

演題：**Translational Science:  
The Chemistry-Biology-Medicine Continuum**

講師：**Prof. Paul A. Wender**

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場所：北海道大学 理学部 5号館 5-203 大講堂

共催：日本化学会北海道支部

要旨：“Form follows function”: An aspirational goal of science is the creation of function including new therapies, diagnostics, catalysts, reagents, energy sources, environmental interventions, and materials. Function-oriented synthesis (FOS) addresses this goal, using synthesis-informed design to create structures (form) which exhibit function (e.g. a cure for cancer), often also inspiring new advances in synthesis (*Nature* **2009**, 197; *Accts Chem Res* **2008**, 40, **2015**, 752). Our FOS research integrates chemistry, computer-based design, synthesis, biology, medicinal chemistry and material science into studies directed at synthetic, biological and clinical problems (functional goals). This lecture will provide examples of FOS directed at the design, synthesis and evaluation of agents that represent a platform for enhancing antigen-targeted cancer therapies (*Science* **2017**, 218; *Nature Commun* **2020**, 1879), agents that cure mast cell tumors in canines (*Nature Chem.* **2022**, 1421) - now FDA approved for treating human soft tissue sarcomas in humans, agents that are effective against Gram-positive and Gram-negative resistant bacteria (*ACS Infectious Dis* **2024**, 384), leads for the eradication of HIV (*Nature Commun* **2022**, 13:121) and organo-catalytically derived drug delivery systems (materials) for the transport of mRNA (*PNAS* **2017**, E448; **2018** E5859; *JACS* 2019, 8416), circRNA (*Nature Biotech* **2022**, 262; *PNAS* **2023**, E2302191120), siRNA (*Bioconjugate Chem* **2023**, 673) and DNA (*Biomacromolecules* **2018**, 2812) across biological barriers. These studies have led to a Covid vaccine (*ACS Central Sci* **2021**, 1191), a prophylactic vaccine and a cure for cancer in mice (*PNAS* **2018**, E9153), a treatment for metastatic cancer in mice (*J Cancer Res* **2019**, 1624) and strategies to address global food security. Exemplifying pure discovery science, our step-economically produced RNA/DNA delivery systems (CARTs) have been found to exhibit exceptional organ (97% lung, 96% spleen) and cell tropism without a targeting ligand (*Nature Commun* **2023**, 6983) and have been used to achieve an important engineering goal, the “synthesis” of CAR-T and CAR-NK cells from their non-CAR progenitors (*Blood Advances* **2020**, 4244; *JACS* 2024).

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