

TUNDRA POLLEN REFERENCE LIBRARY

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Introduction

This document serves as a reference library to document the pollen morphology of 36 Arctic species. We aim to compile pollen images of the most common plant species found at Toolik Field Station in order to make a reference library that is accessible to scientists and the general public for aid in research. Each documented species contains light microscopy images and Scanning Electron Microscopy (SEM) images of the pollen grains, with a few exceptions that only contain images from one of the microscopy techniques.

Plant species have unique pollen morphologies, including the size, shape, and surface of the grains, along with other unique features. These aspects inform dispersal dynamics, viability, and germination of the pollen grain. SEM is a crucial technique to visualize pollen morphology, providing much more surface detail and resolution than light microscopy techniques. Its high magnification and ability to visualize three-dimensional structure allow fine features to be clearly distinguished, enabling more accurate comparisons and more precise identification.

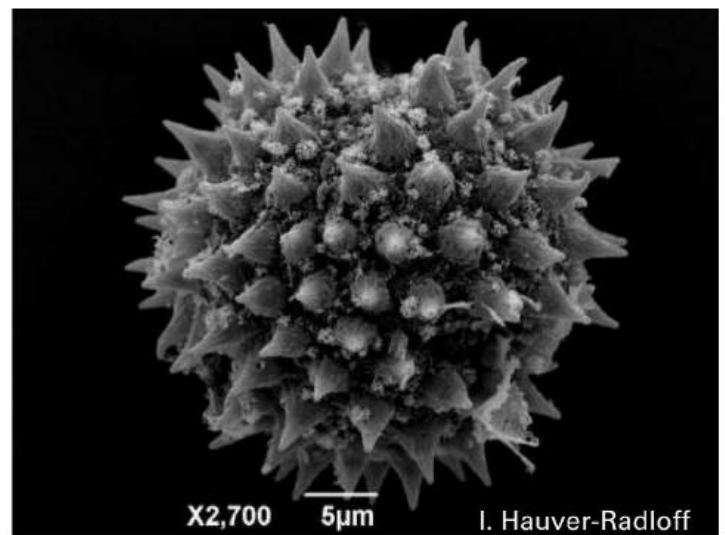
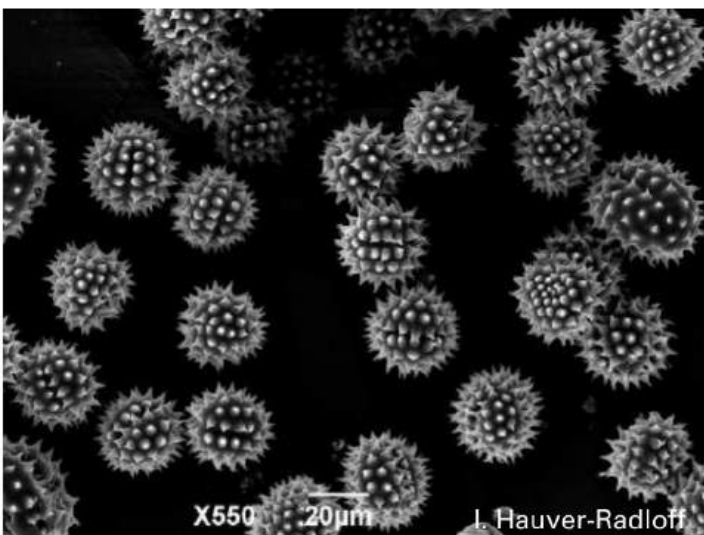
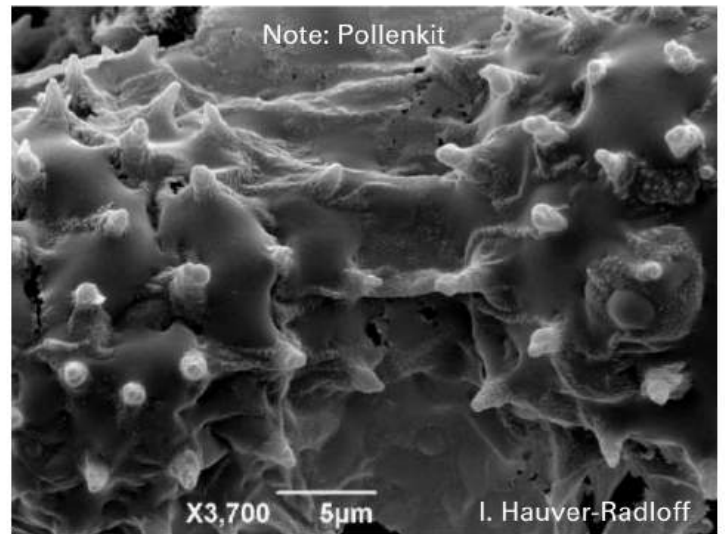
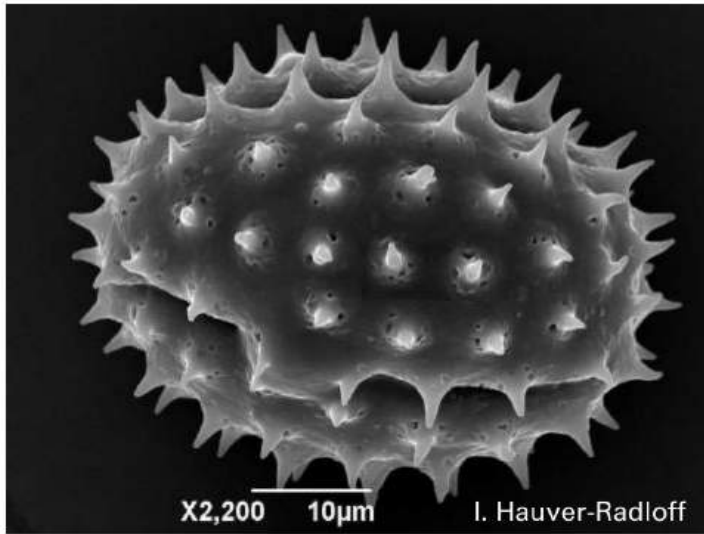
The following steps were used to create the SEM images:

Samples were collected in the summers of 2021 and 2025, and SEM methods were carried out within six months of collection. For each species, flowers were collected when anthers had visible pollen. 3-15 flowers of each species were placed in glassine envelopes. For each dry pollen specimen, a second sample was stored in ethanol to prevent shriveling. The ethanol (wet) samples were initially placed in 70% ethanol, then replaced with 80%, then 90%. Each sample was dried using a critical-point dryer, then the anthers were fixed onto carbon stubs and sputter-coated. Most images used Scanning Electron Imaging (SEI), and some used a combination of SEI and Backscatter Electron Imaging (BEI).

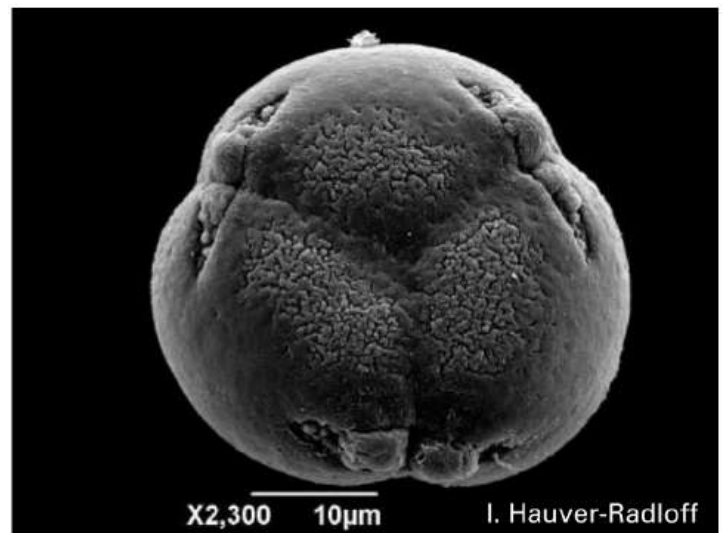
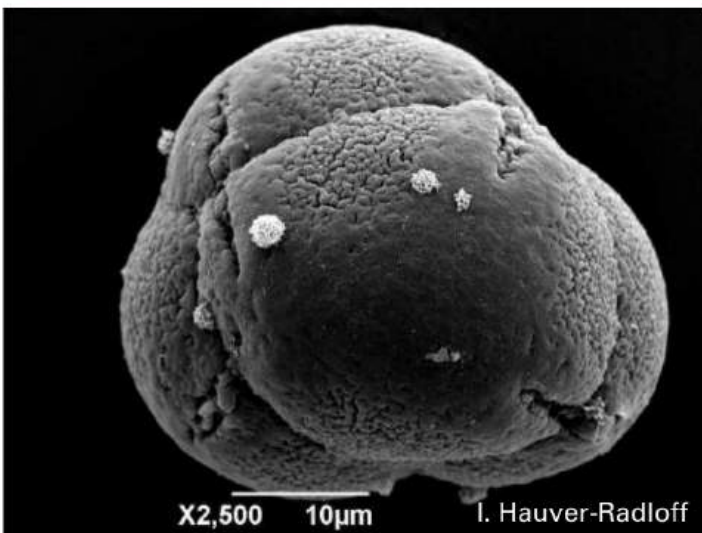
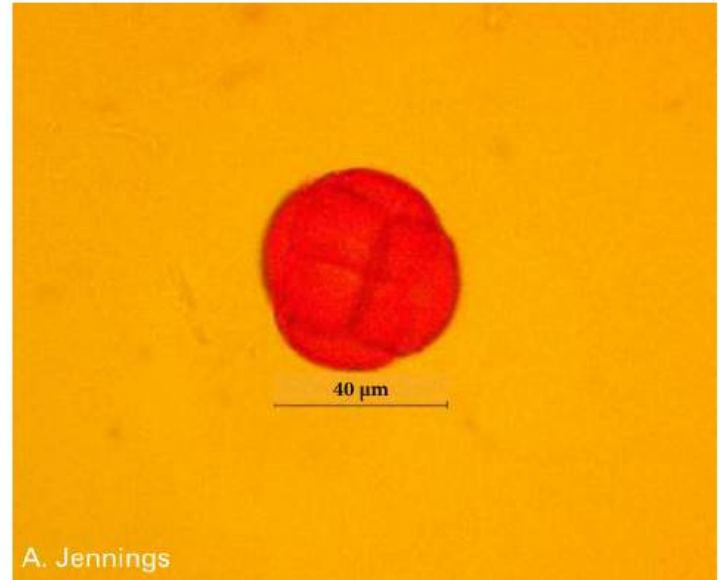
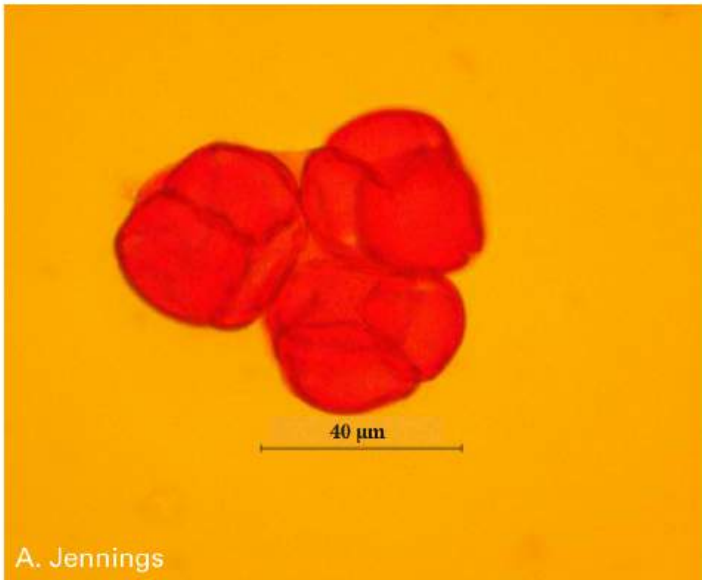
Acknowledgments

First and foremost, we would like to thank our research advisor Dr. Roxaneh Khorsand. The SEM work would not be possible without the direction and guidance of Dr. Ron Hathaway in the SEM lab at Colorado College. We would like to thank Sabrina Ng and Jane Watson for their help collecting pollen samples during the 2025 season. The following Colorado College students contributed to the images in this guide: Alex Jennings, Caroline Brose, Lucy Zicarelli, Matt Luzincourt, Thad Allen, Hayes Henderson, and John Feigelson. Funding was provided by NSF Office of Polar Programs (1836898) as well as various entities at Colorado College including the Department of Organismal Biology and Ecology, the Dean's Office, and the Provost's Office. We thank Dr. Jeremy May and members of the Oberbauer Lab at Florida International University for their invaluable work. We are also grateful for fieldwork and logistical support provided by the director of the Environmental Data Center, Dr. Amanda Young, as well as other EDC staff. This research was conducted on the unceded territories of several Indigenous Peoples, including the Nunamiut, Gwich'in, Koyukuk, and Iñupiaq. We acknowledge their enduring connection to this land and express our appreciation for the opportunity to work on their land.

