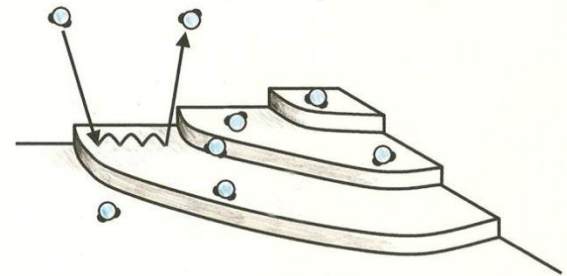
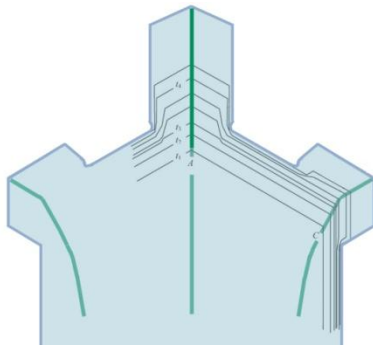


Snow Crystals

Order and mystery at the microscale

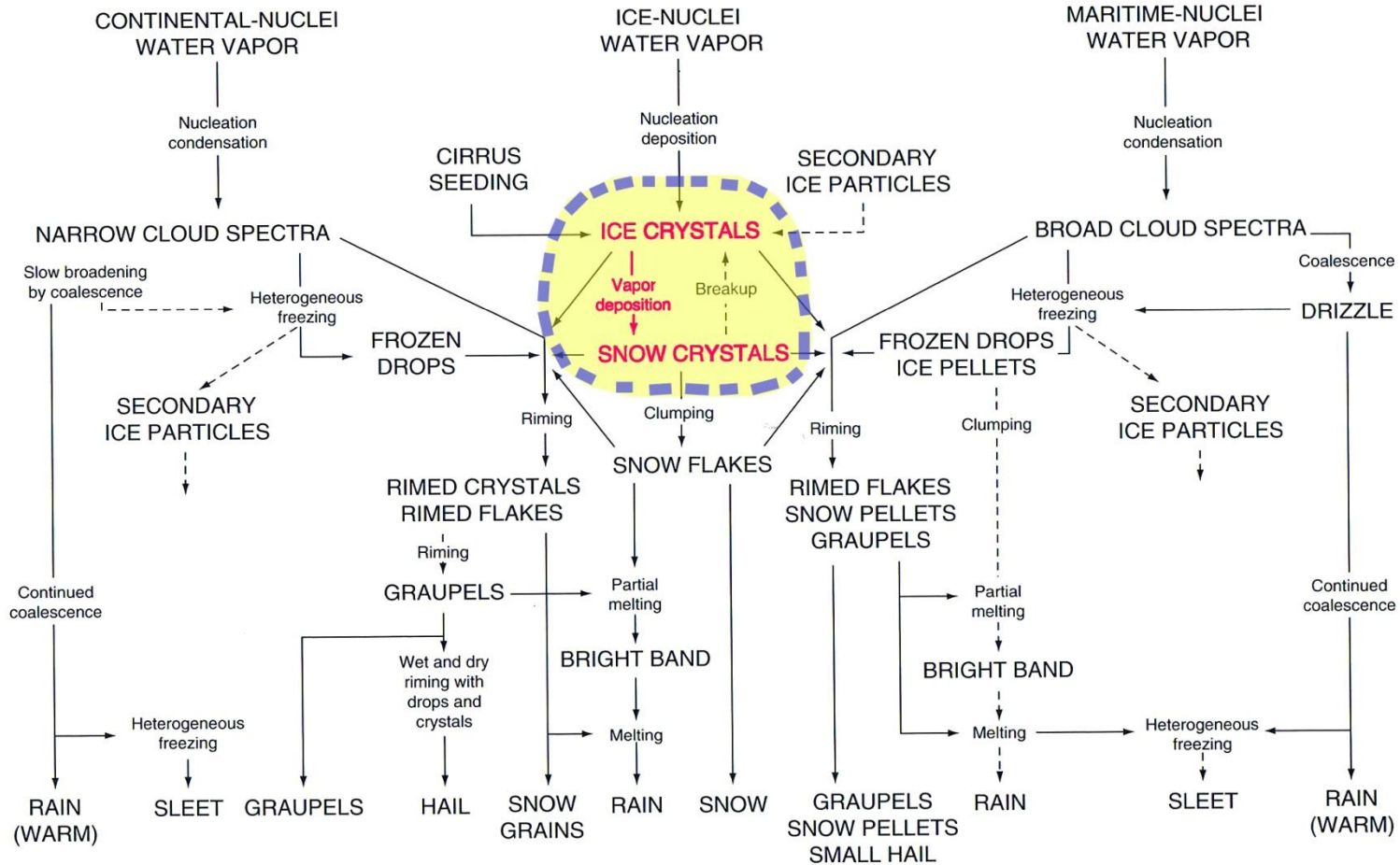


Jon Nelson
22 October 2012
