Ages of “Singles” vs “Multis”: Predictions for Dynamical Sculpting over Gyr in the *Kepler* Sample

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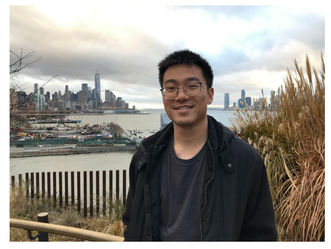
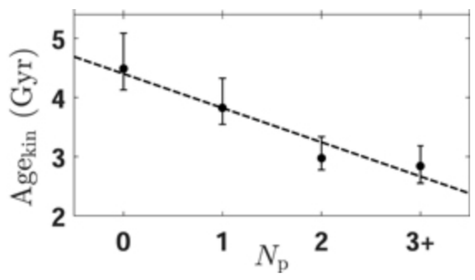
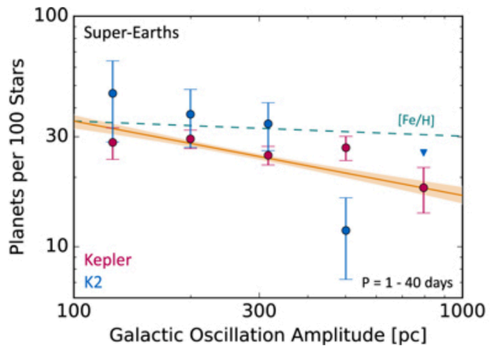
Scan for virtual poster and repo!



What are we probing?

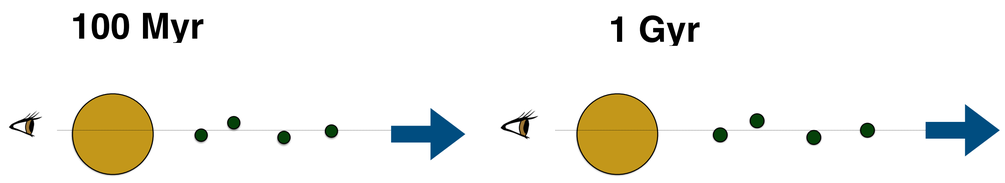


Chen+ 2021

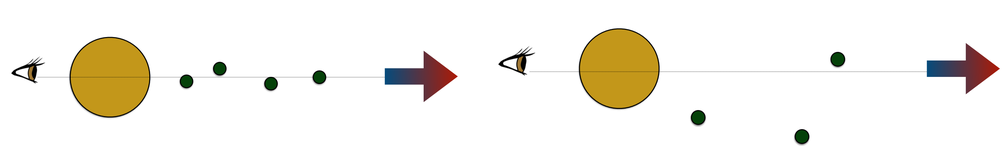


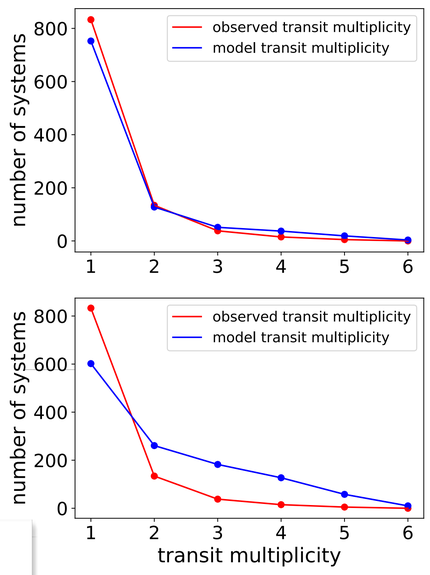
Zink+ 2023

Architecture is locked in at birth



Ongoing dynamical sculpting

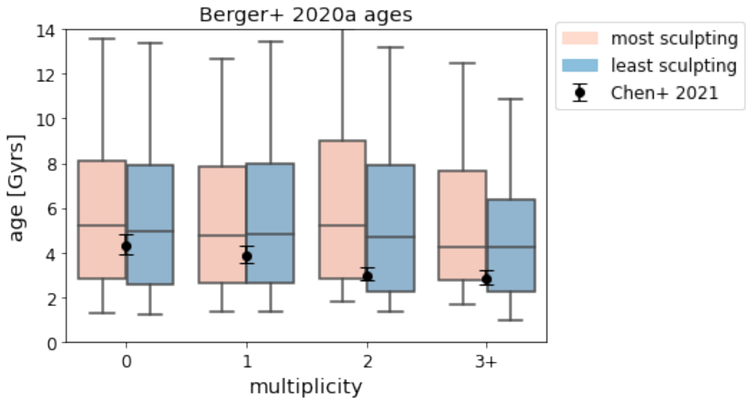




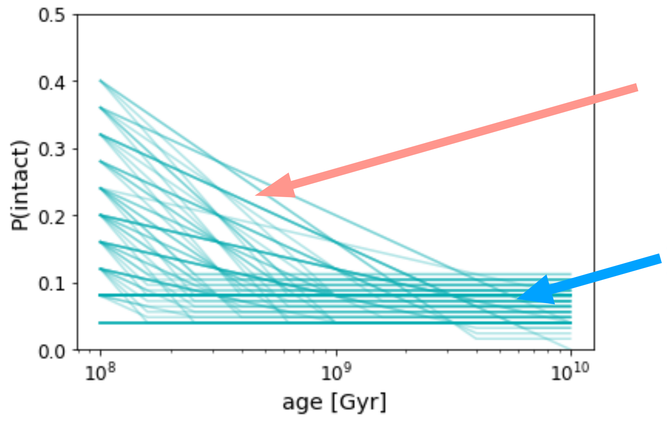
Lam & Ballard, submitted

Do planetary system multiplicities and architectures evolve on Gyr timescales? We explore the hypothesis of **dynamical sculpting**: as dynamical temperature increases, planet orbits get perturbed to higher eccentricities and inclinations, or they may experience orbit crossings that lead to ejections.