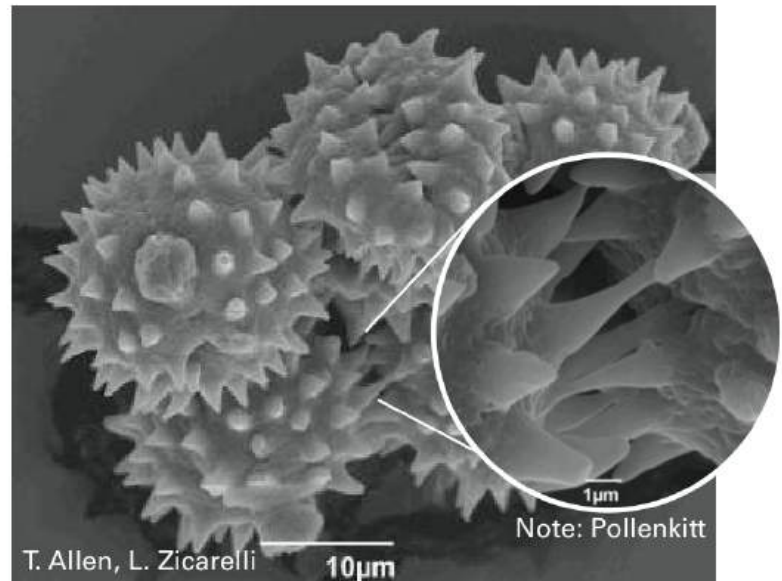
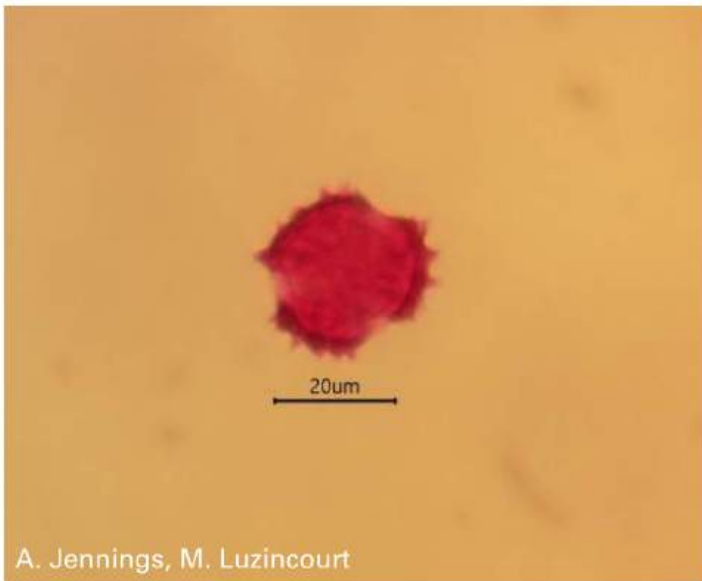
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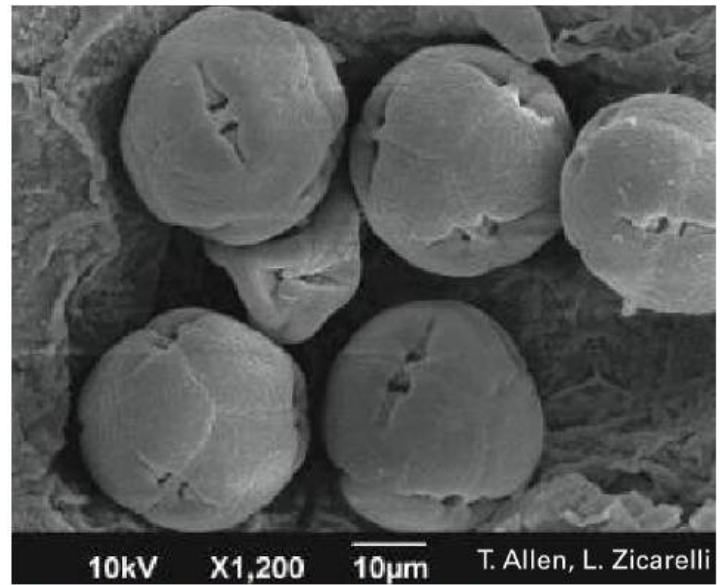
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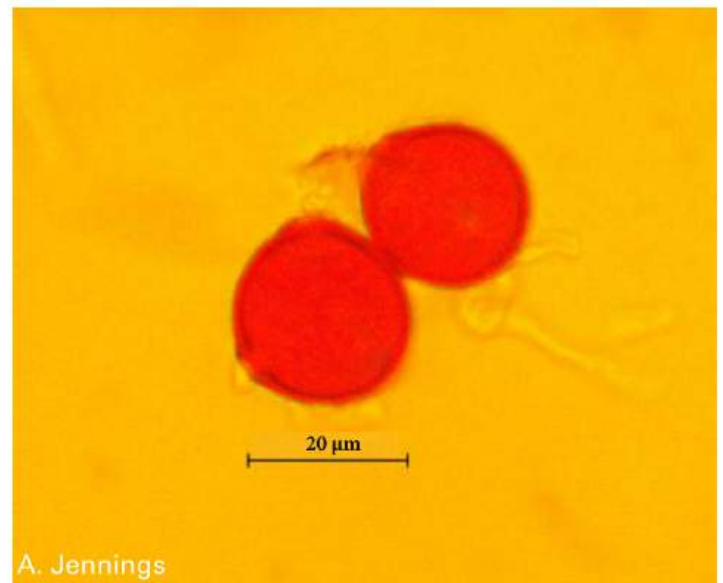
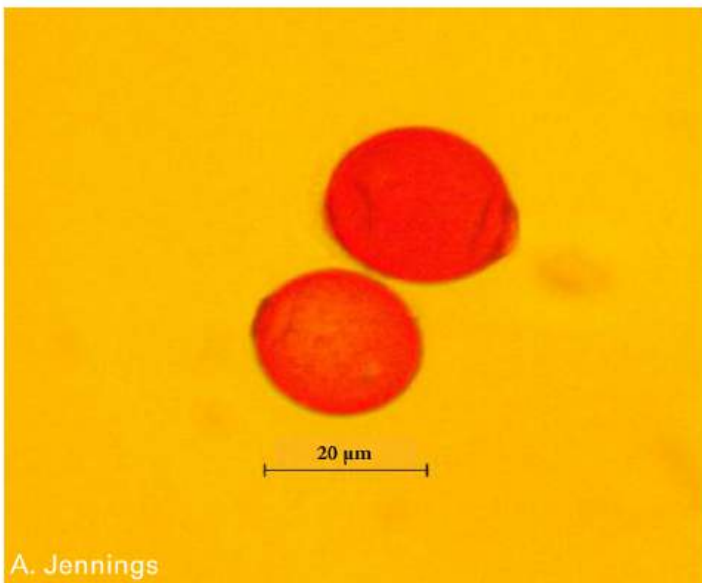
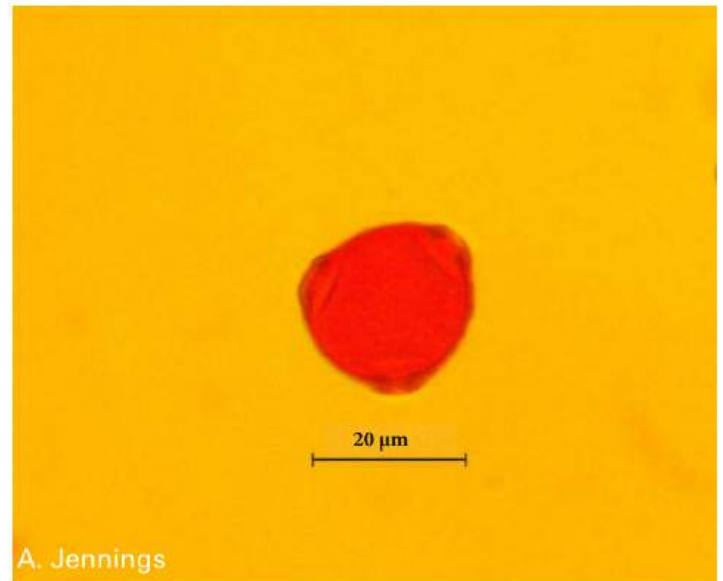
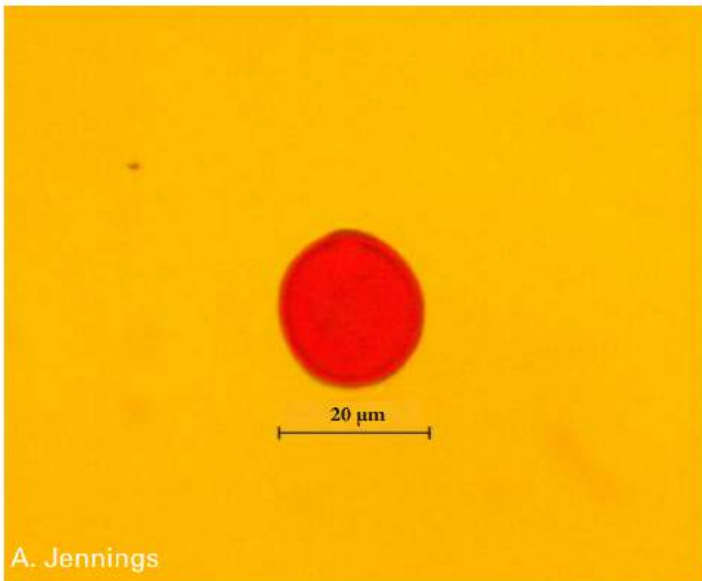
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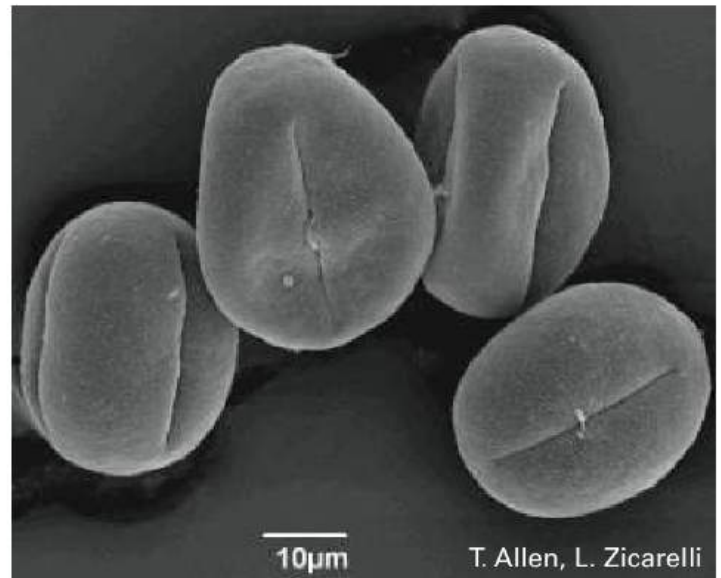
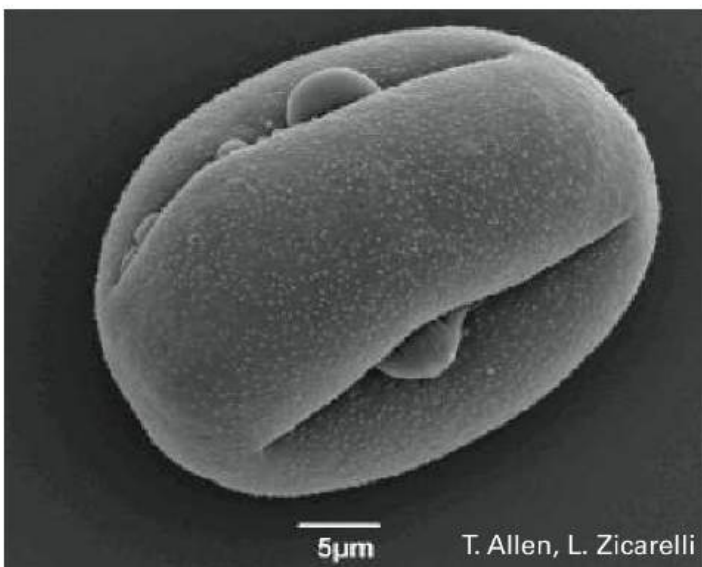
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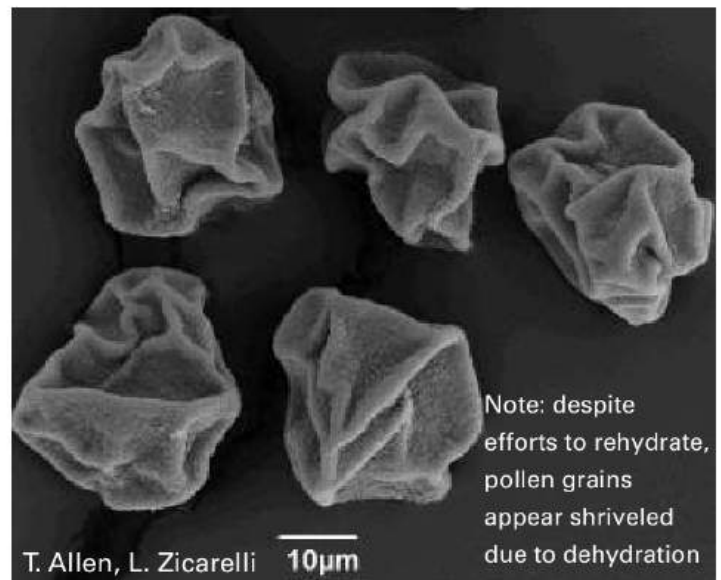
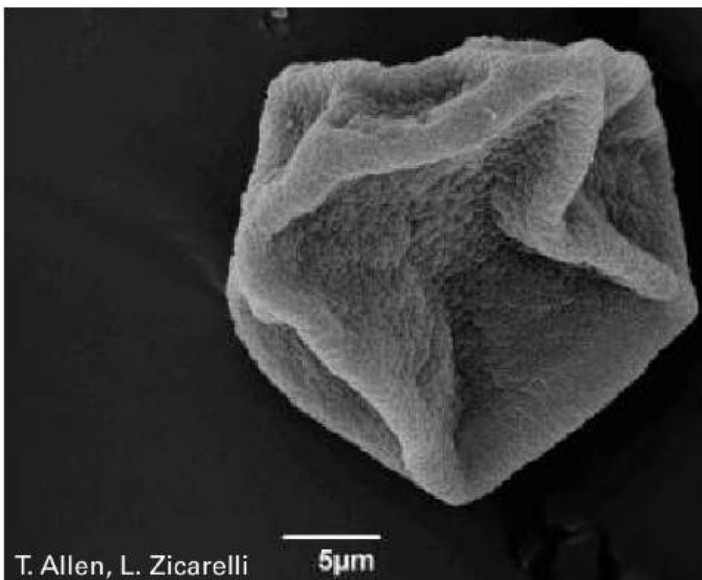
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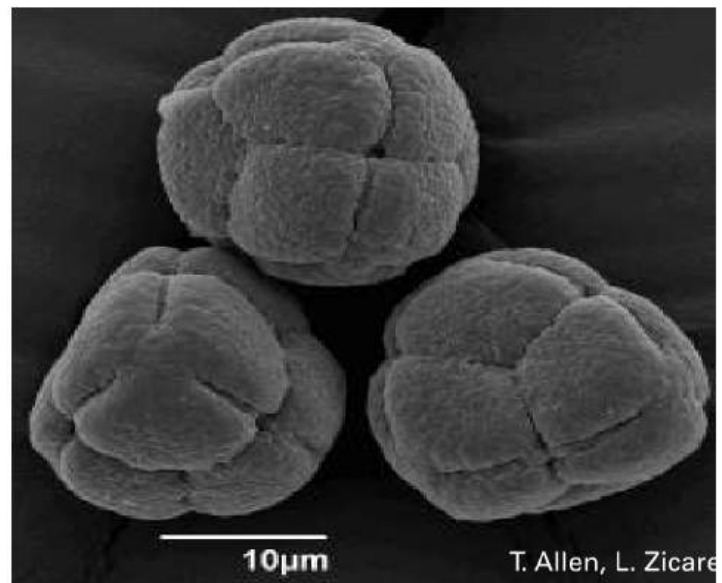
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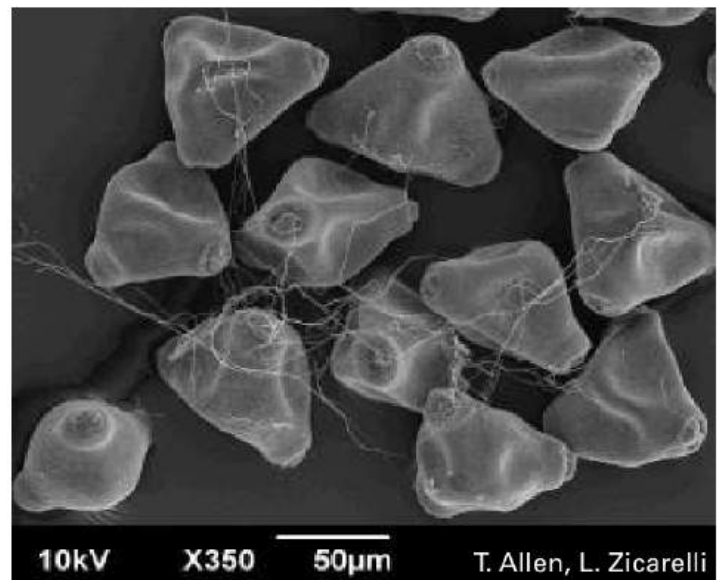
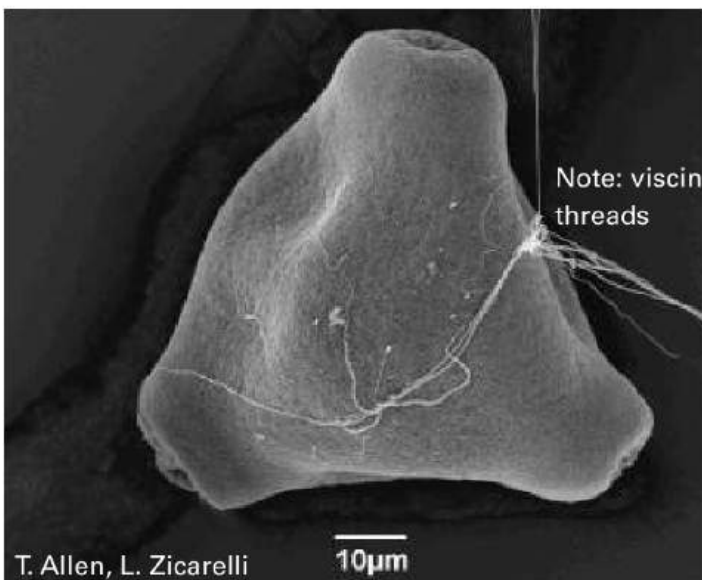
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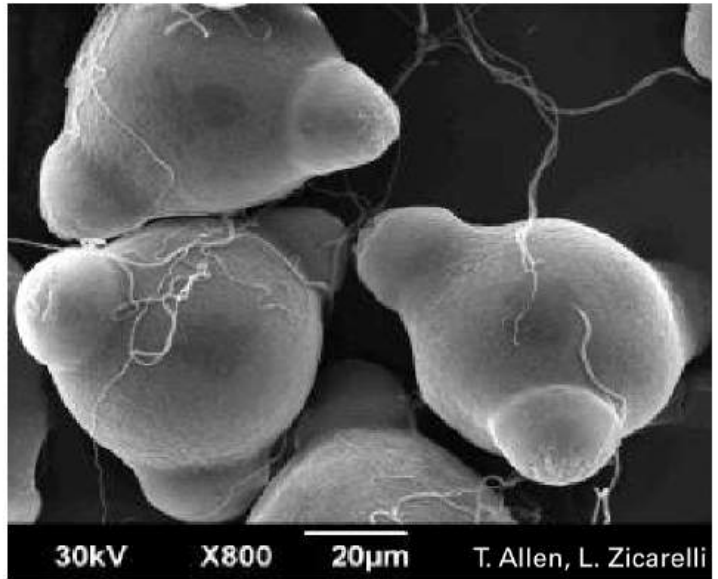
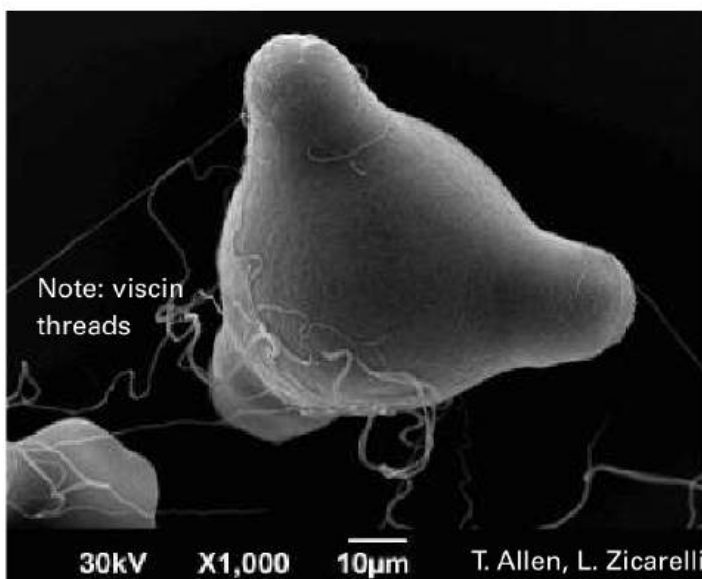
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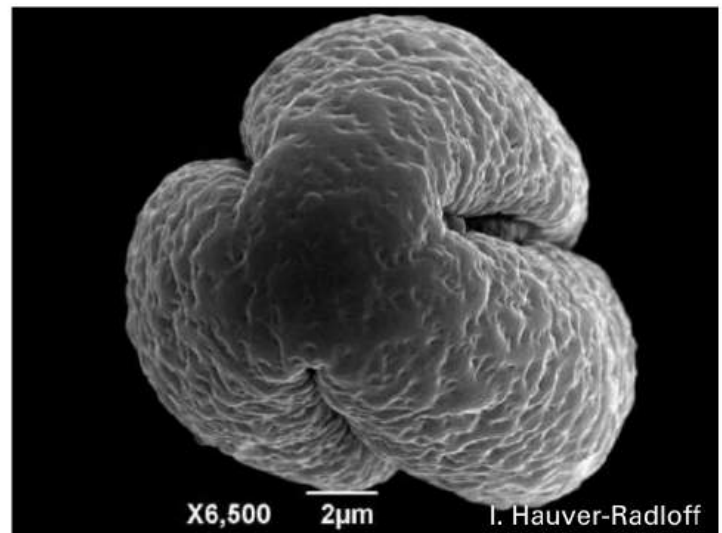
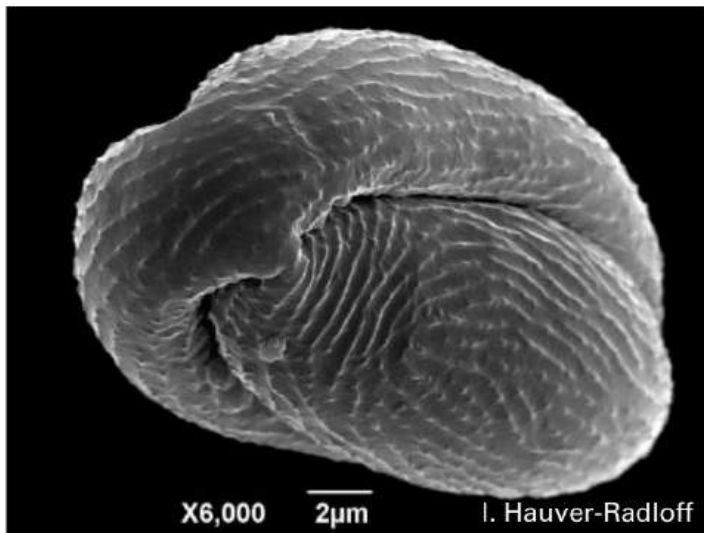
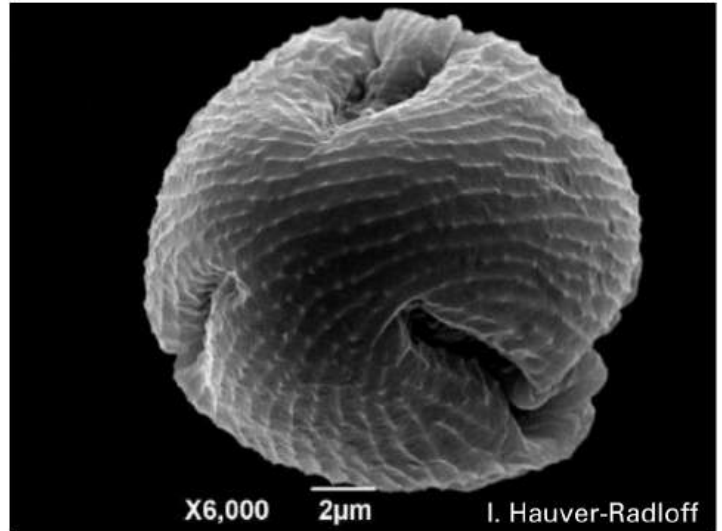
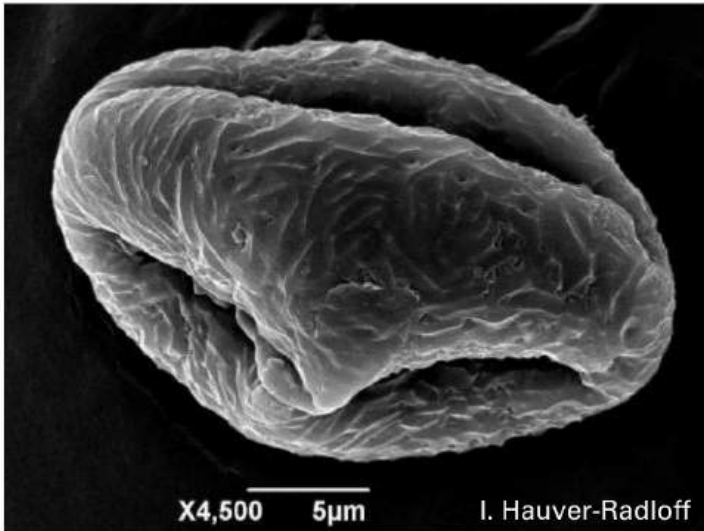
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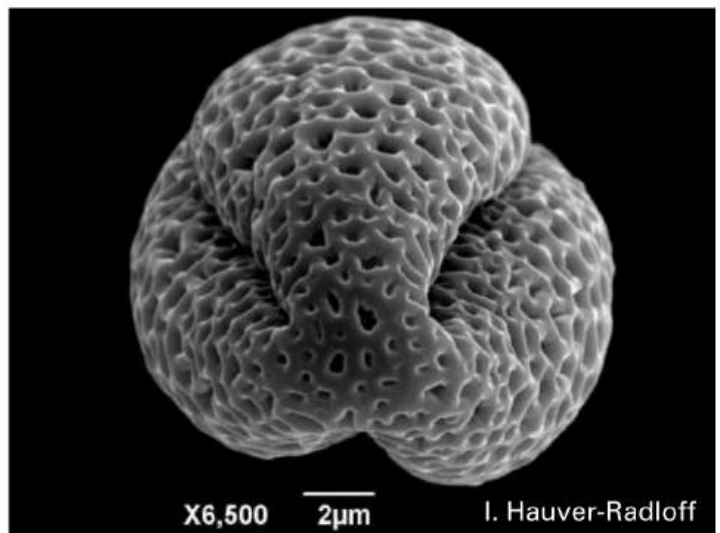
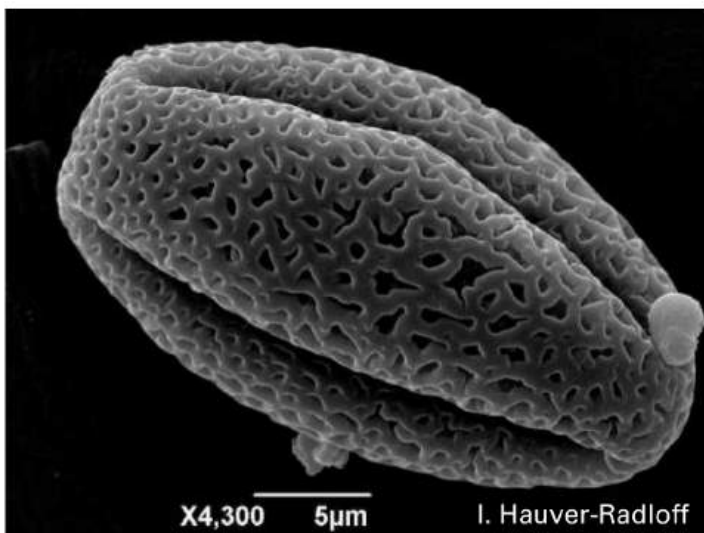
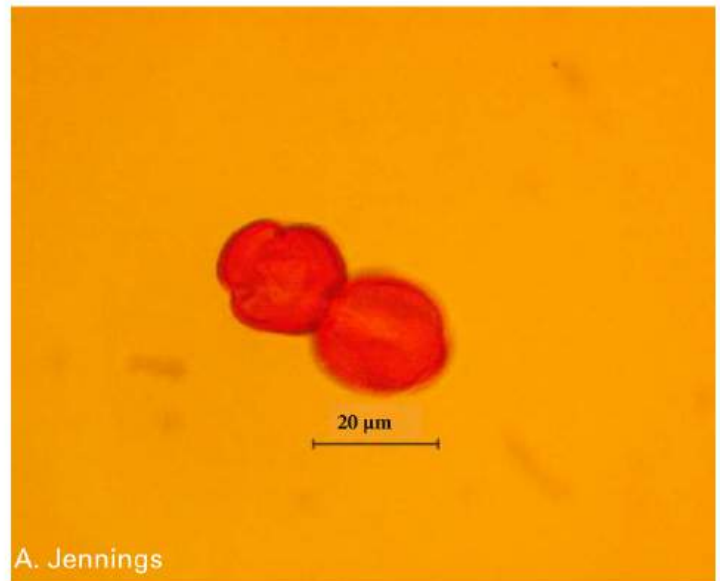
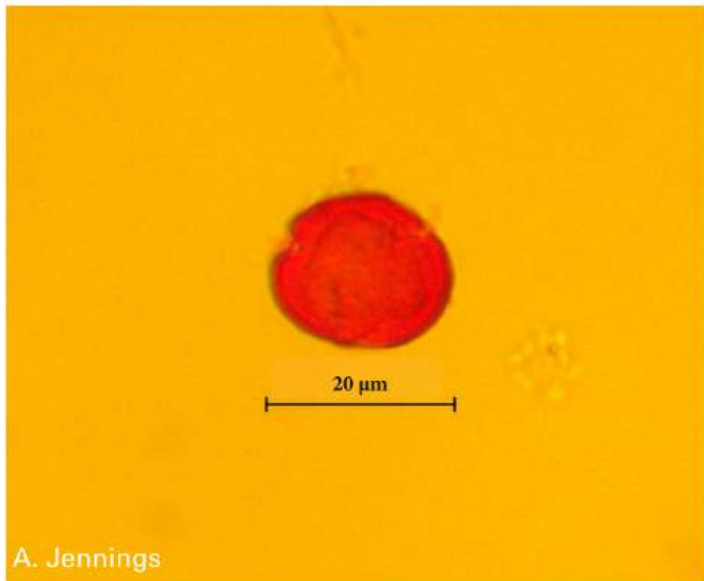
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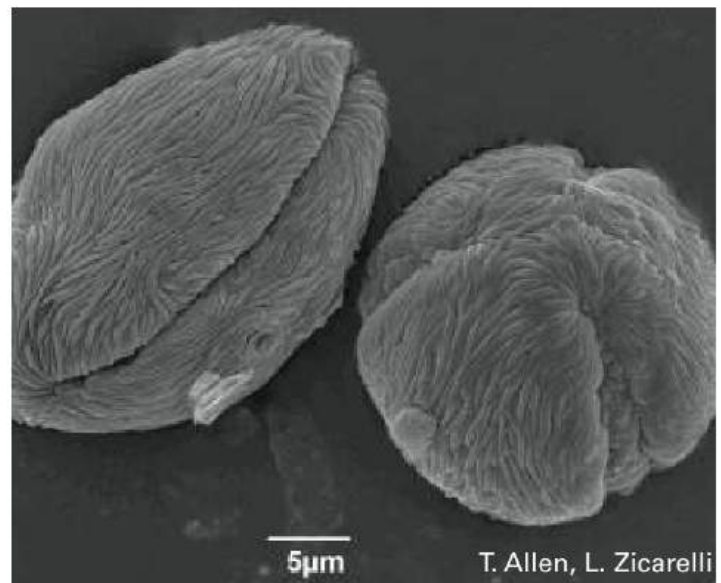
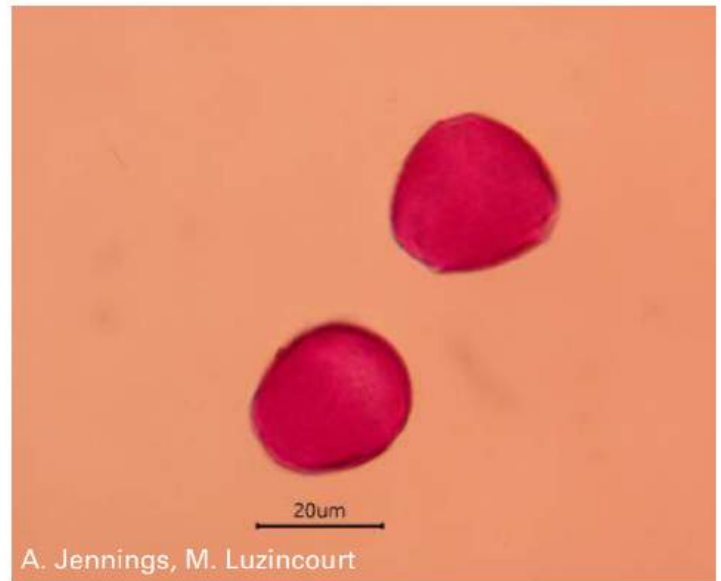
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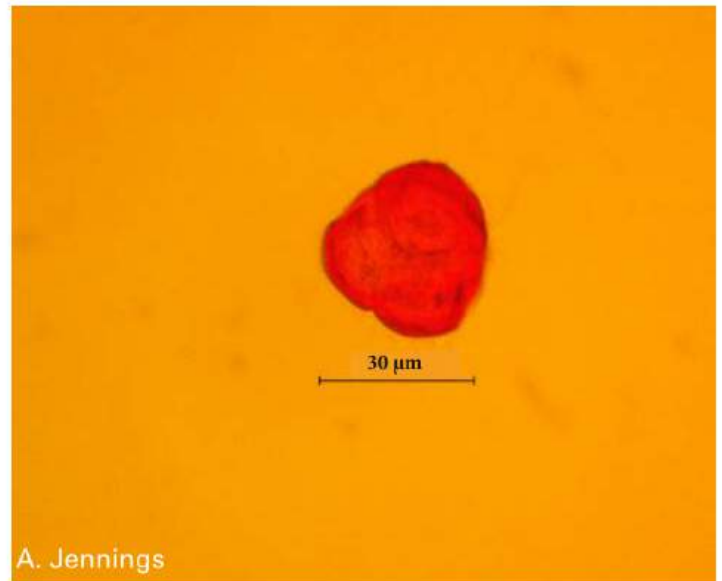
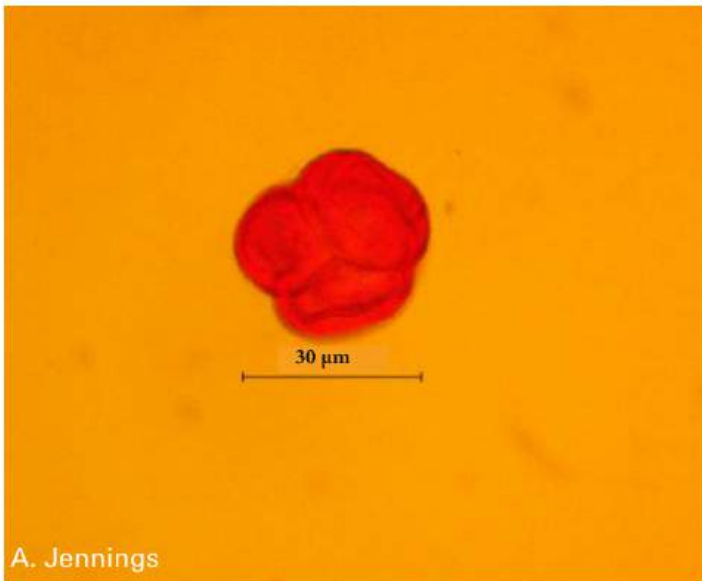
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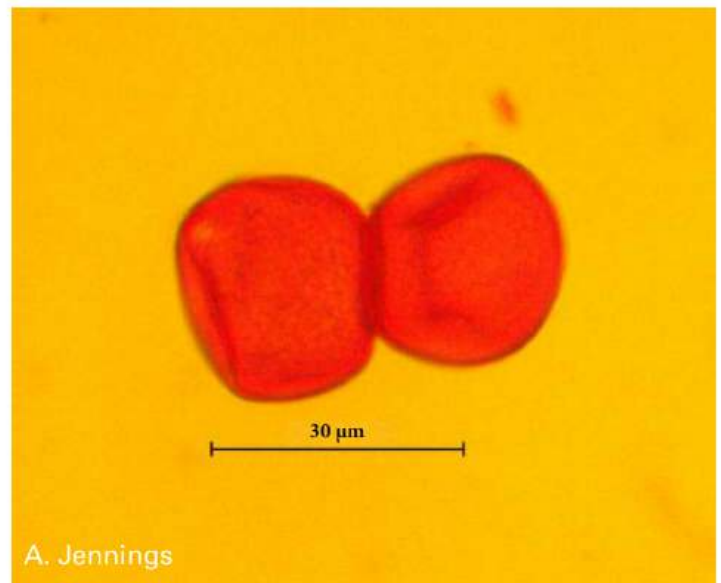
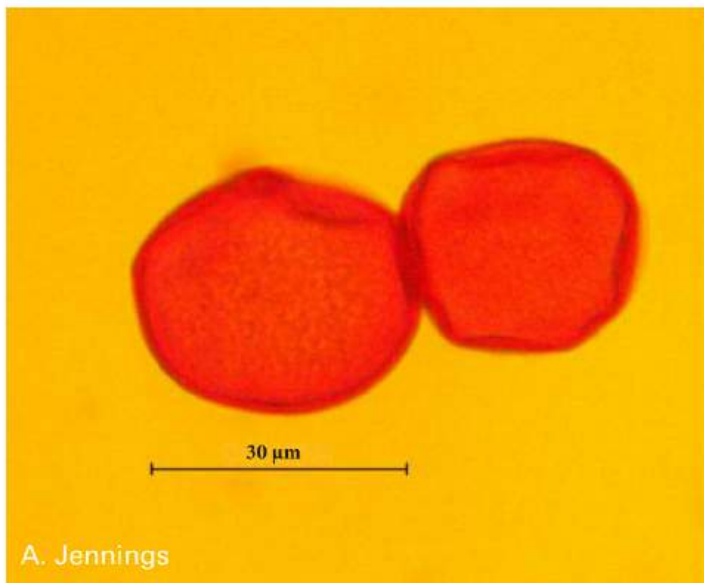
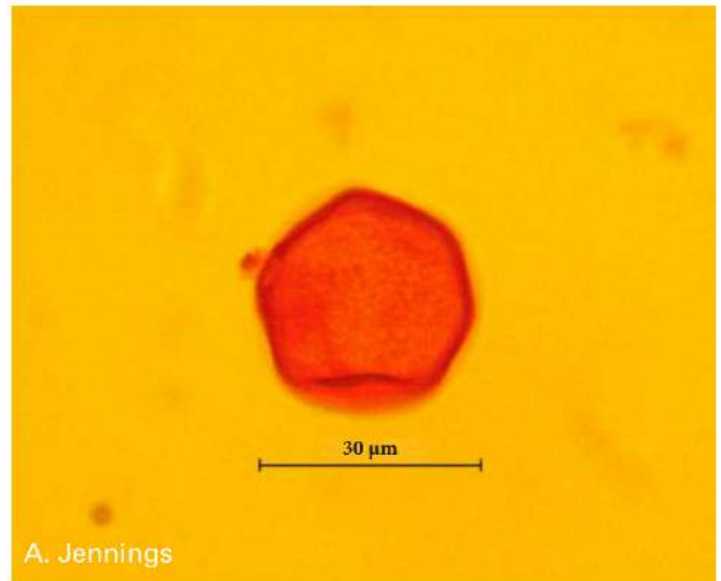
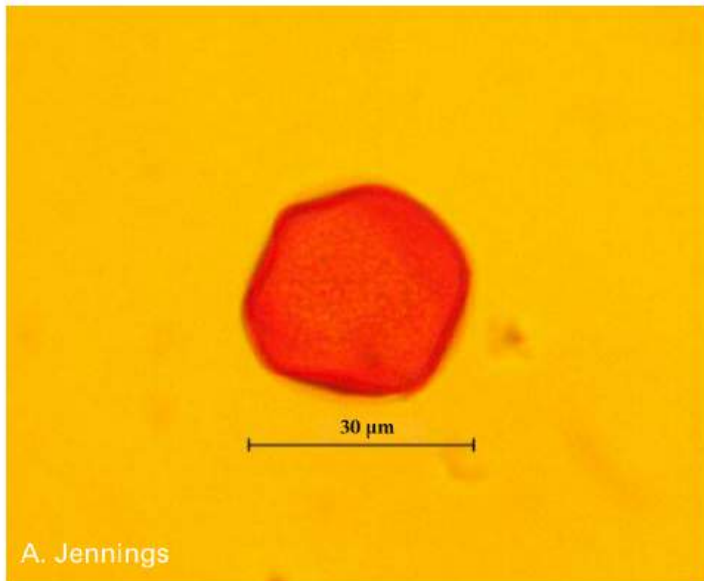
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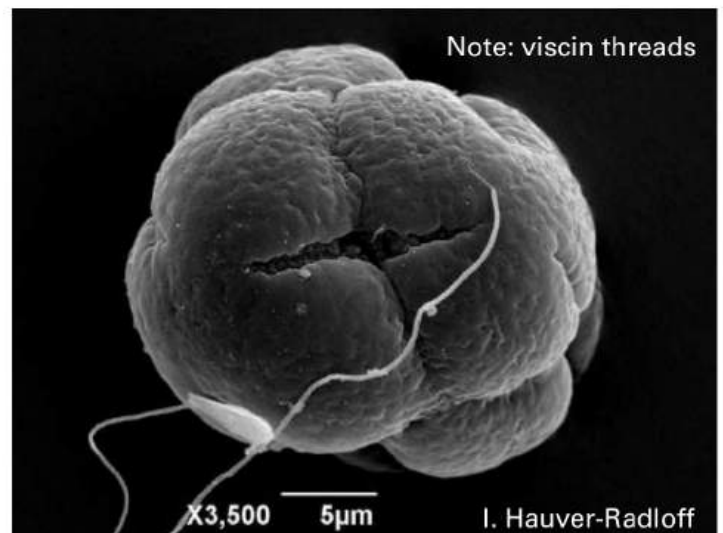
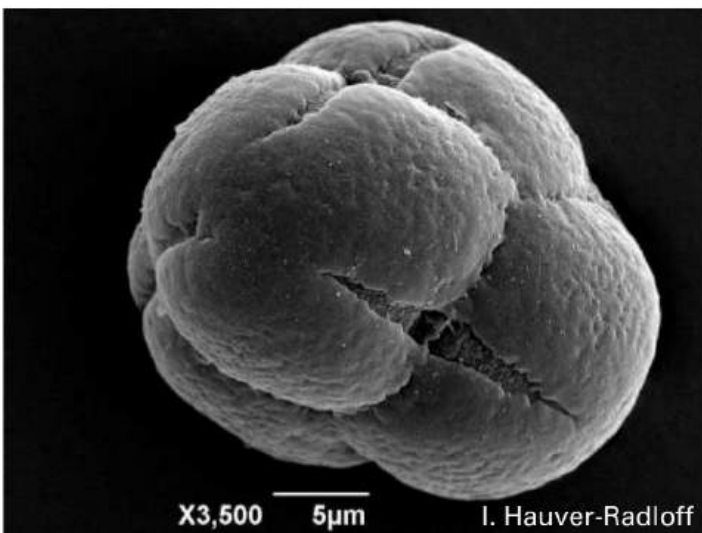
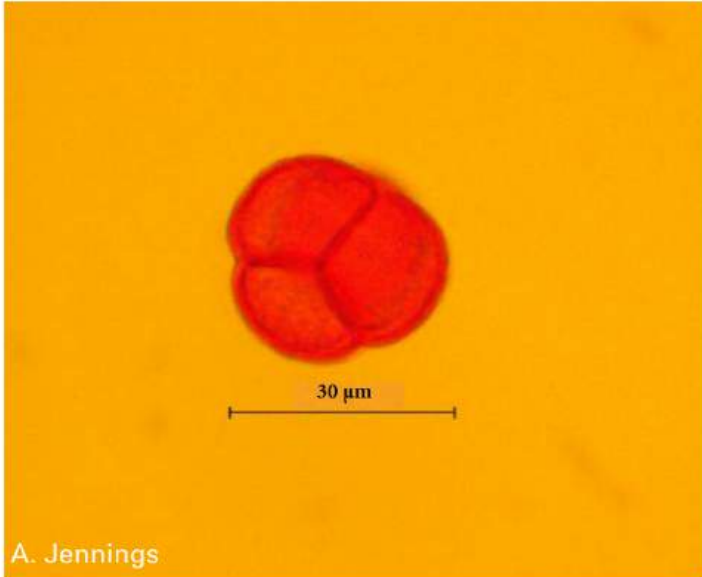
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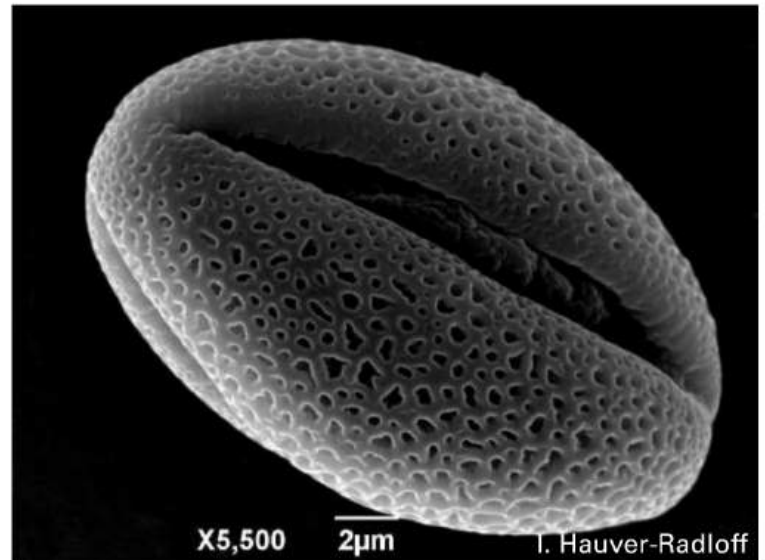
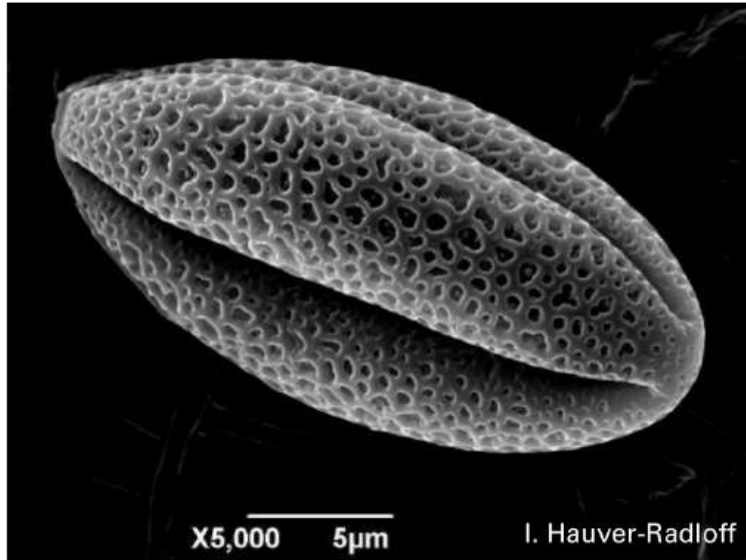
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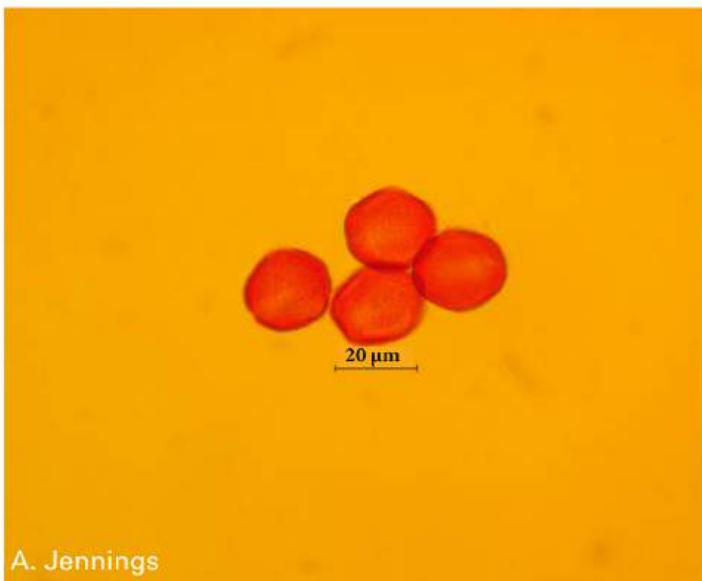
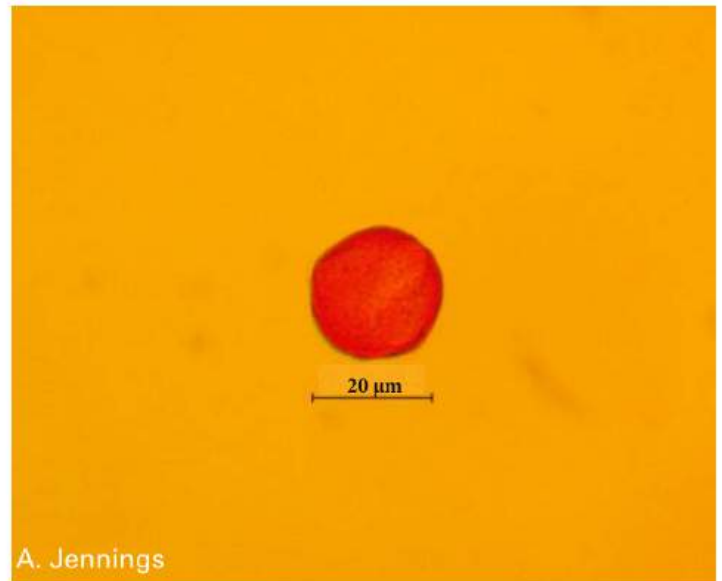
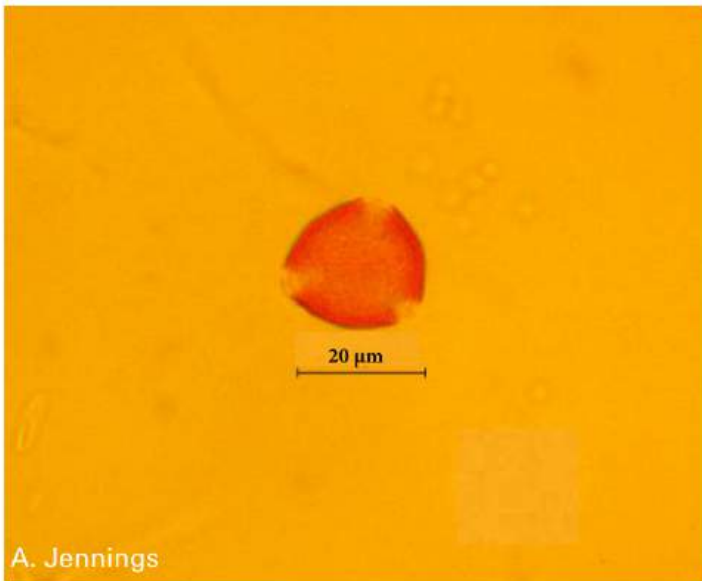
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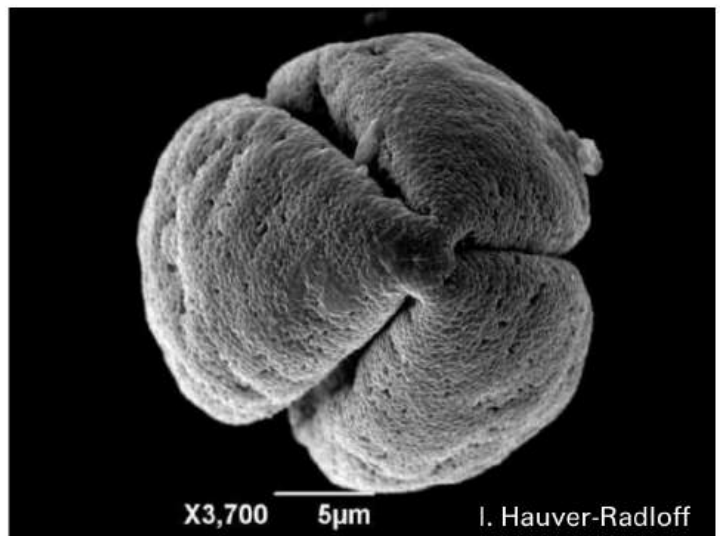
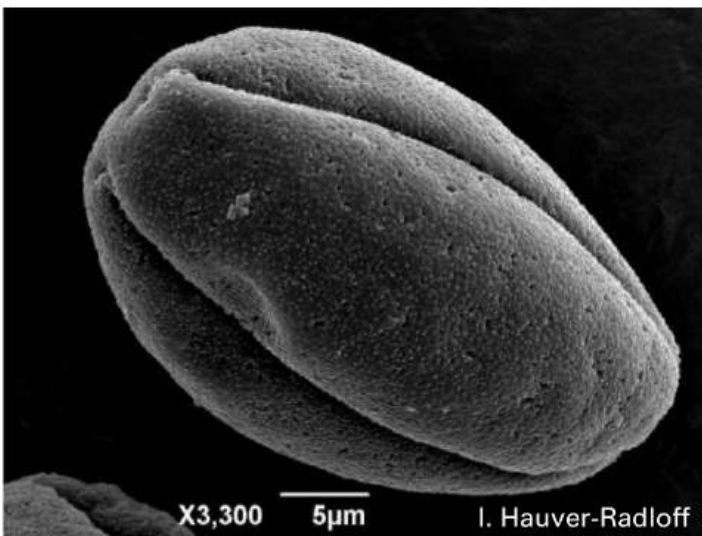
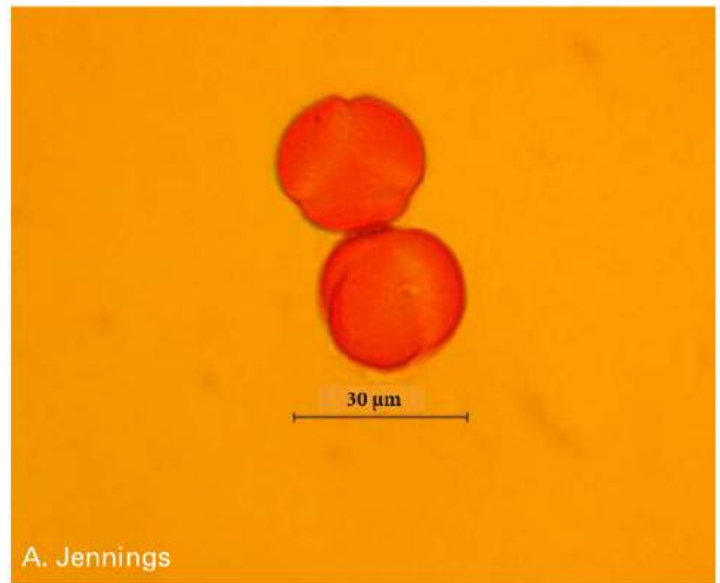
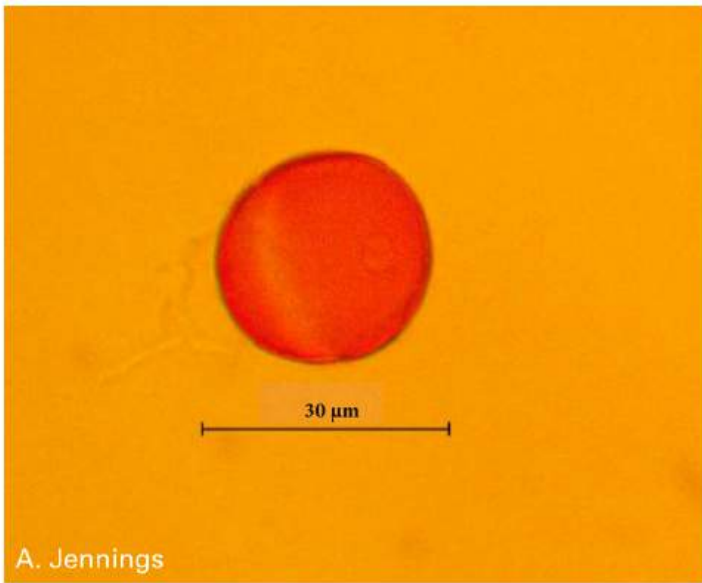
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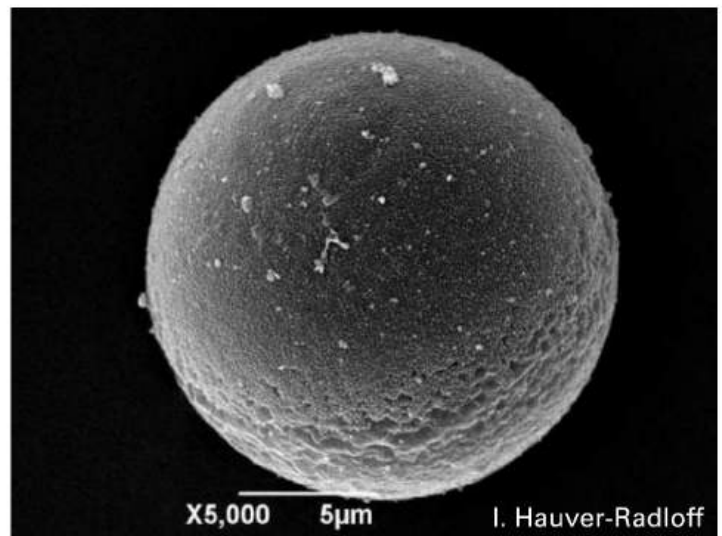
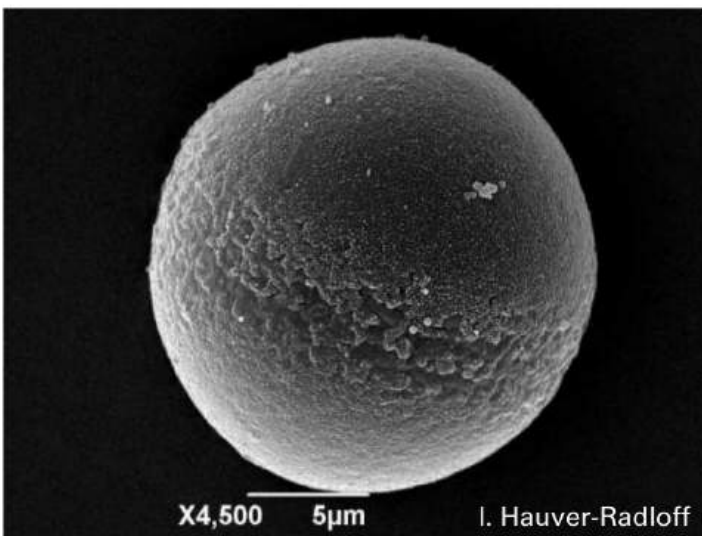
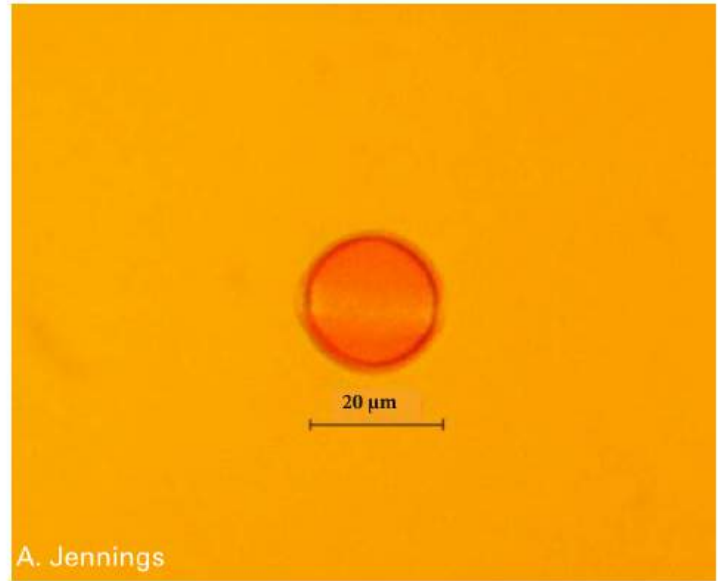
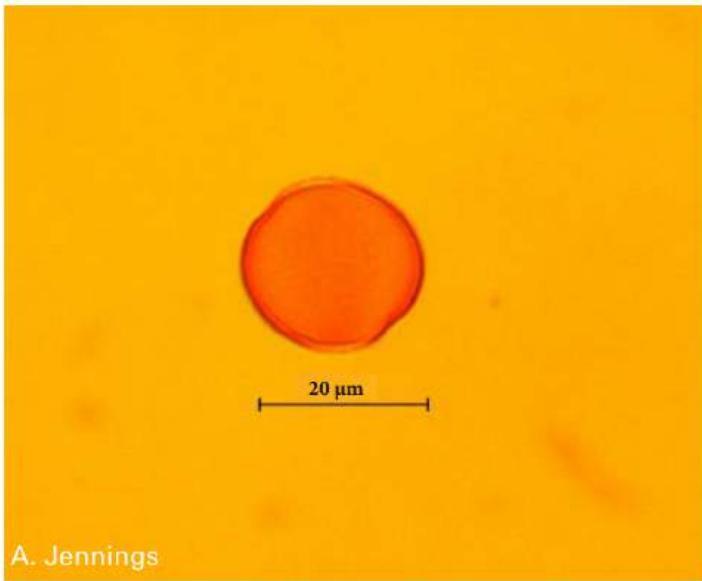
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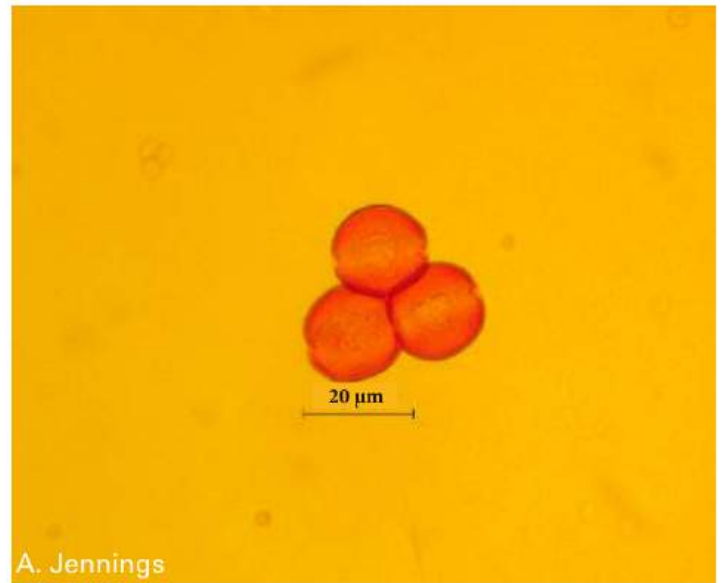
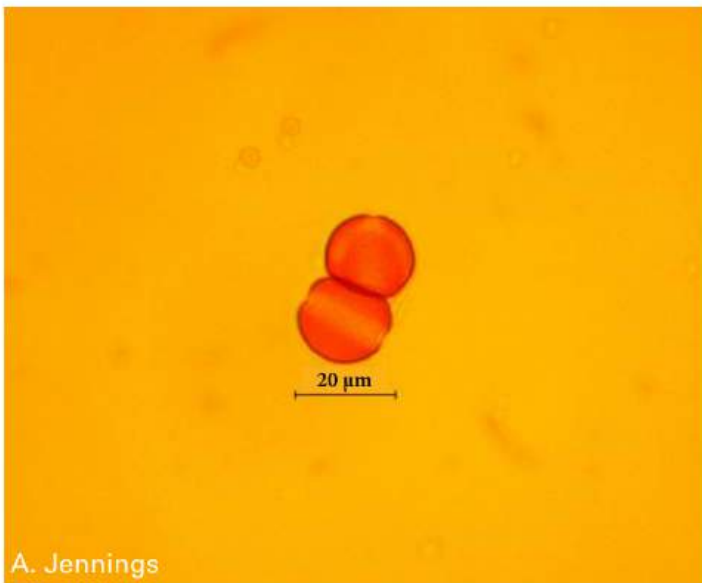
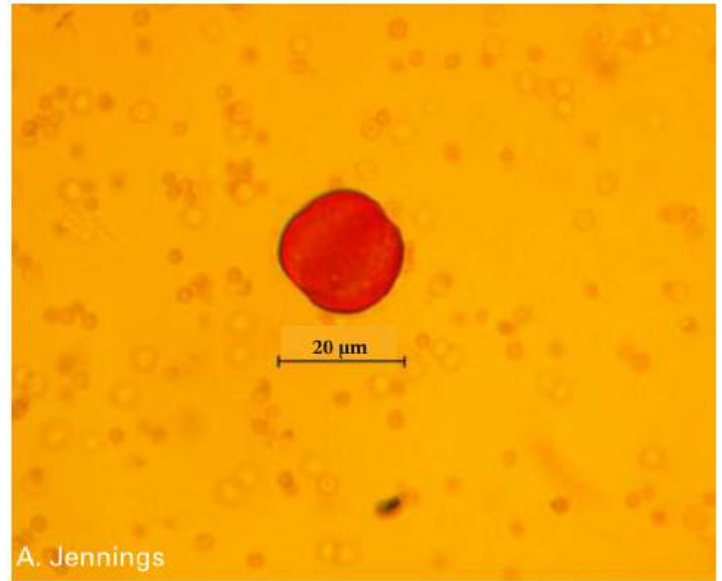
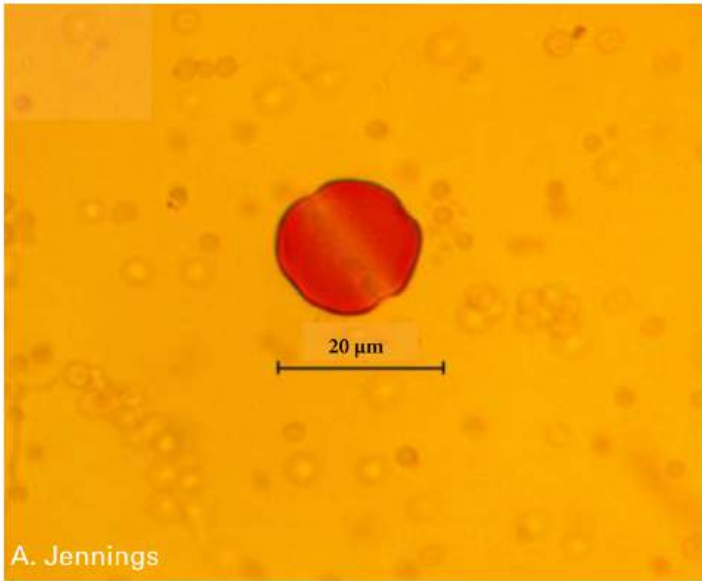
Pedicularis capitata (Scrophulariaceae)