St. Cloud, MN



snow is

Vapor deposition of ice

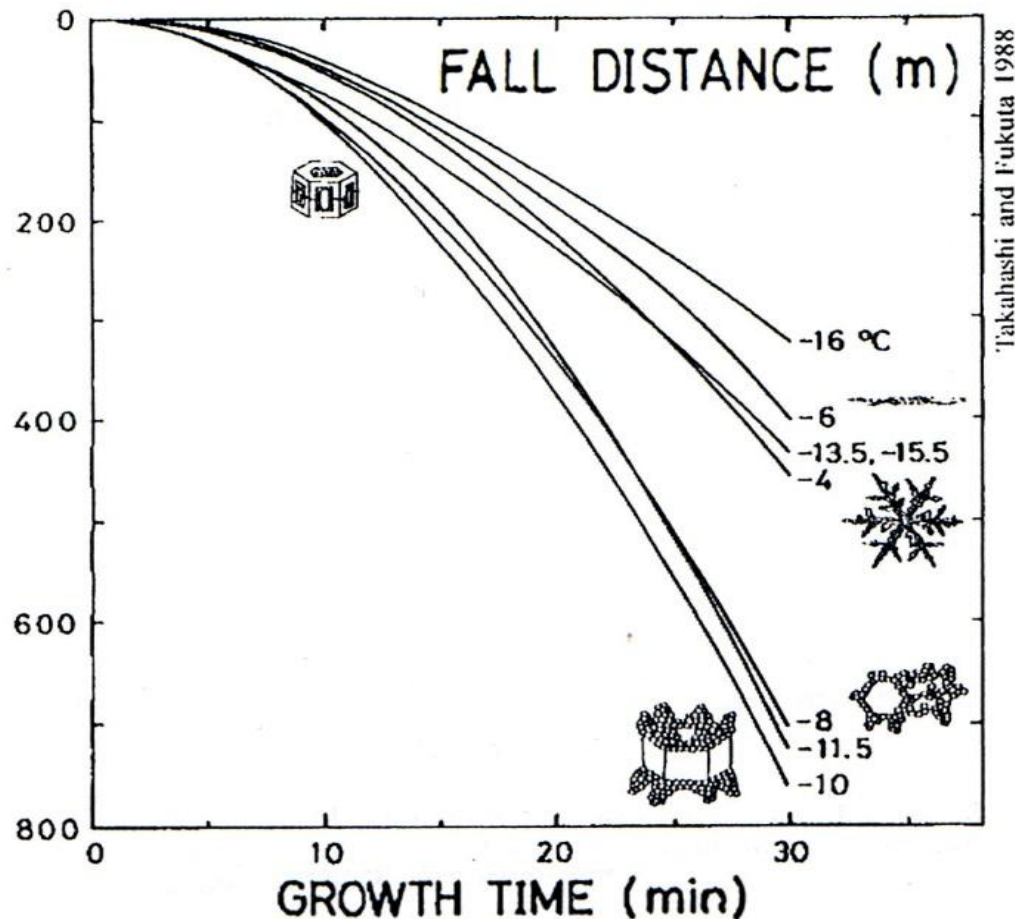


From Braham & Squires 1974; Straka 2009

A central role in precipitation



Crystal fallspeed vs habit (shape)

