

Diagrams of Ice Growth Environments Designed for Educational Use

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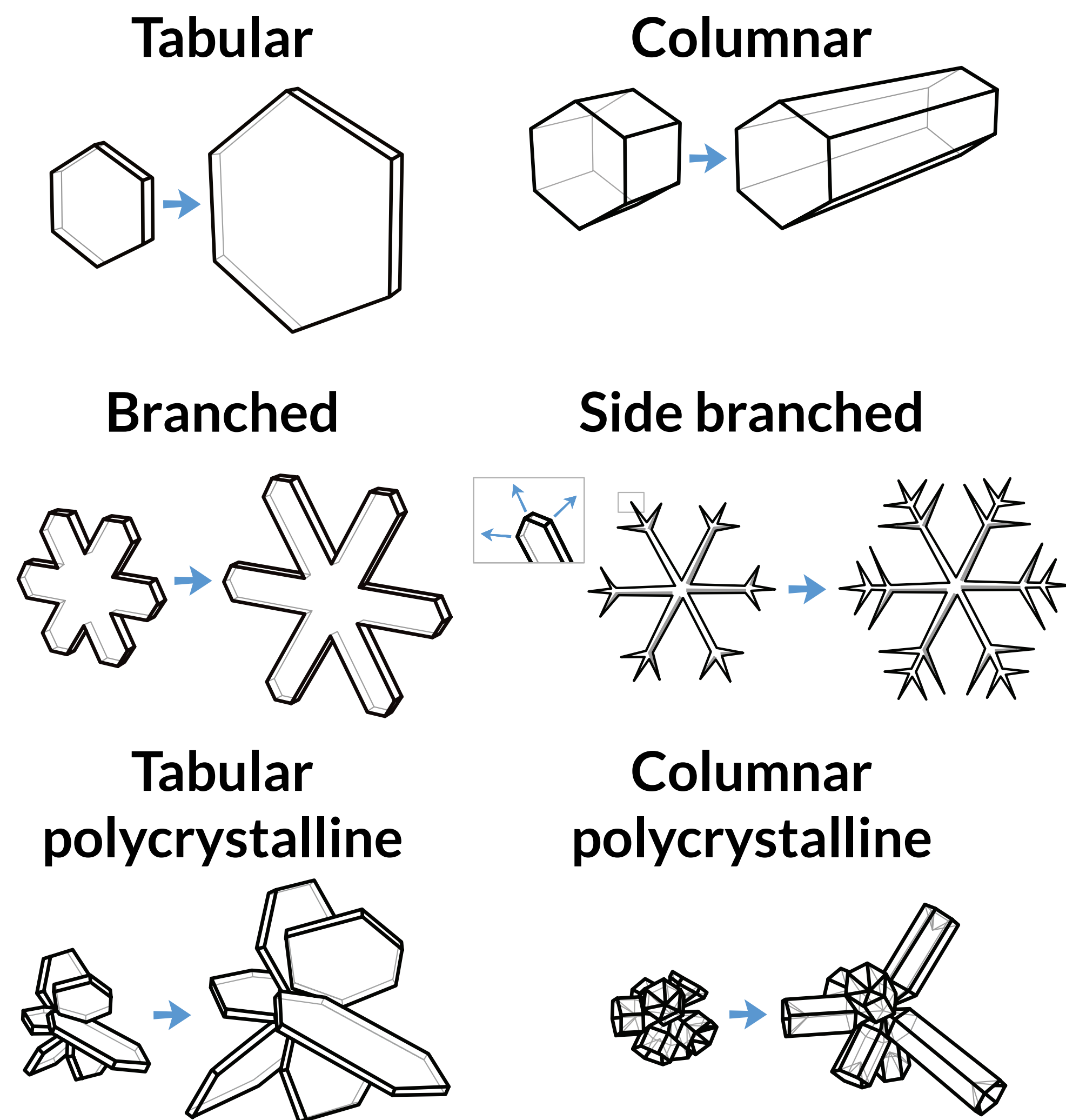
Key points

- Diagram emphasizes six ice growth forms as a function of decreasing temperature and RH_{water}
- Connecting nomenclature to physical processes builds intuition for education and research

Background

- Ice habit diagrams plot ice shapes on temperature and moisture axes
- A web search will return diagrams with substantive differences due to inconsistent terminology and errors in source materials
- We present simplified ice diagrams for education based on the state of the science from in situ data and laboratory measurements¹⁻³