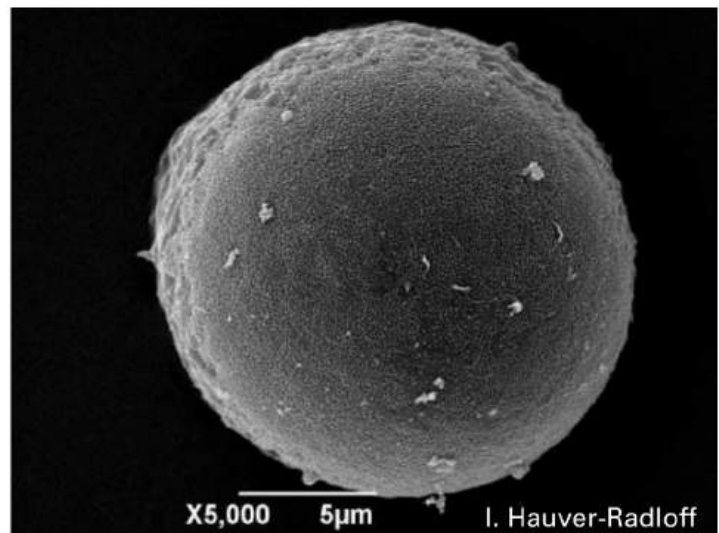
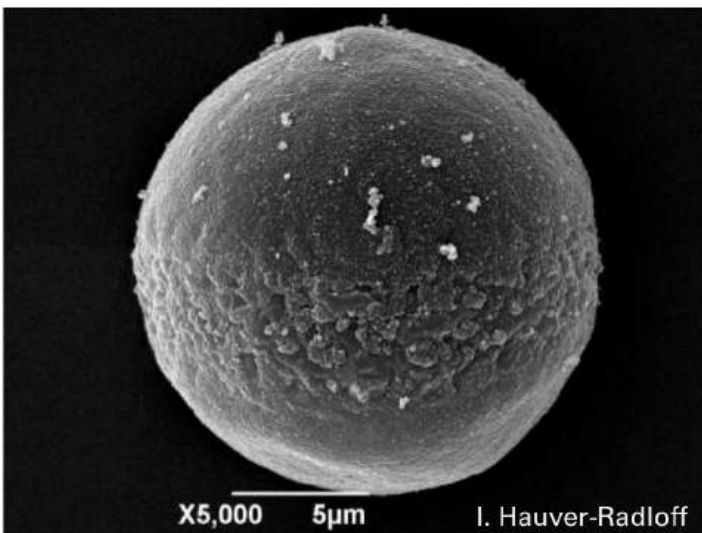
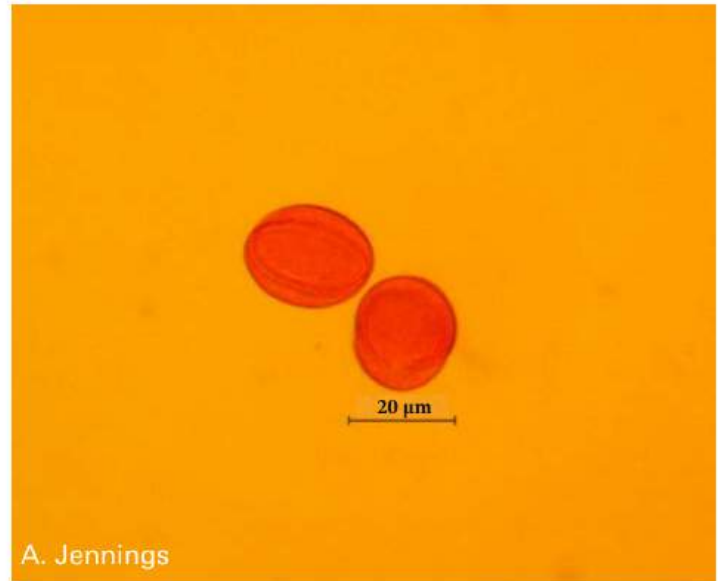
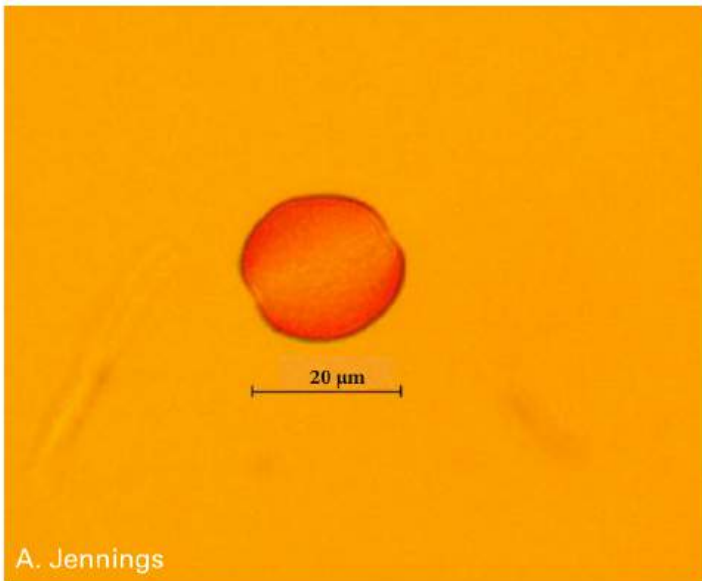
Pedicularis labradorica (Scrophulariaceae)