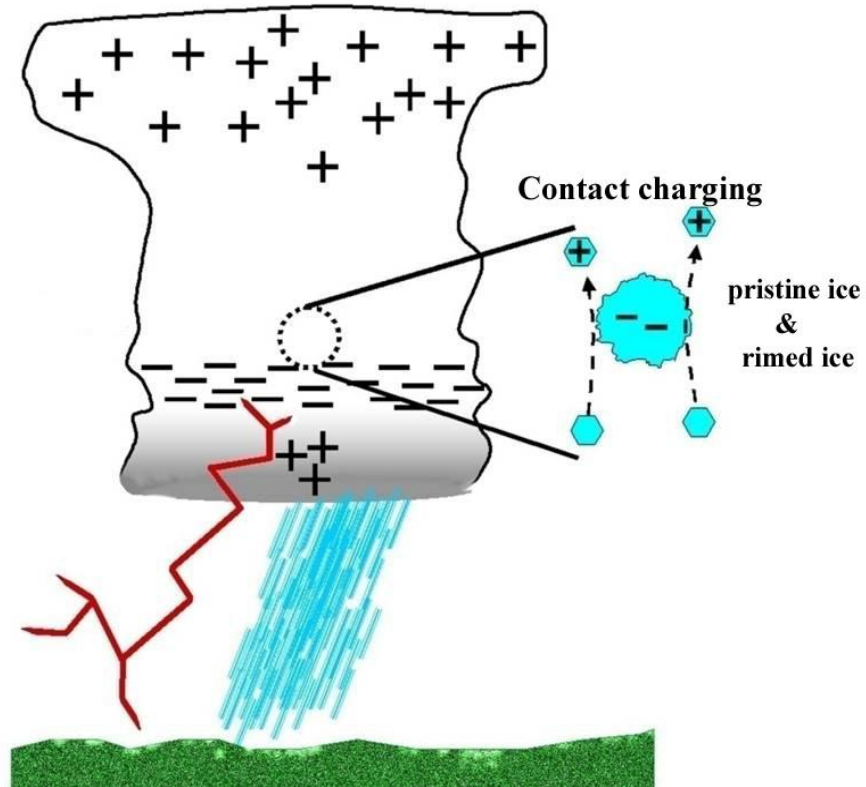


Takahashi and Fukuta 1988

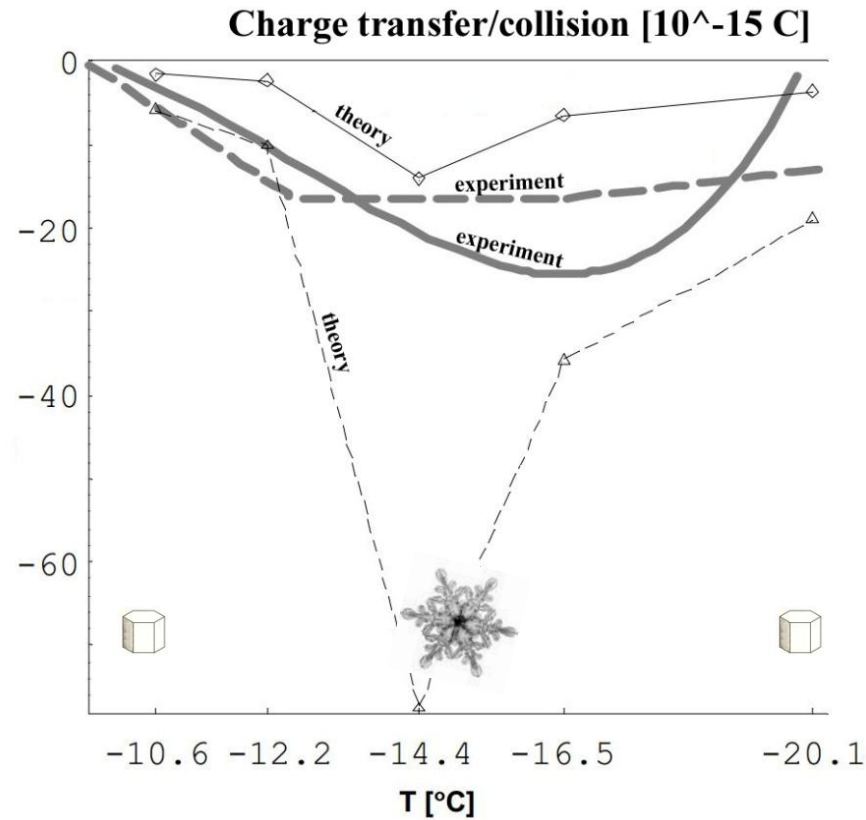
Fallspeed (and thus precipitation type) depends on crystal habit



Vapor deposition can electrify thunderstorms



Habit (or growth rate) affects charging



Maximum thunderstorm charging for thinnest crystals



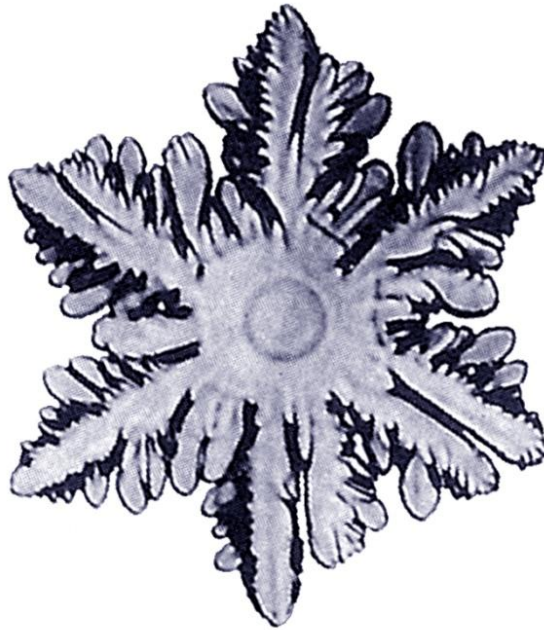
Habit affects radiative transfer



and atmospheric optics



Why does it grow like that?



