under the mentorship of Profs. Yerushalmi and Shinnar on the hydrodynamics of high-velocity fluidized beds. Attracted by his expertise, Mobil hired Amos, who was instrumental in research and management in all of Mobil's central, successful initiatives for over two decades, including its methanol to gasoline (MTG), Fluid Catalytic Cracking (FCC) R&D, and Liquefied Natural Gas (LNG) development and marketing projects. Later Amos moved to the South to become a Texas resident and, more importantly, Bechtel's worldwide Manager of Engineering & Technology quite an impressive jump from his grad student days in Hamilton Heights! He was inducted to the NAE in 2009 for his contributions to the understanding, scale-up, and commercialization of fluid-bed reactors, liquefied natural gas facilities, and gasification plants.

The Next Century Challenge

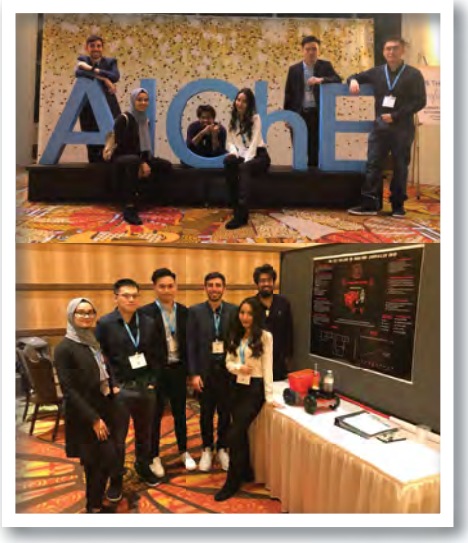
Better late than never! You may recall in our March 2020 newsletter we announced "The Next Century Challenge" to encourage alumni participation and increase donations in an effort to give the next generation of chemical engineers a leg up in their academic and professional lives. As with so many other things, COVID-19 disrupted this effort. However, now that vaccinations are available and students have returned to campus, we are reviving our effort. With the benefit of hindsight, we have learned quite a bit in the past year-and-a-half. One thing we learned is that our students face a lack of visibility – that is, getting national recognition for their accomplishments and being in the loop about academic and professional opportunities open to them. For undergraduates, this means knowing about and taking advantage of national career fairs to procure internships and full-time positions, participating in competitions, and networking in general. For graduate students, it means presenting their research at conferences and networking for both research and job opportunities.

ChE Students at the 2019 SASE Conference

ChE Students at 2018 SHPE Conference

Our ultimate goal now is to raise enough funds to send each ChE student in our department to at least one national professional conference (e.g., AIChE, NSBE, SHPE, SASE or SWE). Needless to say, the pandemic hit our students particularly hard and stymied their efforts in gaining internship and co-op experience, which admittedly, even pre-pandemic was a challenge. This fall, 68% of our seniors stated "I have no internship/co-op experience, [and] would like to gain some industry experience before graduation." Concurrently, 80% reported that they plan to graduate in summer 2022 or earlier, making time of the essence if we want to give our students sorely-needed work experience before sending them off into a very tight market. The reality is that they will be competing with others who have had both internship and co-op experience as part of their undergraduate curriculum. This puts our students at a disadvantage and we are asking alumni to step up to help us bridge the gap. You can help by making a donation to the Department to support this effort and by helping us make viable connections to industry. For graduate students, having the funds to travel and present their work at national conferences and in publications are an important way to gain visibility. Once conferences move back to fully in-person, we want our students at all levels to be able to attend national conferences.

ChE Students at SWE Conference



ChE Students at 2019 AIChE Undergraduate Student Conference

How can alumni (you) engage?

We have had a great first 100 years in The Grove School of Engineering! Now it is time to look towards the next century. The impact that chemical engineers will have on the future is bright. We have the tools and skills to be able to address some of the world's most pressing challenges including those at the energy-food-water nexus, personalized and targeted medicine, the preservation of the environment, and development of next generation materials. To educate our students at the graduate and undergraduate levels, we need to continue to instill in them the rigor of the chemical engineering curriculum while incorporating new advances, applications, and soft skills necessary to be engineers of the future. We are looking to you – our alumni and friends – to help us ready the next generation of students through "The Next Century Challenge." For this challenge we are looking to maximize alumni participation – any donation, even donations of $5 can make a big difference!