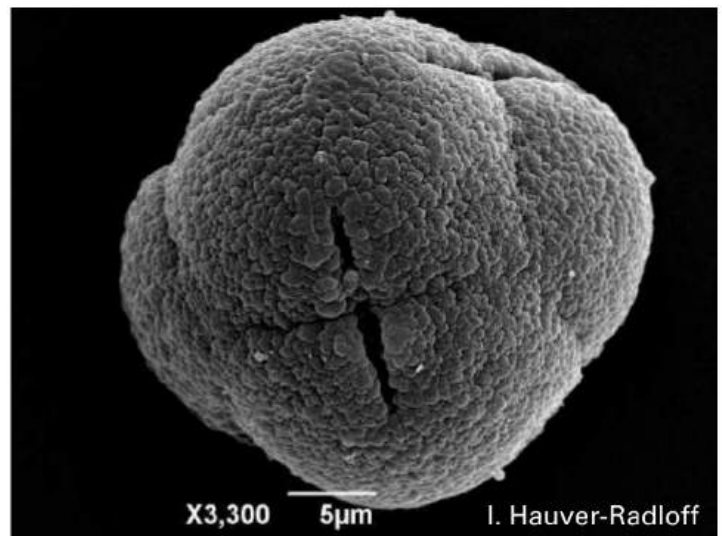
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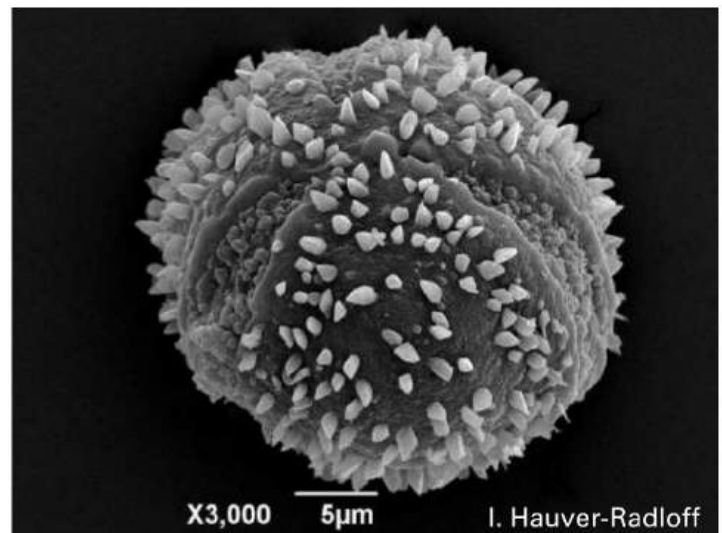
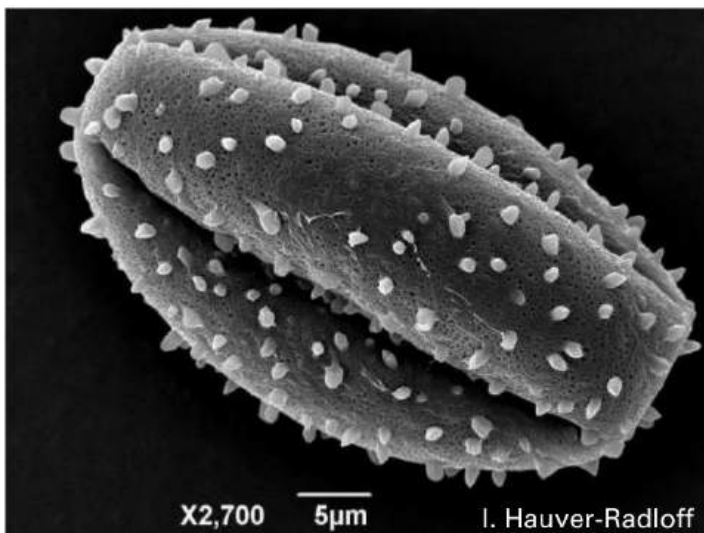
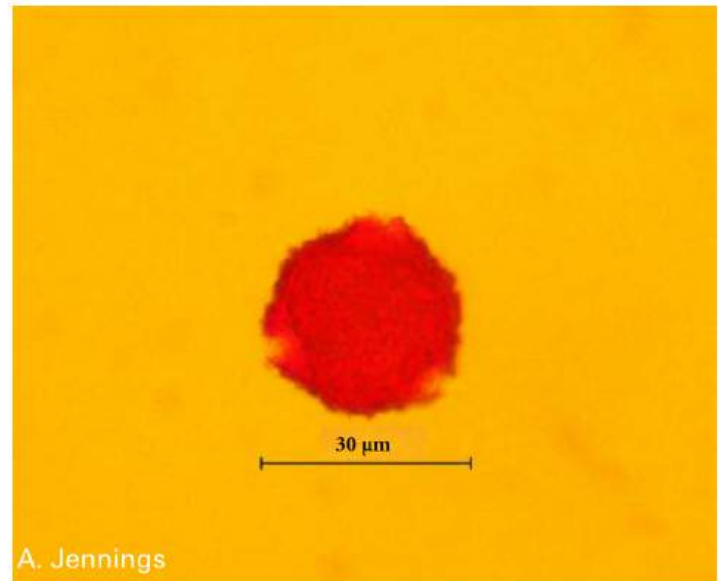
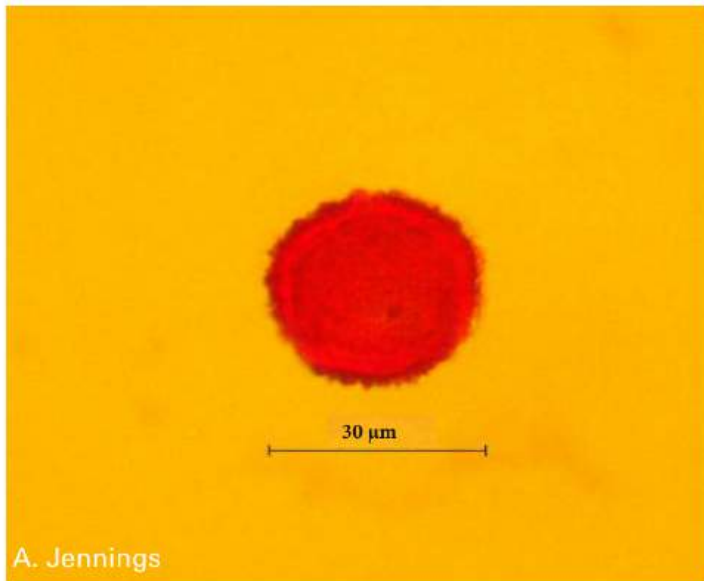
Pedicularis lapponica (Scrophulariaceae)