Ice growth forms



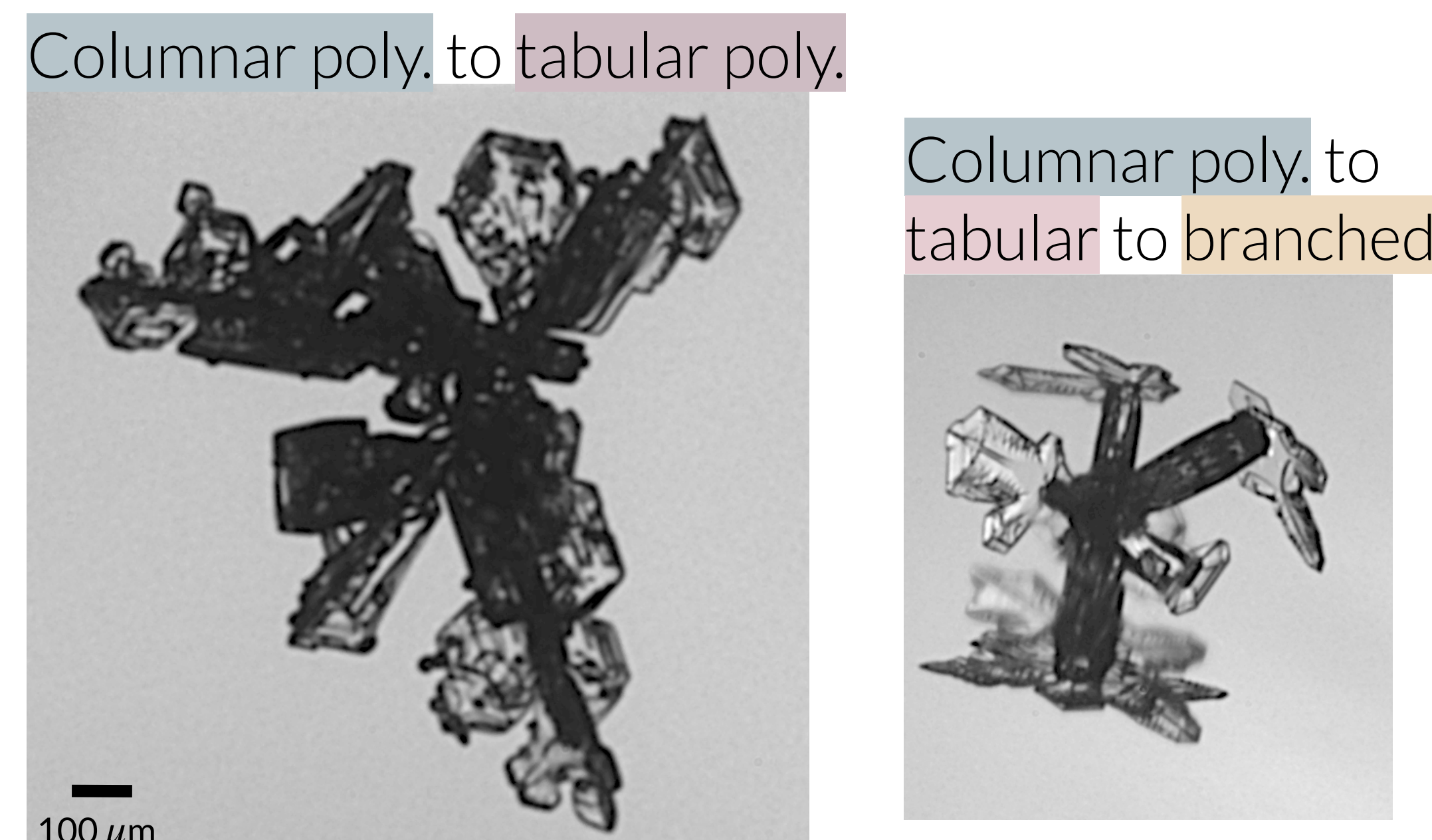
The **ice growth form** is the main direction or growth pattern of a crystal, which arises directly from crystal surface processes.