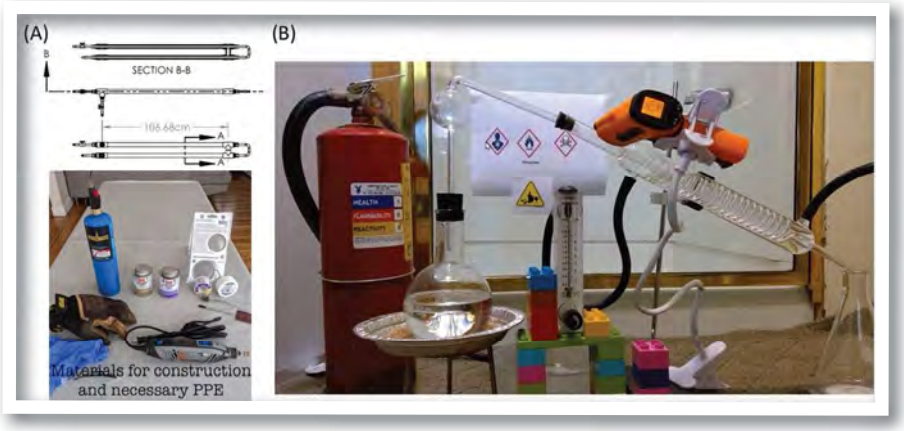
To make a donation, please go to https://www.ccny.cuny.edu/chemeng/make-gift. You will need to select the designation of "Grove School of Engineering" and in the 'comments' please indicate "Chemical Engineering." After you have made the donation, please, send an email to Prof. Ilona Kretzschmar at ikretzschmar@ccny.cuny.edu to indicate that your donation is for "The Next Century Challenge."

Design from an Undergraduate Perspective

The COVID-19 pandemic had a strong impact on our ability to bring students together in a hands-on laboratory setting and to have them work on design projects. Here, we report on our students and faculty rising to the challenge.

Prof. Tu Transports the Lab to the Students

The 2020-2021 academic year presented a unique challenge for ChE students and faculty around the world due to the COVID-19 pandemic. This was particularly true for unit operations (UO) laboratory courses, where the practical aspects of hands-on learning are at the heart of the UO experiments. In order to address the absence of a typical UO lab, Prof. Tu made a virtue of necessity: he worked together with Junior ChE students in The Grove School of Engineering to perform the elements of a design process in the context of the laboratory component of CCNY's *ChE 34600 Transport Operations* course: the student task was to design, procure, construct, and test Remote Transport Operations Experiments, which became fondly known as "RTO experiments" during the semester.



(A) RTO experiment (Group 6) of Spring 2021 ChE 346: a heat exchanger. The design is shown on the top, and their supplies and PPE are shown on the bottom. (B) Group 8's RTO experiment, a condenser, including the relevant signage and a fire extinguisher.

The RTO effort was in itself an experiment, whose goal was to capture the lessons typically taught in the UO lab by integrating the physical component of the laboratory in students' homes while simultaneously teaching aspects of project management and process design. Each team of five worked together to design an experiment that could be safely constructed and operated at home. Subsequently, a formal proposal was written that included detailed procurement steps as well as a standard operating procedure (SOP). Prof. Tu ordered and shipped the RTO components over spring break. Finally, the RTO experimental apparatuses were constructed and put to use to test fundamental transport operations principles in the last six weeks of the semester.

The ChE Juniors engaged with the RTO projects with impressive enthusiasm and creativity. More importantly, Prof. Tu and his colleagues found that the practical lessons learned went well beyond the typical UO lab experience, in large part because (as is often the case with engineering projects!) most of the RTO designs required numerous iterations to yield useable data. The tenacity and ingenuity that was shown by our Juniors to optimize their designs – from home during a pandemic – was truly inspiring.

"My Senior Design Experience" by Armando Aquino (ChE BE '21)

Senior Design II Group 8 (Armando Aquino, Hector Colon, Abraham Ferrera and Nurjahan Nazu) worked on the Fluid Catalytic Cracking (FCC) of waste cooking oil (WCO) using spent FCC catalyst. We began with the general assignment of designing a traditional FCC unit. Being environmentally conscious, it was a difficult choice to make because while we were adverse to utilizing fossil fuels, the FCC is a well established and researched process for which Aspen HYSYS, the industry standard, is available and therefore sophisticated tools to aid our design. To make our lives easier after several grueling years of engineering school, we swallowed a tough pill, and proceeded with what we saw as the easy way. Working on our initial proposals for design, we kept seeing bio-oil used in FCC units to produce renewable fuels and we thought to ourselves: "Now THAT is cool. Could we make this pivot?" We figured "tomorrow we're meeting with Prof. Castaldi, it won't hurt to ask." We were met with enthusiasm from Prof. Castaldi. He left us with his mantra "it's your project." Realizing that it was our project and a reflection of ourselves, we pushed to pursue our passions and go with the more environmentally friendly path. Our pivot to renewable sources meant throwing away everything we had and venturing into the unknown. We did it anyway; it was a horrible nightmare.

