Event Details:
Location: Leikam Brewing - 5812 E Burnside St, Portland, OR 97215
Date: Thursday, September 11th, Time: 6 pm to 9 pm
Keynote Speaker: James A. Frank, Oregon Health & Science University
Intro Speaker: Sajal Sen, Frank Lab, OHSU

Join us for our monthly lecture series at Leikam Brewing in Portland, featuring a dinner and talk by Dr. James Frank, Assistant Professor in the Department of Chemical Physiology & Biochemistry and the Vollum Institute at Oregon Health & Science University. This event includes a cocktail hour, catered dinner from a local Portland eatery, introductory lecture by Dr. Sajal Sen of the Frank Lab, and keynote lecture by Dr. Frank. This event is all ages welcome and encouraged.

Register for a dinner ticket before the event for $25/person ($15 for undergraduate students, high school teachers, unemployed members). $5 added for tickets purchased at the event.

Keynote Title: Chemical biology tools to control cannabinoid signaling pathways with light

Keynote Speaker Bio:
James Frank completed his bachelor's degree in Chemistry at the University of British Columbia in Vancouver, where he worked in the lab of Prof. Stephen G. Withers. There, he developed fluorescent glycosides for the detection of glycosidases in high-throughput screens. Frank then travelled overseas for an industry job at Corden Pharma LLC near Basel, Switzerland, where he developed a large-scale synthesis of a complex glycolipid pharmaceutical. He obtained his Ph.D. in Organic Chemistry at the Ludwig Maximilian University of Munich in Germany in the lab of Prof. Dirk Trauner, where his research focused on the synthesis/evaluation of photo-switchable lipids. In 2017, Frank joined the bioelectronics group of Prof. Polina Anikeeva at Massachusetts Institute of Technology, where he engineered fiber-based implants to apply these photochemical probes to control behavior in freely moving rodents. He joined the Vollum Institute in 2018 as a Vollum Fellow and Research Assistant Professor, where his research interests focus on the roles of lipids on cell physiology. In 2021, Frank was named Assistant Professor in OHSU's Department of Chemical Physiology & Biochemistry, with a joint appointment in the Vollum.

Keynote Talk Summary:
Endocannabinoid signaling involves cannabinoid receptors, lipid-derived ligands, and the metabolic enzymes that control their synthesis and degradation. The best-studied component is cannabinoid receptor 1 (CB1), an inhibitory GPCR abundant in the brain and responsible for marijuana's psychotropic effects. Yet, recent work has revealed a broader set of cannabinoid-sensitive targets—including stimulatory GPCRs, ion channels, and nuclear receptors—that respond to both endocannabinoids and phytocannabinoids to regulate diverse signaling pathways. Interpreting these pathways is challenging because most cells express multiple

receptor subtypes at distinct subcellular sites, while cannabinoid ligands are highly hydrophobic, leading to poor solubility, uncontrolled application kinetics, and membrane partitioning that prevents rapid signal termination. To address these limitations, our lab develops cannabinoid ligands that can be precisely controlled with light and targeted to specific cell types or subcellular compartments via bioorthogonal conjugation to protein tags. These tools enable reversible, spatiotemporal control over ligand activity and receptor signaling at genetically defined cellular targets. In this talk, we will present our latest efforts to design and apply photoswitchable and photocaged cannabinoid ligands, and their integration with SNAP- and HaloTag bioconjugation to dissect complex cannabinoid signaling networks in living cells and tissues. Ultimately, these molecular tools can be adapted for use in more complex systems, including in vivo studies in behaving rodents, to uncover the physiological roles of cannabinoid signaling with high spatial and temporal precision.

Intro Title: Optical Control of Endocannabinoid Signaling with NIR Photopharmacology

Intro Speaker Bio:

Sajal Sen completed his bachelor's and master's degree in Chemistry at the University of Calcutta and IIT Kanpur, respectively, in India. Sajal then moved to USA to obtain his Ph.D. in Chemistry at the University of Texas at Austin under the supervision of Prof. Jonathan L. Sessler. His PhD research was focused on the development of gold N-heterocyclic carbenes based novel anticancer drugs and their use as chemoimmunotherapy agents. After finishing his Ph.D. in 2021, Sajal joined the group of Prof. Alan Jasanoff at Massachusetts Institute of Technology as a Simons postdoctoral fellow. At MIT, he developed multimodal MRI probes, built on a porphyrinoid chemical framework, for investigating intracellular calcium and cholinergic activity in the brain. In 2024, Sajal joined OHSU as a postdoctoral fellow in the Frank Lab, where he is currently working on developing cannabinoid-based photoligands to study substance use disorder. Besides his research work, Sajal finds interest in following sports, watching scifi movies, and traveling to national parks across USA.

Intro Talk Summary:

Endocannabinoids (eCBs) are critical modulators of synaptic function that activate cannabinoid receptors (CBRs) in the central and peripheral nervous systems. Due to their complex pharmacology, eCBs can act through multiple CBRs and ion channel targets. Photopharmacology, which employs light-triggered molecules, offers powerful tools for studying eCB signaling with precise control and high spatiotemporal resolution. While our group and others have made significant advancement in this field though developing photocages that can be activated by UV-Vis light, application of these tools are often stymied by poor tissue penetration and photo-toxicity. To address these challenges, we have now developed heptamethine cyanine (Cy7)-based photocages carrying endocannabinoid payloads that can be released upon near-infrared (NIR) light activation. We have created a small library of these photocages by modifying substituents on the cyanine scaffold and selected a lead compound based on higher yields and optimized uncaging kinetics. Finally, using a cannabinol-appended

photocage (NIR-CBN), we demonstrated the ability to monitor eCB signaling through CB1 receptors in a cannabinoid-sensitive fluorescent biosensor assay with precise temporal control and subcellular resolution. Our future efforts will entail expanding the scope of these photocages in complex tissue and in vivo settings by attaching other relevant endocannabinoid payloads to better elucidate eCB – CB1 interactions and achieving even higher spatial control through optically cleavable targeted (OCT) technique.