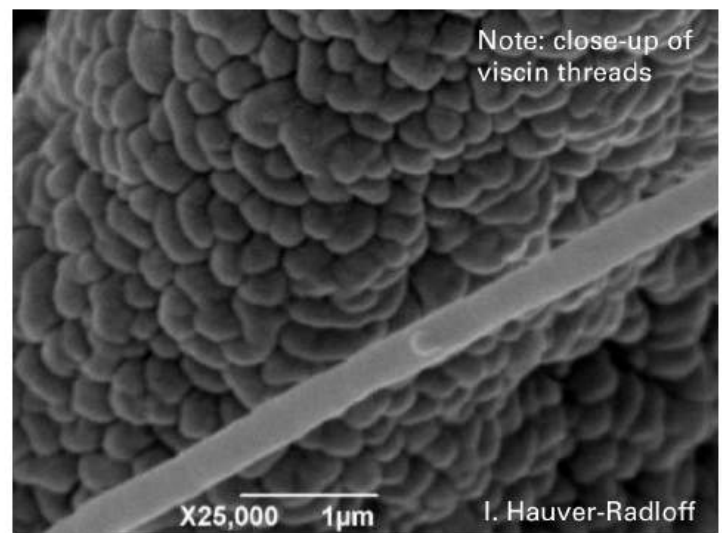
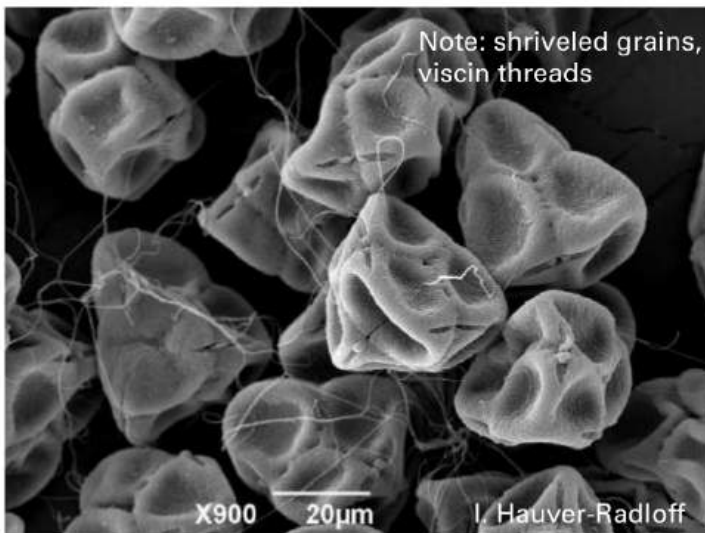
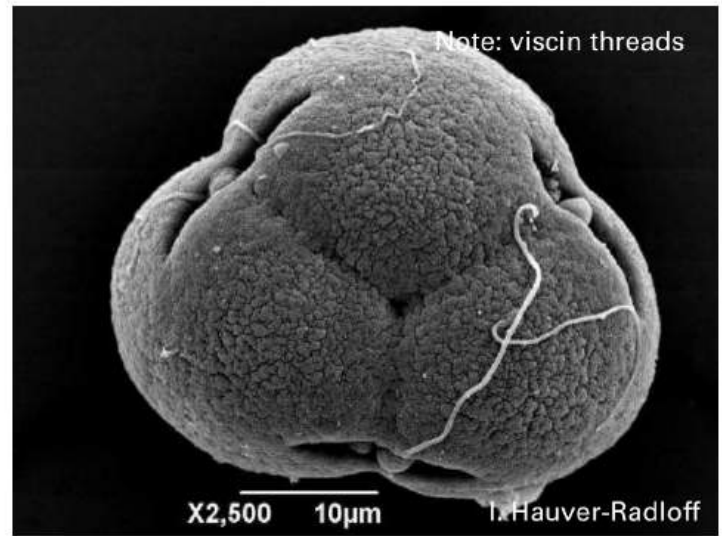
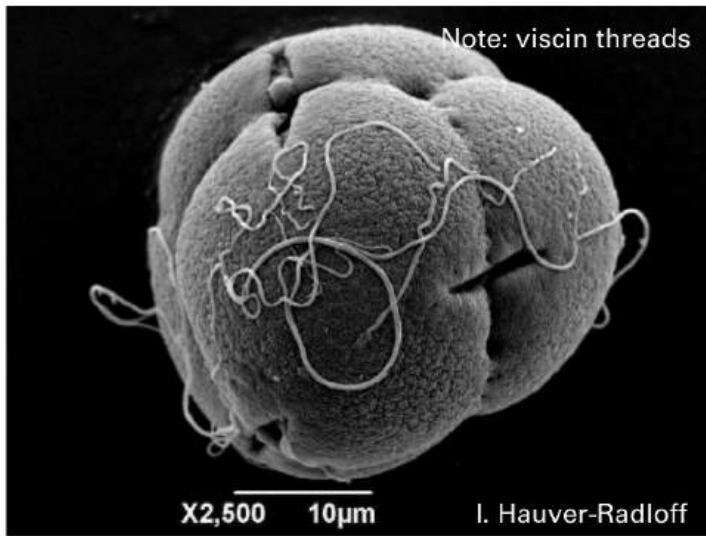
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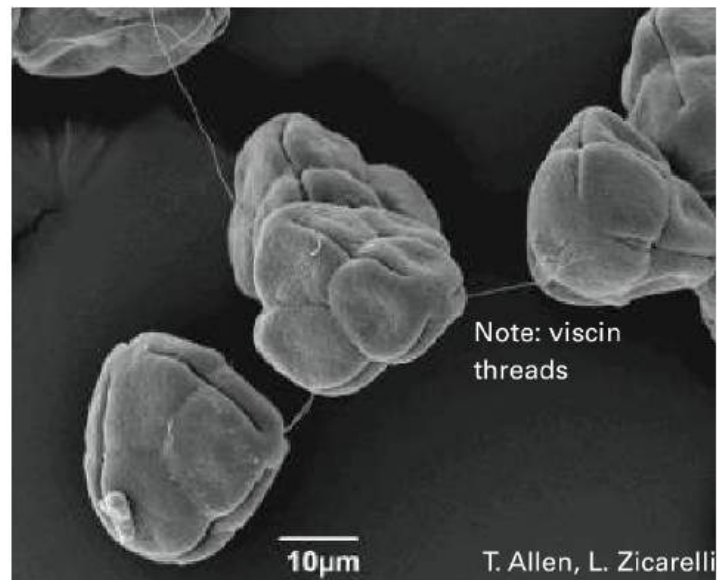
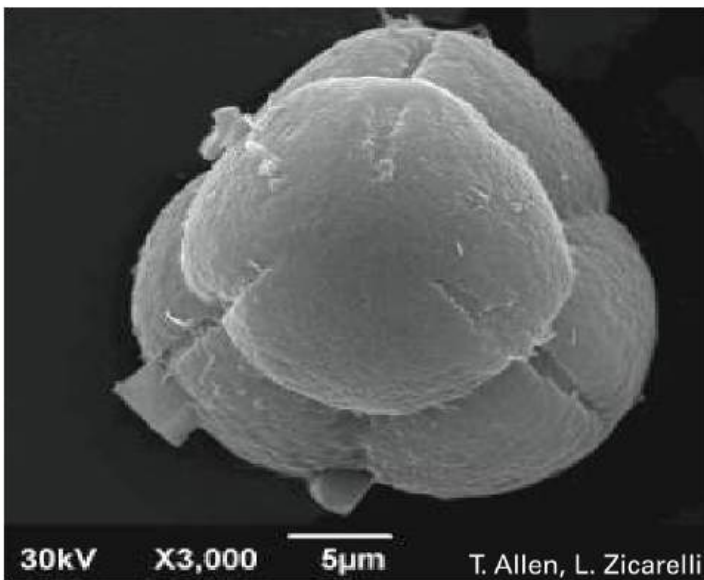
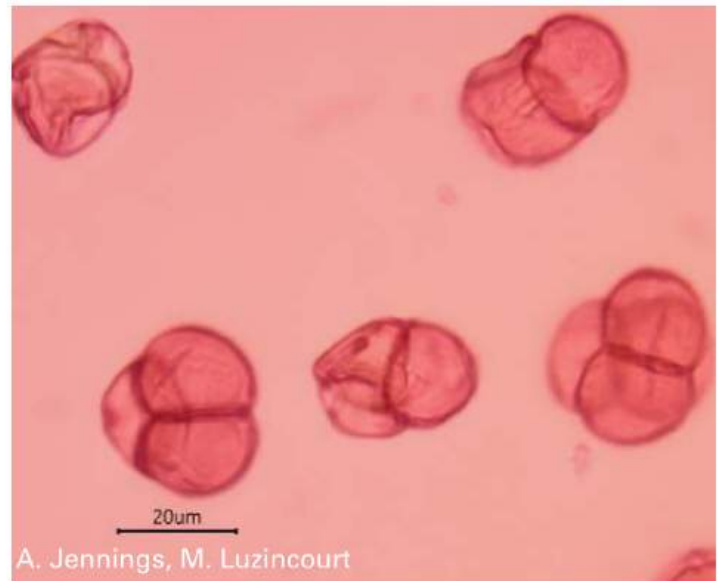
Rubus chamaemorus (Rosaceae)



