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Specificity, promiscuity, and the structure of complex information processing networks CHRISTOPHER MYERS, Cornell University — Both the top-down designs of engineered systems and the bottom-up serendipities of biological evolution must negotiate tradeoffs between specificity and control: overly specific interactions between components can make systems brittle and unevolvable, while more generic interactions can require elaborate control in order to aggregate specificity from distributed pieces. Complex information processing systems reveal network organizations that navigate this landscape of constraints: regulatory and signaling networks in cells involve the coordination of molecular interactions that are surprisingly promiscuous, and object-oriented design in software systems emphasizes the polymorphic composition of objects of minimal necessary specificity [C.R. Myers, Phys Rev E 68, 046116 (2003)]. Models of information processing arising both in systems biology and engineered computation are explored to better understand how particular network organizations can coordinate the activity of promiscuous components to achieve robust and evolvable function.

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