from liquid



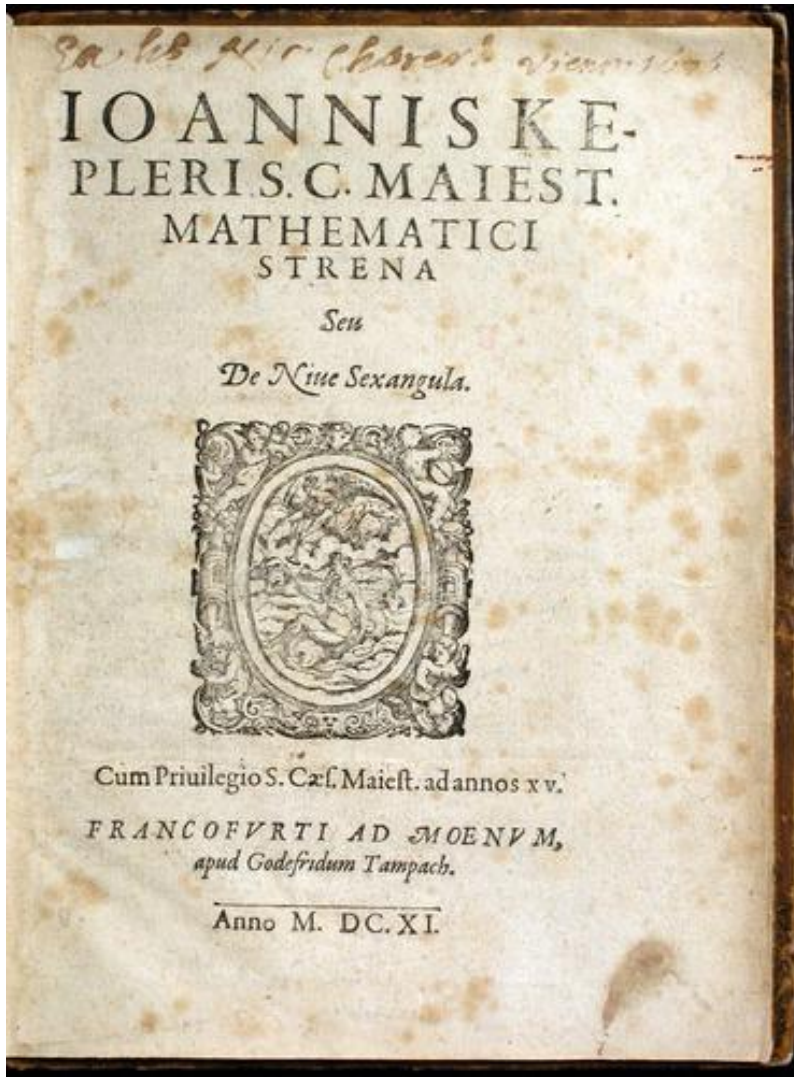
from vapor (snow)

Photos: T. Sei, T. Takahashi

Dendritic snow crystals obviously differ from other dendrites.

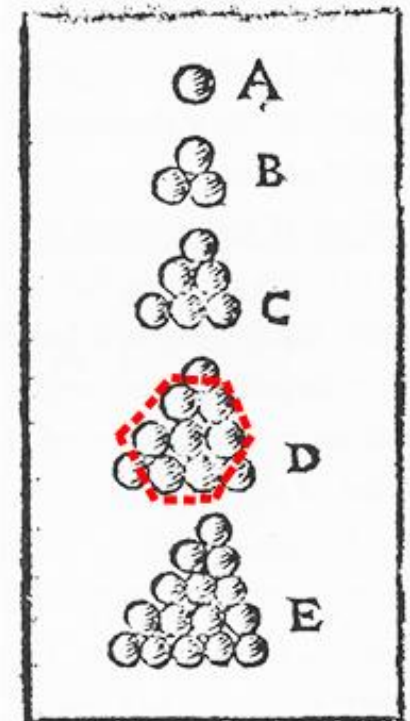
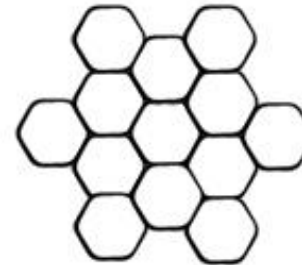
Snow has much greater order.