Our choice made our existing tools and accumulated research mostly useless and forced us to scramble to find new solutions. We discovered that bio-oil, or pyrolysis oil, was troublesome in FCC units and we became wary of using it in our design. However, we found research suggesting success with WCO, but that meant competing with the established process of WCO transesterification to biodiesel. Our breakthrough came with the discovery that WCO with acid values well above the maximum possible for transesterification were possible to be broken down in an FCC unit. Rather than compete with the existing dominant method, we could find our niche in converting WCO not fit for transesterification into biogasoline and other renewable fuels. As the saying goes "give us your poor, your tired, your exceptionally high acid value waste cooking oil yearning to be gasoline." **Other challenges arose, but I believe each successive challenge confirmed that in the years we attended City College we were prepared by our classes, professors, and hard work to overcome any challenges with practical solutions. It was the first time that I really felt like I had become an engineer. I am tremendously proud of our work on the project and to have studied Chemical Engineering at CCNY.**

CCNY ChE Senior Design

Prof. Marco Castaldi has taught Senior Design I and II (ChE 495 and ChE 496) every fall and spring for the last nine years. It's an academic rite-of-passage and cap-stone requirement for the chemical engineering major. Students apply the fundamentals of chemical engineering to real-world design projects. So, we asked Prof. Castaldi and his team about Senior Design.

Senior Design

Senior Design I comprises a series of lectures with homework given so that students can apply the chemical engineering fundamentals learned during the previous years. ASPEN is introduced to give students "a firm introduction and foundation to slowly build up their expertise in assembling and simulating complex processes." The course concludes with a mini-project that serves two main purposes: i) it allows the students to begin to tie together the lectures during the semester and ii) provides the students with their first experience with ASPEN for a complete design and simulation. The mini-project requires submission of a report, a working converged ASPEN program, and a 12 minute presentation to the class. The mini project teams typically consist of 2-3 members.

In *Senior Design II*, students complete a full project working independently as teams. The course is "solely student-driven and focused on a complete semester long design project." Only two lectures are presented at the beginning of the semester to remind the students of the elements of design and the expectations for the final product. Each group meets with the instructor at a prearranged time once a week with additional meeting times scheduled via Blackboard scheduling manager. In addition, a series of interim reports are required to be submitted that each focus on a different aspect of the design process. Importantly, the prearranged meeting times that are established at the beginning of the semester are not required. The student teams can choose to attend at their discretion. The format ensures the students are "taking leadership and ownership of their project and destiny."

Senior Design Instructional Team

To ensure the projects are developing in a realistic manner, Prof. Castaldi connects the teams to Mr. Mark Halperin who owns Pfaltz and Bauer, Inc. and Mr. Sheldon Horowitz (ChE BE '69, ME '76) who recently retired after 35 years of working in various capacities in the chemical engineering industry. Mr. Halperin says sitting in on the Design courses and final presentations "was a great experience" and he enjoyed "interacting with Prof. Castaldi and the design course students, trying to add an 'industrial world' perspective as well as additional direction in economic analysis and writing/presentation skills." He "re-learned (and newly-learned) quite a bit of chemical engineering…a most enjoyable by-product!" These two seasoned professionals, combined with Prof. Castaldi's regular experiences working with industry sponsors, injects timeliness, professionalism and a grounding into the students' thought processes.

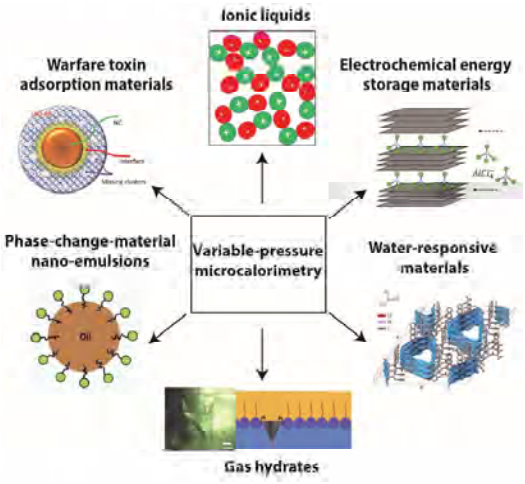
L to R: (top) Prof. Marco Castaldi, Mr. Mark Halperin, and Mr. Sheldon Horowitz, (bottom) Dr. Snehesh Ail, and TAs Andrew May and Yegor Nikitin