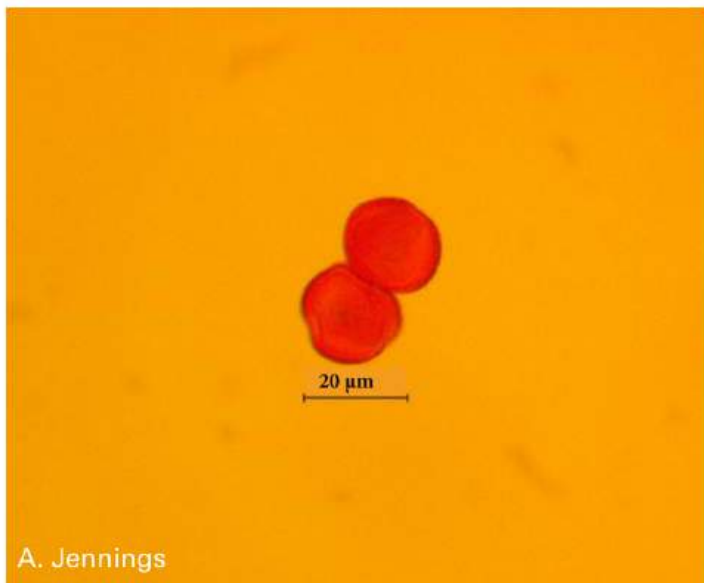
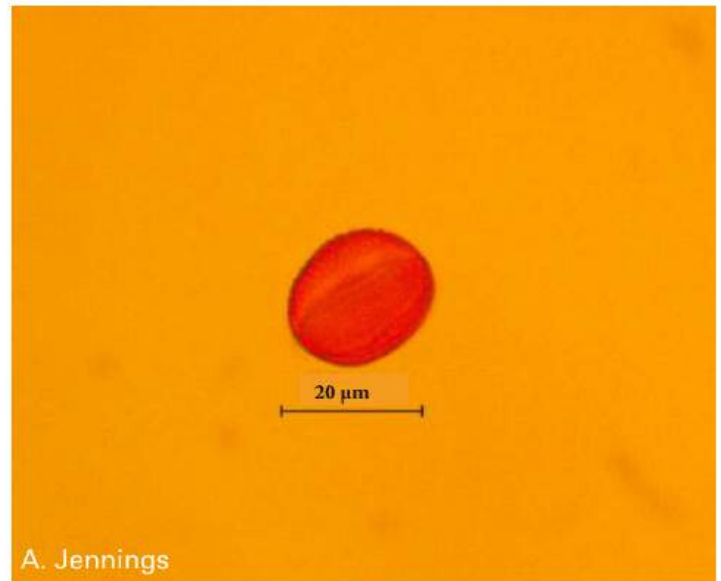
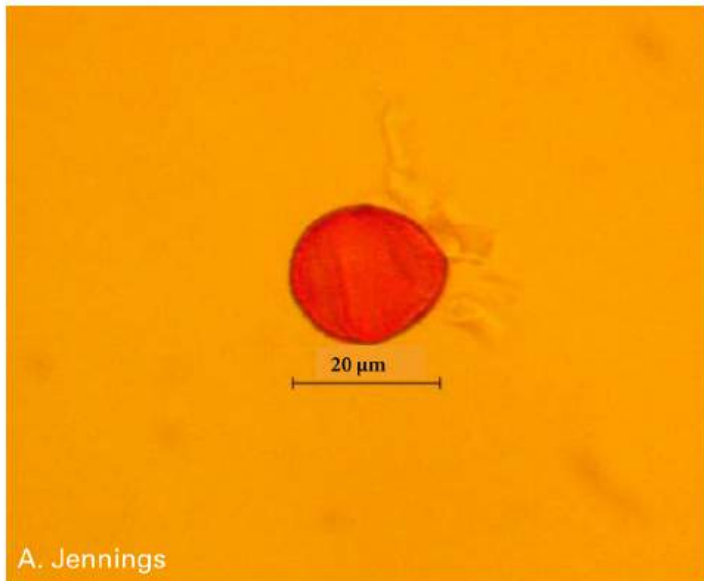
Rhododendron lapponicum (Ericaceae)