Sequences of growth forms

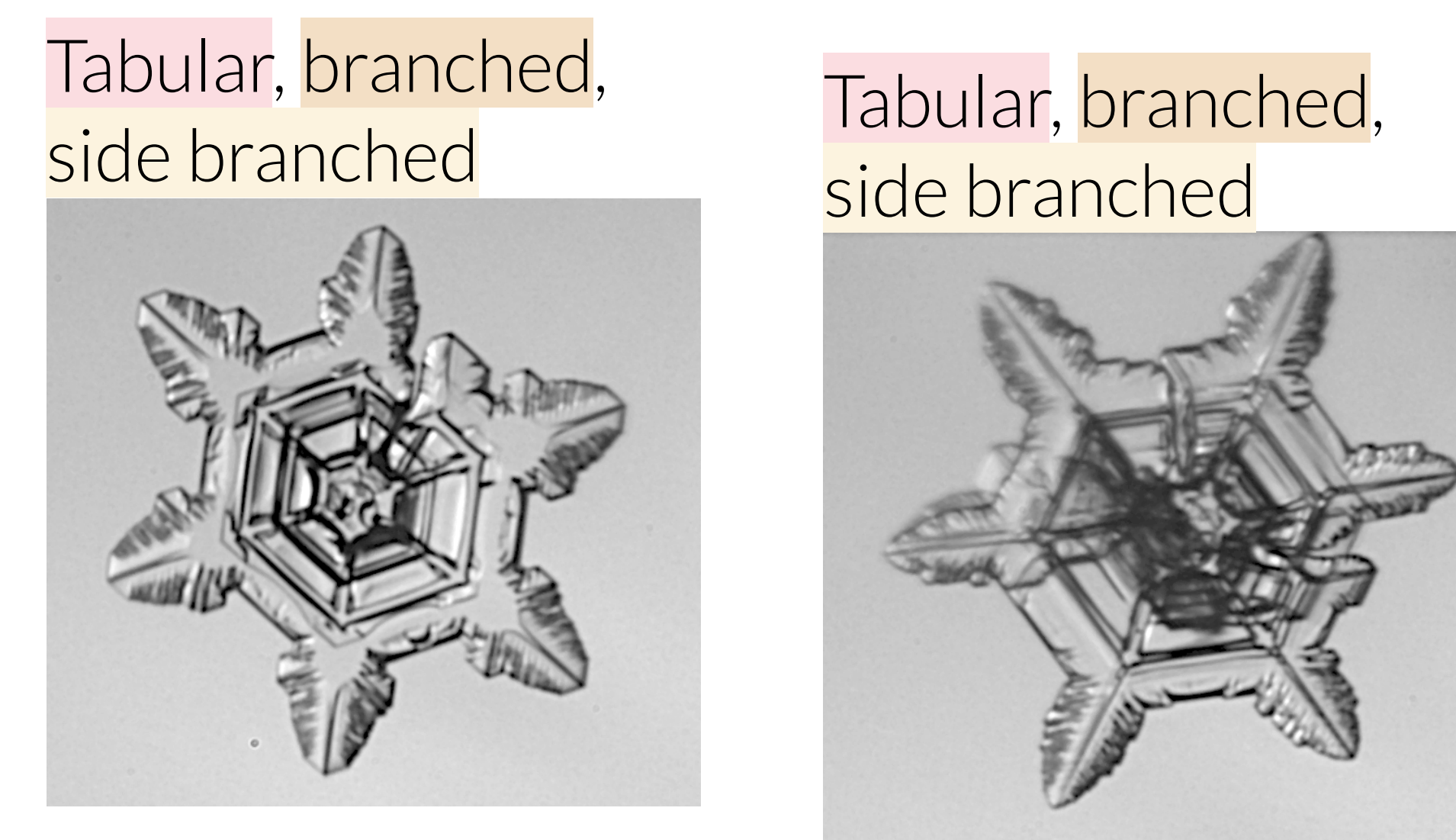
- A precipitation-sized crystal undergoes a sequence of growth forms as it falls through different ambient conditions
- The particle shape when observed is a time-integrated result of this sequence
- High-resolution imagers like the Karlsruhe Institute of Technology Particle Habit Imaging and Scattering Probe (PHIPS)⁴ reveal sequential growth

Images from the Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS)⁵ field campaign

Sequences beginning with polycrystalline growth forms produce intricate, highly complex particles



Crystals featuring branched or side branched forms often initiate as tabular growth with local moisture subsequently enhanced by ventilation or updrafts



Sequences with columnar growth followed by tabular or branched growth yield "capped" columns