In Spring 2020, Prof. Castaldi went on sabbatical for a full year. Dr. Snehesh Ail, a postdoctoral researcher in the Castaldi lab, was tapped to teach the Design II course in tandem with Mr. Horowitz. Along with experienced TAs, Andrew May and Yegor Nikitin, both current PhD ChE students, Dr. Ail and Mr. Horowitz managed to seamlessly fulfill the mission of Design II, despite a pandemic and a transition to a fully online mode. It wasn't without its challenges. Dr. Ail summed up his experience as an adjunct assistant professor "as an opportunity to pass on the knowledge and wisdom that I had inherited from my teachers. Teaching design was particularly challenging since there is no correct or wrong answer – there are just so many innovative techniques that could be implemented in projects. Combining the material and energy balances with fluid dynamics and reaction engineering fundamentals is the backbone for the course. Since the course itself is a constant research-based iteration, [the] COVID-19 lock-down initially sheared the learning curve. The solutions I came up with for the pandemic era teaching, were extended access hours, increased patience with students, and enthusiasm without compromising the course quality. The underlying objective was to ignite the curiosity in students' minds, which can then foster further interest in the subject."

TA Andrew May's advice to future Design students is to do research and legwork first, then ask informed questions that give the TAs context as to the thought and research processes behind the questions. He also says it's not a good idea to ask TAs questions outside of the class or office hours (i.e., in the hallways or off-hours). He emphasizes that "TA office hours" are specifically for questions, so use them wisely. He encourages students to not be afraid of taking risks or be wrong—Design I and II is ultimately a learning experience. TA Yegor Nikitin observes that when the Spring '20 Design II course transitioned fully online and all lectures were recorded, he felt overall student attendance was lower. However, he acknowledges that students likely had to work harder to sustain their life through COVID-19 and appreciated the opportunity to watch the recording later. Yegor notes that "writing less" on slides allows the audience to focus more on what the presenters say. He feels that having a more formal presentation format (i.e., in person and the opportunity to collaborate) is more preferable than online meetings.

ChE New Instrumentation Highlights

Advanced Microcalorimeter (Prof. E. Biddinger et al., Army Research Office)



Microcalorimeter enables thermodynamic characterization

The grant supports the purchase of an advanced microcalorimeter (micro DSC 7 evo) with high pressure and custom mixing options by Setaram. In addition, the highly sensitive 3-D heat flow design of the microcalorimeter would enable thermodynamic quantities to be measured with accuracies that are not possible with conventional instruments, opening up new avenues of materials research, including measurements of more nuanced transitions and processes such as emulsion formation/breaking, structuring in liquid phases, and chemical decomposition reactions at interfaces.

The equipment allows the user to accurately quantify the thermodynamic properties of materials and material interactions, which is necessary to be able to design, develop, and utilize advanced material systems. These include materials for electrochemical and mechanical energy storage and conversion, adsorption and absorption; fuels and fuel transport; and heat transfer and refrigeration that will be identified here, along with many more applications. Microcalorimetry techniques are cross-cutting across virtually all STEM disciplines, making access to the technique transformative to CCNY science and engineering activities.

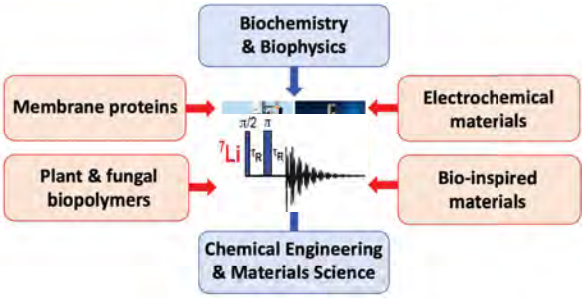
Differential Scanning Calorimeter and Thermogravimetric Analysis (Prof. M. Castaldi et al., CUNY Graduate Research Training Initiative)

The GRTI grant will support the purchase of a Discovery DSC 25 & SDT 650 (DSC/TGA), Modulated DSC Technology. The analyzers will allow for multiple modes of characterization including temperature programmed desorption (TPD), oxidation (TPO), reduction and reaction (TPR). They can be connected to close-coupled analyzers (i.e., GC) to enable detailed material characterization with simultaneous measurements of gaseous species evolving from the samples in real-time. In addition, transient kinetics, reaction isotherm generation, conversion studies can be conducted providing unprecedented understanding of samples prepared using novel synthesis routes.