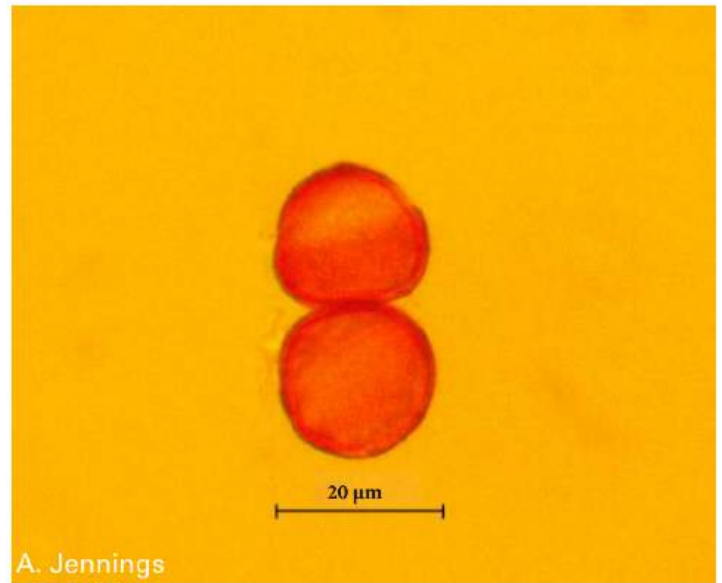
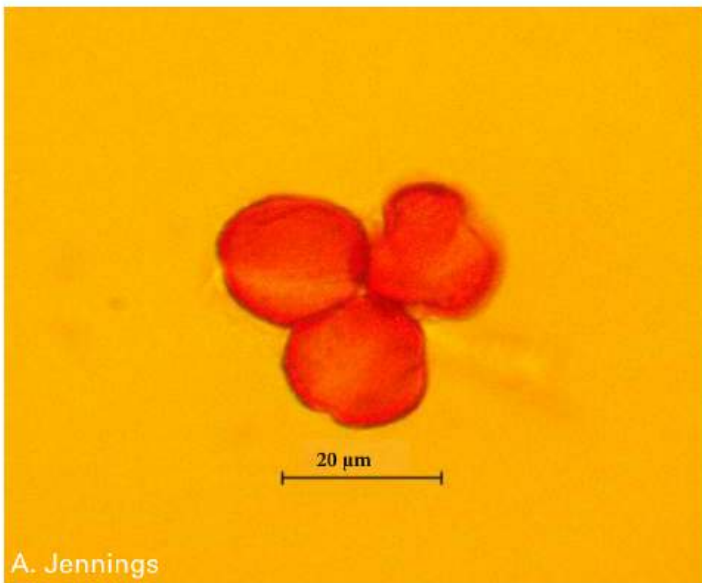
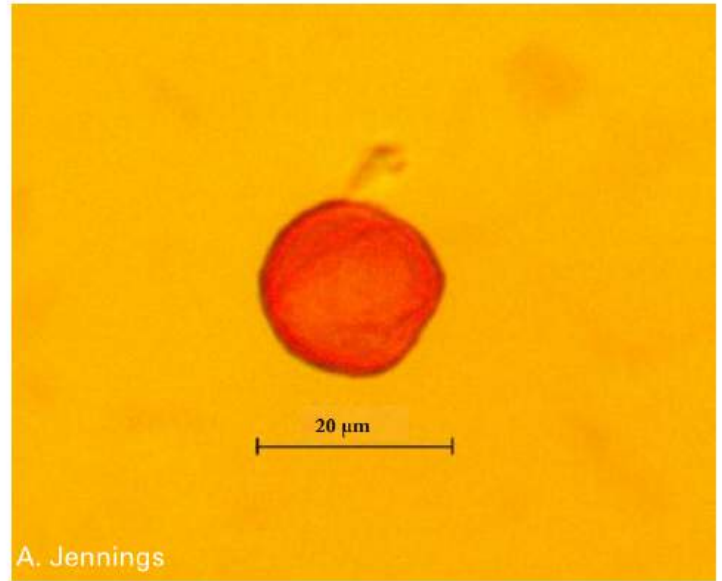
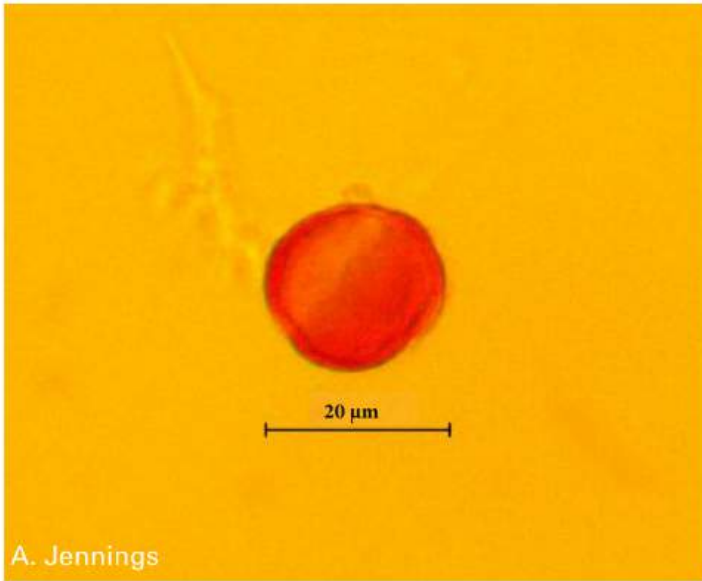
Rhododendron tomentosum (Ericaceae)



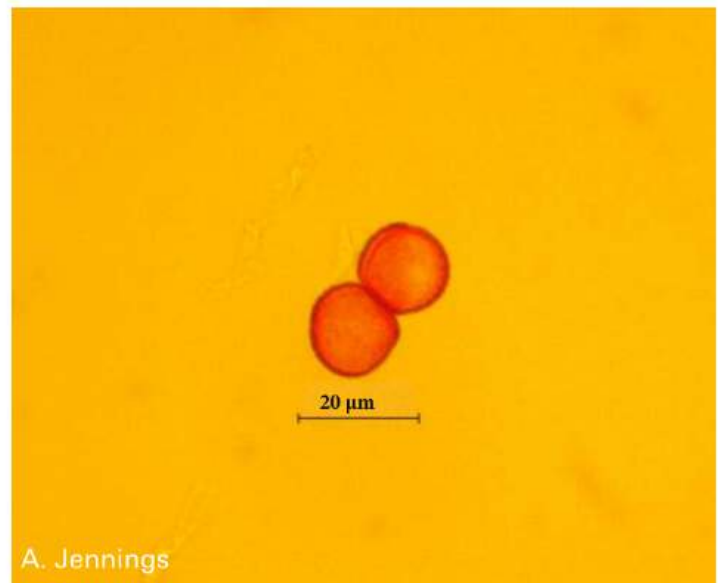
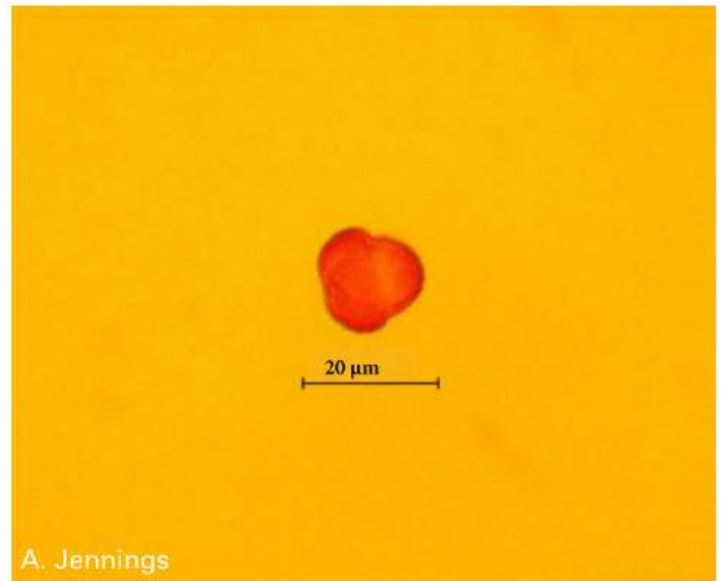
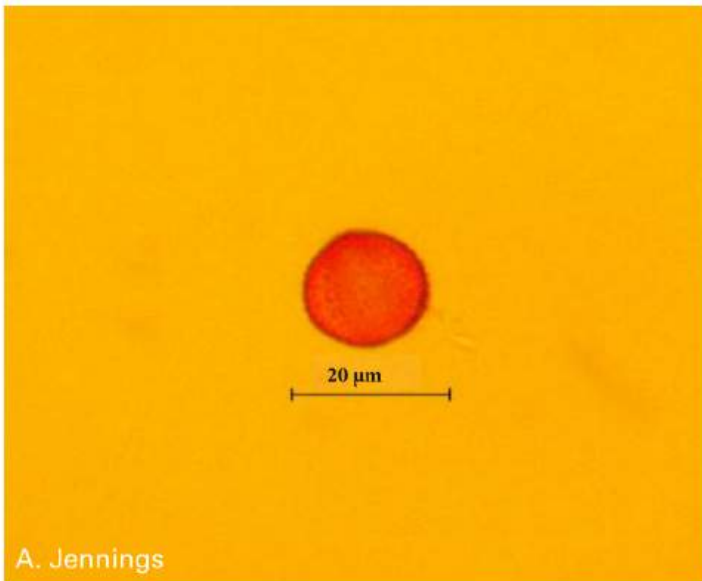
Salix pulchra (Salicaceae)