Why thin and flat?

Why six “corners”?

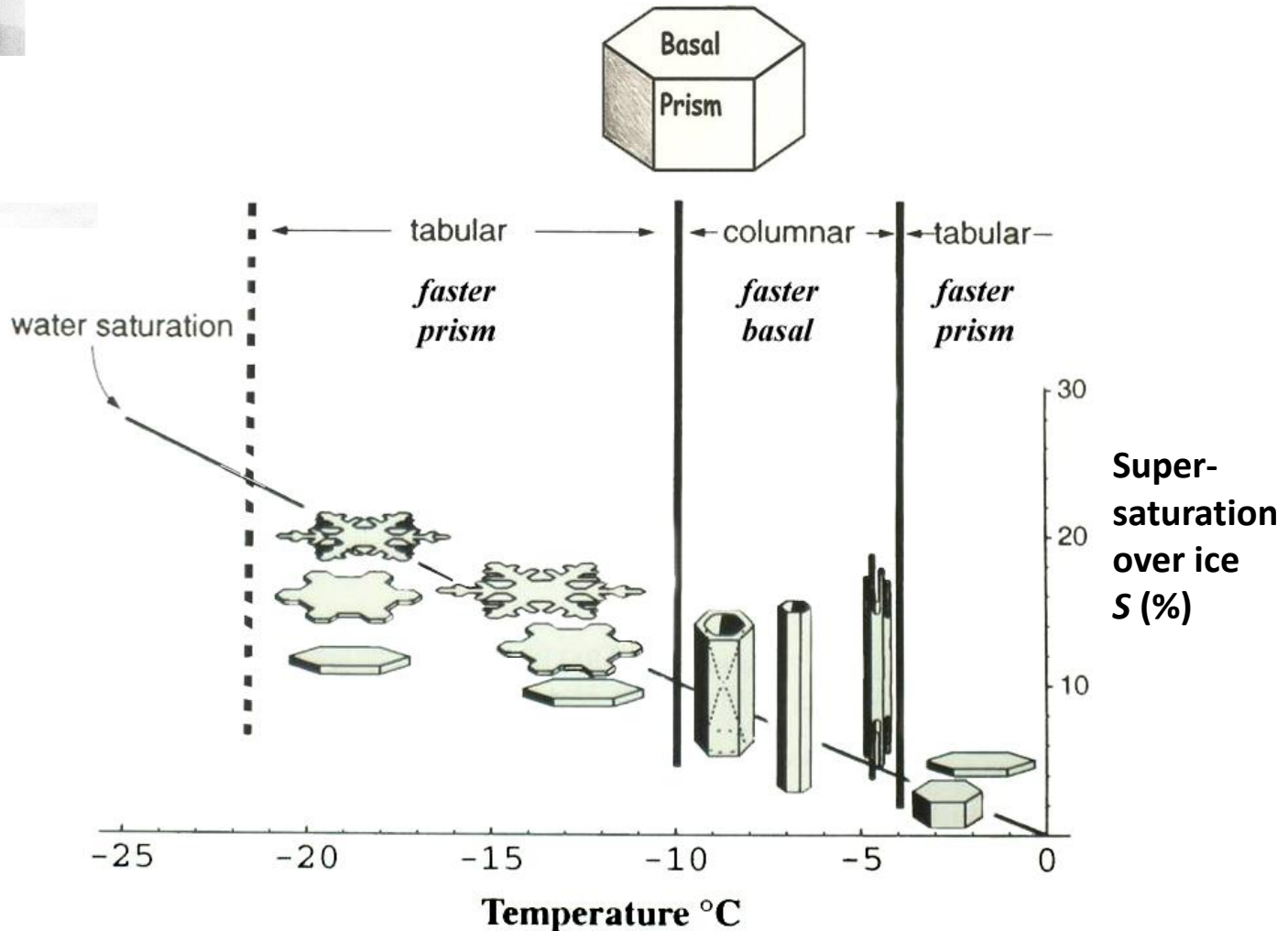


Kepler's "New Year's Gift Concerning Six-cornered Snow" (1611)





Nakaya habit diagram (1930s)



Questions

- Why thin and flat?
- Why six “corners”?
- Why the tabular—columnar transitions?
- Why do branches and sidebranches form?
- Why do they have so much variety?
- Do they really carry messages?



Order