Research areas that would benefit from the use of the DSC & TGA units include: heterogeneous catalysis, electrochemical materials, polymers, infrastructure components from recyclable materials as well as functional materials. The instruments will be primarily used for externally-supported research activities that engage undergraduates to post-doctoral research associates. In addition, the capabilities of the unit can serve to conduct important industrially-sponsored research on materials being developed for numerous applications, which will provide a unique insight regarding industry's needs and visions for new materials as well as enable students, and PIs, to imagine and explore exciting lines of research.

Upgrade for Solid-state Nuclear Magnetic Resonance Instrument (Prof. R. Messinger et al., National Science Foundation)

This award from the NSF's Major Research Instrumentation (MRI) program, supports the upgrade for advanced solid-state nuclear magnetic resonance (ssNMR) spectroscopy at CCNY, providing new technical capabilities to the CCNY research community while also modernizing aging equipment. The upgrade includes (i) an advanced Bruker AVANCE NEO solid-state NMR console, resulting in a comprehensive upgrade to a 2006-vintage Varian/Agilent electronic console interfaced to an existing 14.1 T NMR magnet; (ii) Bruker amplifiers, pre-amplifiers, shim system, magic-angle-spinning (MAS) pneumatic unit, probe adaptor kits, and other associated electronics; and (iii) a high-gradient broadband diffusion NMR probe and gradient amplifiers for pulsed-field-gradient (PFG) diffusion NMR measurements. The console, which generates, times, amplifies, and detects all radiofrequency (rf) signals, will not only significantly improve the sensitivity of all spectra but also enable new capabilities, such as precise rf resolution (12.5 ns) and pulse shaping, multi-channel acquisition, and superlative temperature control and stability. The broadband diffusion NMR probe has strong gradient strengths (17 T/m) that will enable diffusion measurements of slow-diffusing and/or fast-relaxing species (e.g., ranging from large molecules to fast-relaxing ionic species).



Advanced solid-state nuclear magnetic resonance spectroscopy accesses to molecular environments of functional materials

The equipment will provide CCNY investigators with unique access to molecular environments, structures, and motional processes that underlie the functions of materials including battery electrodes and electrolytes, membrane proteins, and biopolymers with applications in fields ranging from engineering science to the biology of animals, plants, and fungi.

Connect, Engage, & Contribute

Connect

There are many ways to connect with your alma mater. Please check the boxes that interest you.

- ☐ I would like to visit the campus.
- ☐ I would like to speak about my experience to students.
- ☐ I would like to attend departmental seminars on technical & research topics (Zoom, Mondays 2-3 PM).
- ☐ I would like to connect via LinkedIn group "CCNY ChemEng Alumni."
- ☐ I would like to mentor students.

You can always email us with updates or questions at:
chealumni@ccny.cuny.edu

Engage

Shiv Singh, ChE BE '99

Shiv supports our CCNY students by hiring them as contractors and providing them with training for the pharmaceutical industry. Shiv has over 21 years of operational management, engineering, business process/project management and compliance experience in biotech/vaccine and consumer production. After graduating from CCNY in 1999, Shiv started in the Merck Rotational Development program and became a manufacturing supervisor at Merck. After his stint at Merck, Shiv held several roles at Pfizer from lead investigator to senior manager in consumer healthcare engineering and technology and remediation. More recently, Shiv has transitioned into the field of quality control. After being the Director of Technical Sterility Services for four years, he now leads the Environmental Control group, where the group is responsible for the environmental and contamination controls, aseptic practices and engineering, training, ongoing monitoring, and environmental investigation for the Rocky Mount site. If you are interested in contacting Shiv, he can be reached at: shivn.singh@pfizer.com.

Contribute

Please fill out this form to provide an information update and/or to make a donation to the Department of Chemical Engineering at CCNY.

Name_____

Graduation Year & Degree from CCNY (if applicable)_____

Company _____

Address_____

City_____ State_____ Zip Code_____

Phone _____

Contact email_____

Signature_____Date_____

$_____ towards Fund for Excellence

$_____ towards Undergraduate Student Activities

$_____ towards Graduate Student Development

_____ A Gift in Kind

☐ My employer makes matching gifts.
Employer name: _____

_____

To leave a gift in your will, simply share this sentence with your attorney or financial planner:

"I bequeath $_____or_____% of my estate to the Department of Chemical Engineering, CCNY, Steinman Hall, T322, 140th Street & Convent Avenue, New York, NY 10031."

☐ I have included the Department of Chemical Engineering (CCNY) in my will.

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