Concluding Panel

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1. When do circumstellar disks first form and how?

ALMA will provide a detailed picture of the collapse process (spectroscopy) and reveal the role of magnetic fields (polarimetry). Are first-principles theories lacking any key ingredients? ALMA can probe deep into protostellar envelopes to constrain size, mass, kinematics of compact structures. Related to core properties?

2. How does gas evolve in circumstellar disks?

ALMA will complement optical and infrared diagnostics, especially for early stages. Will ALMA show us how disk accretion works? We’ll need large and unbiased samples spanning a range of ages. (And we really need to develop ways to measure disk gas masses.)
3. What is the origin of the gaps and holes in "transition disks"?

Multi-wavelength observations have the potential to disentangle the effects of grain growth, photoevaporation, and companions. Will ALMA imaging show the same diversity as scattered light? (Have we been focused on special cases too much?)

4. What are the observational signatures of embedded planets in circumstellar disks?

Can observations of gaps, holes and asymmetries in disks allow us to unambiguously constrain the properties of planets? Disk-planet interactions and their observational consequences will need further theoretical development. Will ALMA directly detect circumplanetary disks? orbital motion?
5. What is the process of grain growth and evolution?

Does substantial grain growth happen early, in dense cores? Are the observed millimeter dust rings and asymmetries due to particle traps (that seem to solve so many problems)? Do $\beta(r)$ and disk gas/dust disk size discrepancies imply radial drift?

6. Can we fully ascertain the physical and chemical processing of planetary materials, and connections to meteorites, planetesimals, comets, and KBOs?

Cosmochemists know incredible details about the formation of the Solar System, including timescales and isotope fractionation. The challenge will be to translate this information to astronomical signatures in (other) disks, especially for the earliest stages ($t=0$?).
7. What is the full extent of disk chemistry and what is the detectable limit of molecular material in disks?

What chemical inventory do disks inherit from earlier stages? Will ALMA detect molecules in disks more complex than $H_2CO$? Can ALMA observations connect to the chemistry of the inner AU? Note emphasis on basic understanding vs. elaborate networks—ALMA is going to make us all astrochemists!

8. What do millimeter continuum and spectral line observations tell us about Solar System bodies?

ALMA will be invaluable for probing processes that shape surfaces, atmospheres, and compositions of planets, moons, comets, KBOs.
“Let’s Rock with ALMA!”

Mahalo to all 2013 Rocks! organizers and participants.