



Colloquium

Inaugural Lecture

Friedrich Stricker & Yuval Wigderson

ISTA

Host: Björn Hof

Friedrich Stricker | Beyond On/Off: Multistate Molecules and Materials
A slime mold with no brain and no nervous system can still remember: *Physarum polycephalum* reinforces the tubes of its cytoplasmic network along paths that once carried nutrient flow, so a stimulus encountered minutes ago changes how the organism responds to a stimulus now. History is written directly into the material's structure. Synthetic materials have rarely matched this — not because they can't respond to a cue, but because most are built to give one answer, not many, and to forget the moment the stimulus is gone. At the root of that limitation is a simple fact about energy landscapes. In a binary switch, a stimulus drives the system along one path — on to off, off to on — so the response is always the same regardless of how it got there. In a multistate system, the same stimulus can drive the system along different paths depending on kinetics, local environment, and history: the landscape stops being a fixed two-well problem and becomes something the material can be routed through. Getting there means tracing a single design logic across three length scales. At the molecular level, multistate photoswitches give us control over kinetics, absorption, and mechanistic pathways — the raw vocabulary of reactivity. Organizing those switches within ordered, multiphase materials — often liquid crystal elastomers — lets us govern how changes at the molecular level propagate into changes in structural order. And by shaping how these material meet a stimulus — through its geometry — we convert molecular-scale reactivity into coordinated, purposeful behavior at the macroscale. Molecular design, material organization, and geometry aren't separate levers; each constrains and amplifies the next, and it's this chain that lets us engineer function rather than just response. This chain — molecule, assembly, geometry — is a first step toward a larger goal: materials in which a past stimulus leaves a physical trace that biases the path taken by future stimuli, built not from external control but from molecular architecture that intrinsically encodes state. Programming reactivity, assembly, and geometry together is how we move from isolated switches to physically intelligent, multifunctional matter.

Yuval Wigderson
| Finding Structure in Chaos
Pareidolia refers to the human tendency to see patterns in unstructured chaos. Examples of pareidolia can range from the benign (seeing constellations in the night sky) to the destructive (gambling one's savings on the imagined patterns of a roulette wheel's outcomes). However, sometimes the patterns really are there! In fact, in many cases, we can prove this mathematically: no matter how complex and chaotic a system may seem, it must contain some given structure within it. In this talk, I will give a gentle introduction to Ramsey theory, the fascinating area of mathematics that

studies such theorems, and discuss some of the major questions we still cannot answer.

Monday, October 5, 2026 11:30am - 12:30pm

ISTA | Central Building | Raiffeisen Lecture Hall



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