

**Making proteins do unnatural things with unnatural amino acids:
from non-native-PTM to nanotechnology.**

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The ability to introduce new chemistry into proteins with precision through genetic code reprogramming has allowed the sampling of new functional space not available via the 20 natural amino acids. This includes novel routes to protein modification through a process we term “non-native post-translational modification”. Using such an approach we can modulate a protein’s properties in ways not available through classical PTM approaches. An area ripe for exploitation is the controlled bottom-up assembly of proteins and protein bionanohybrids. In my talk I will demonstrate how the introduction of new reactive handles at designed positions can be used to interface proteins with other biological molecules (proteins and DNA) and non-biological nanomaterials (CNTs and graphene) with high precision and specificity. By forming intimate interfaces between the proteins and the second component system, we demonstrate that functional coupling occurs between the two systems leading to new emergent properties.