What did we find?



Lam & Ballard, submitted



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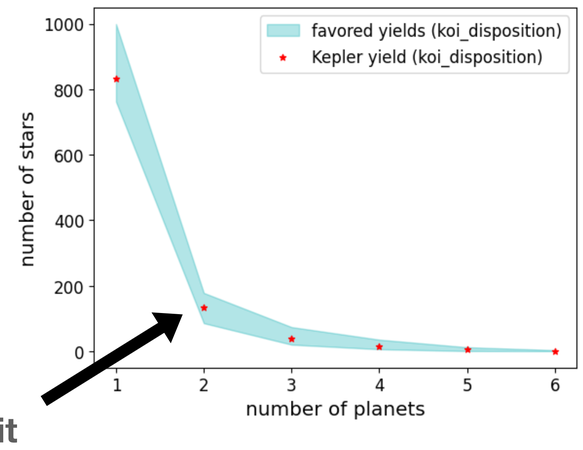
Favored: the fraction of dynamically cool (“intact”) systems changes over Gyr

Also favored: the intact fraction starts lower but doesn’t change after 100 Myr

Both models have transit multiplicity yields resembling *Kepler*’s!



Is there actually a difference in multiplicity between young and old systems? Not using the isochrone ages and their errors from the Berger+ 2020a *Gaia-Kepler* crossmatch.

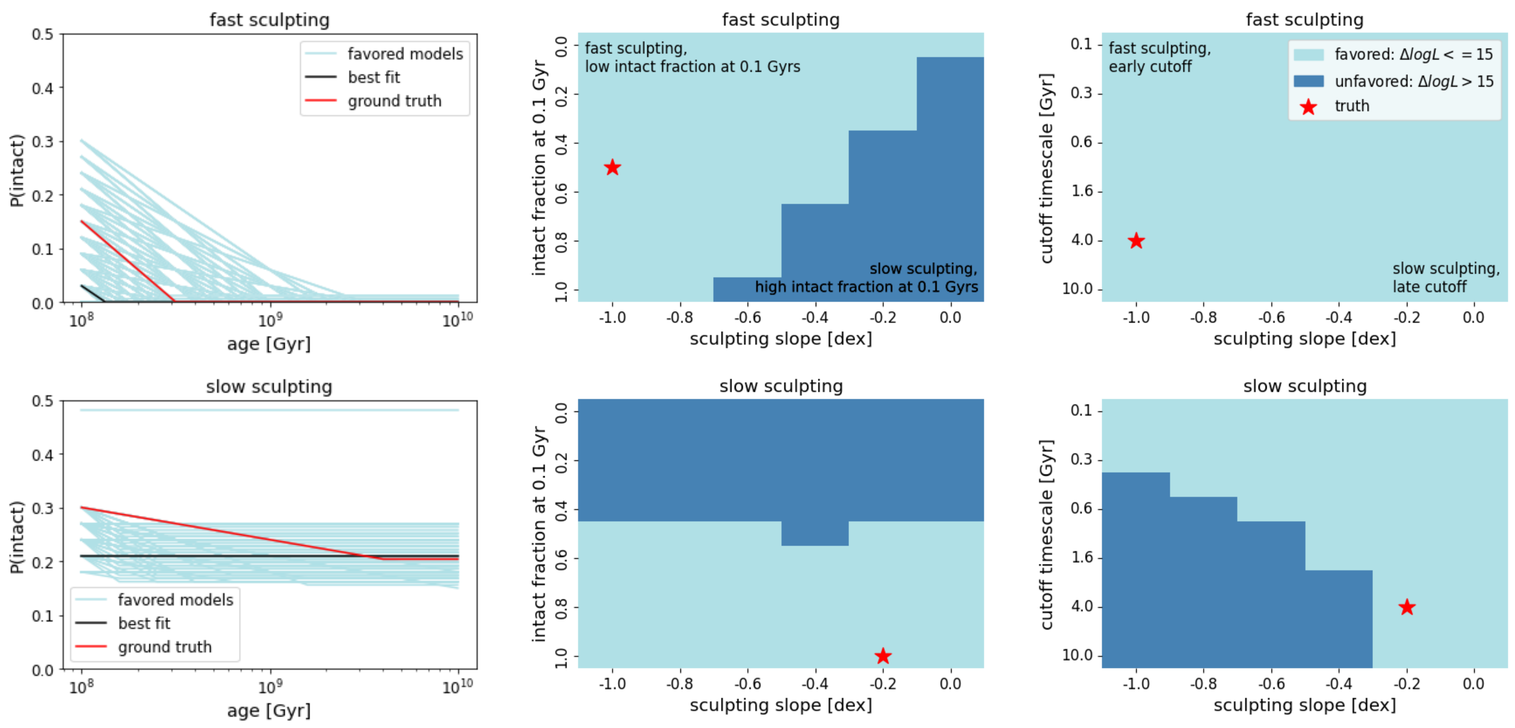
Yet, there are many different dynamical sculpting laws that match the *Kepler* transit multiplicity. Thus, transit multiplicity alone is insufficient for constraining Gyr sculpting. We may need some law that turns on later, or it may imprint through some other observables.

How did we do it?

We ran injection-recovery tests on different sculpting laws.

Depending on the ground truth, we can rule out different amounts of parameter space.

Across the board, we found that the primary driver of a model’s likelihood is the present-day intact fraction it yields.



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Acknowledgments

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