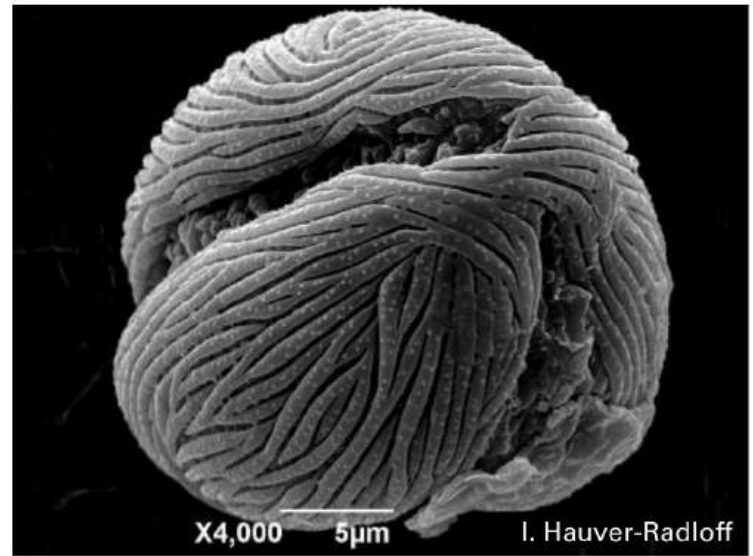
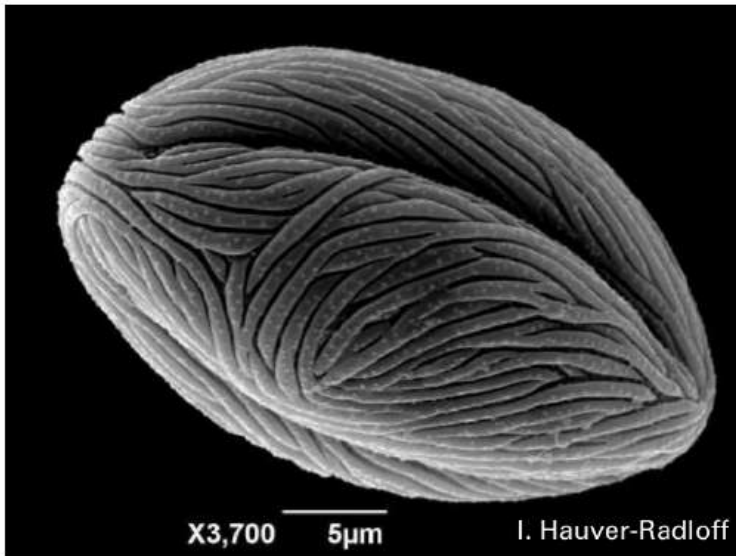
Salix phlebophylla (Salicaceae)



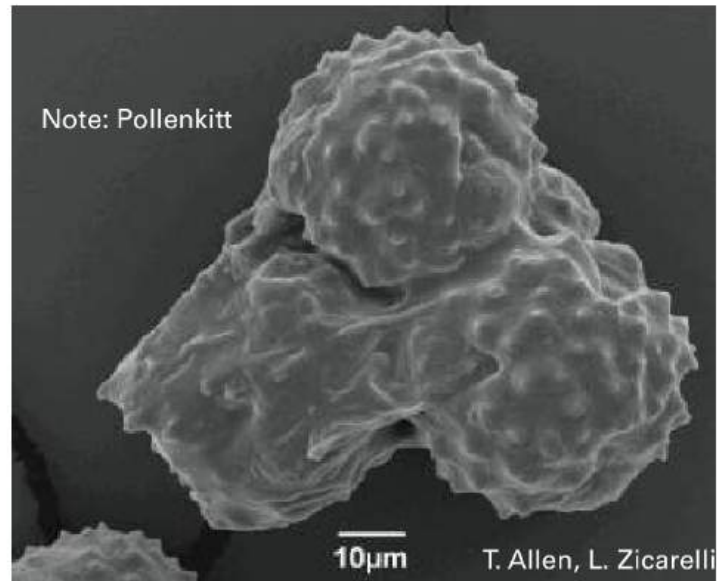
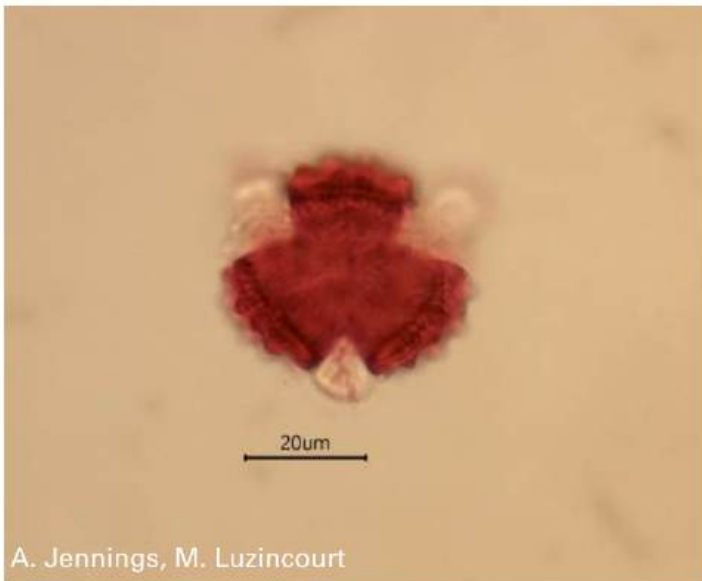
Salix reticulata (Salicaceae)



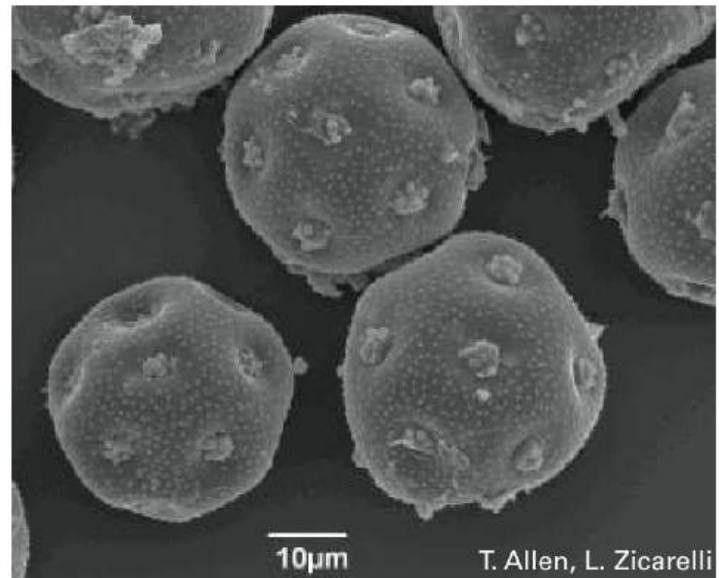
Saxifraga tricuspidata (Saxifragaceae)



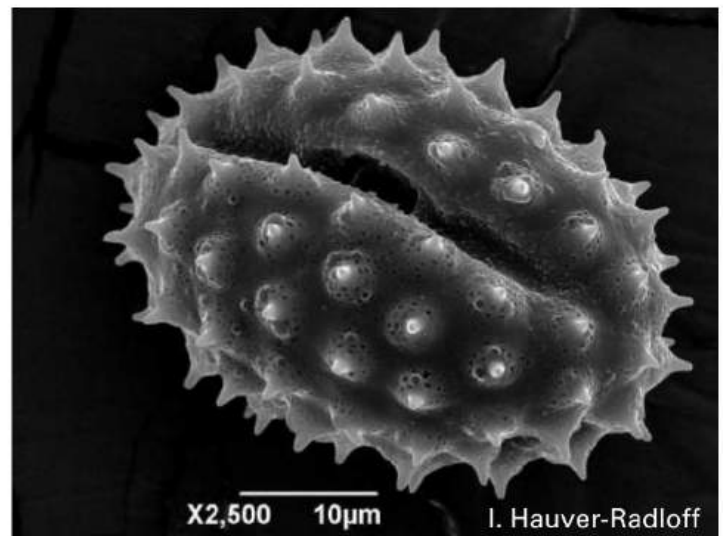
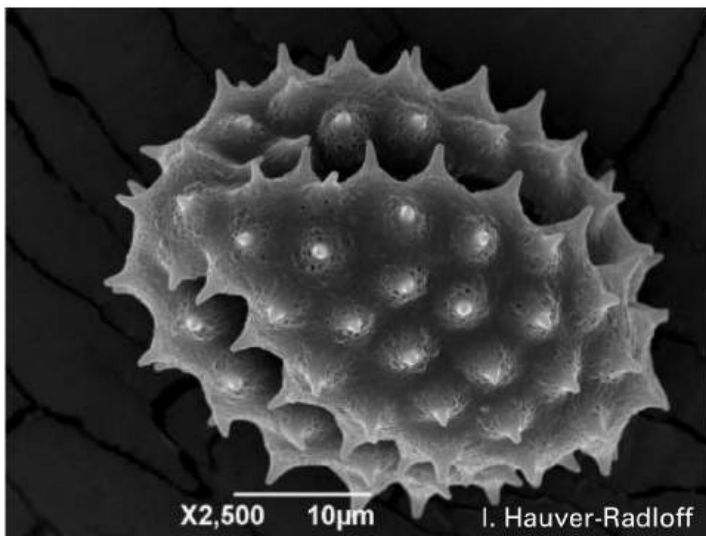
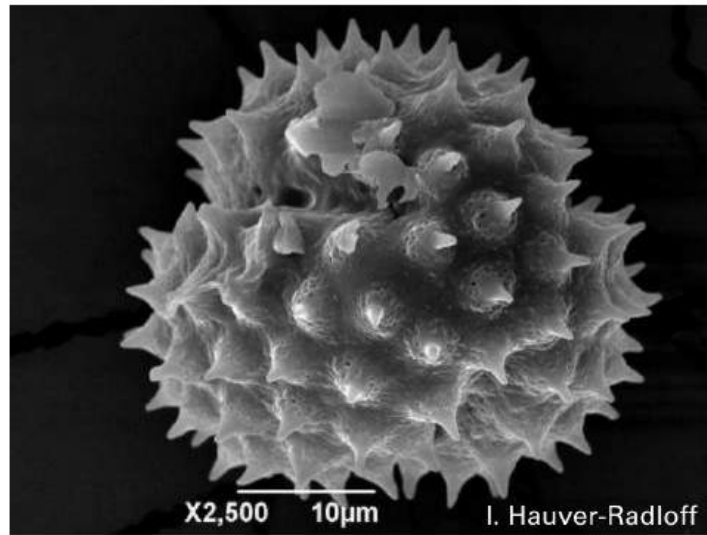
Saussurea angustifolia (Asteraceae)



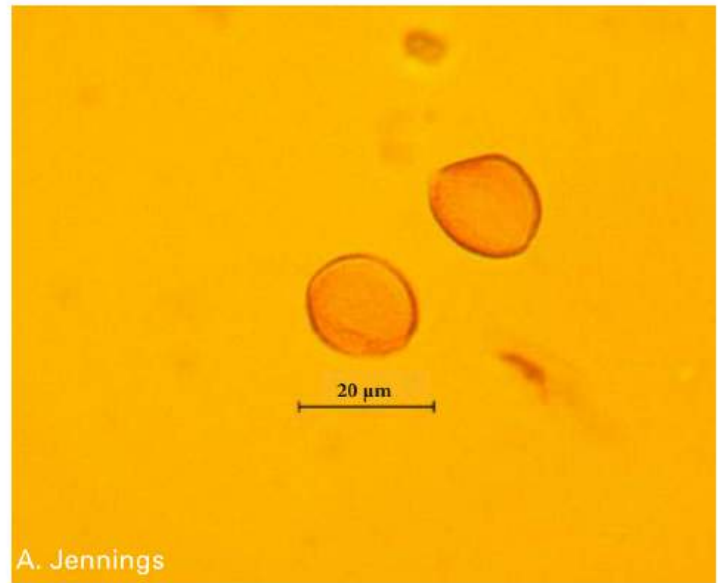
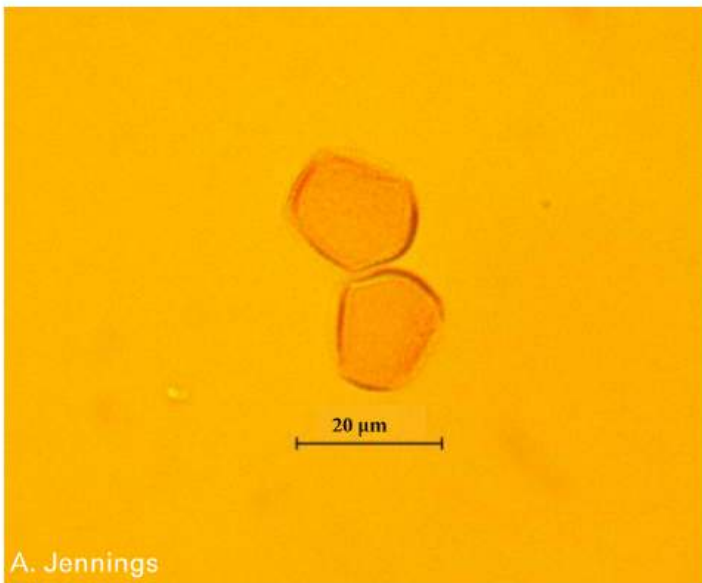
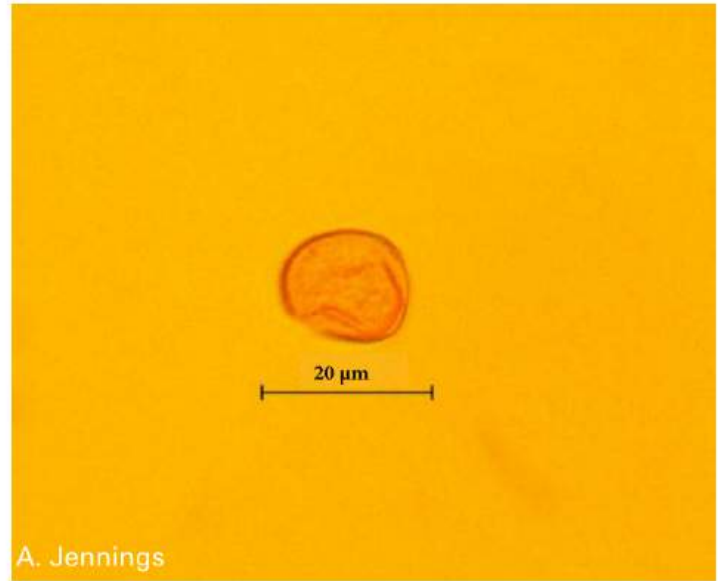
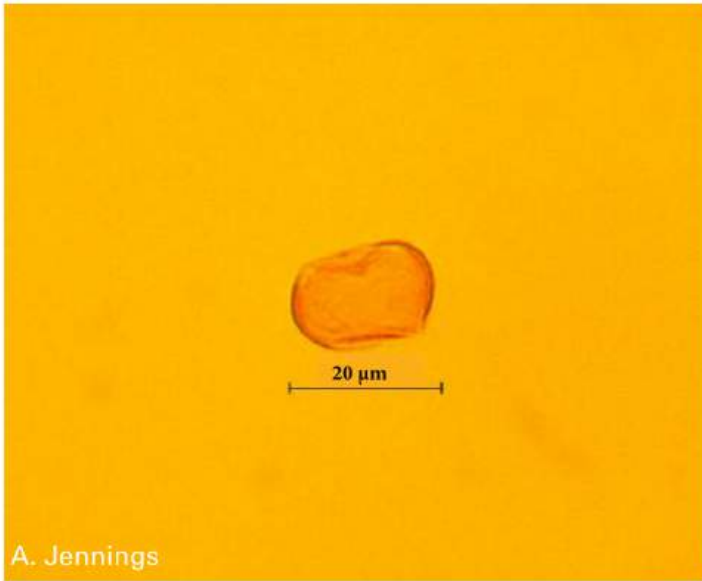
Stellaria borealis (Caryophyllaceae)



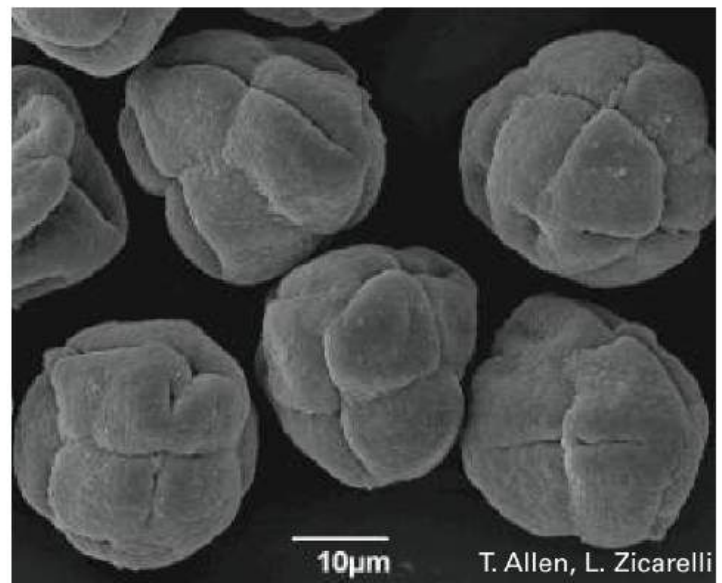
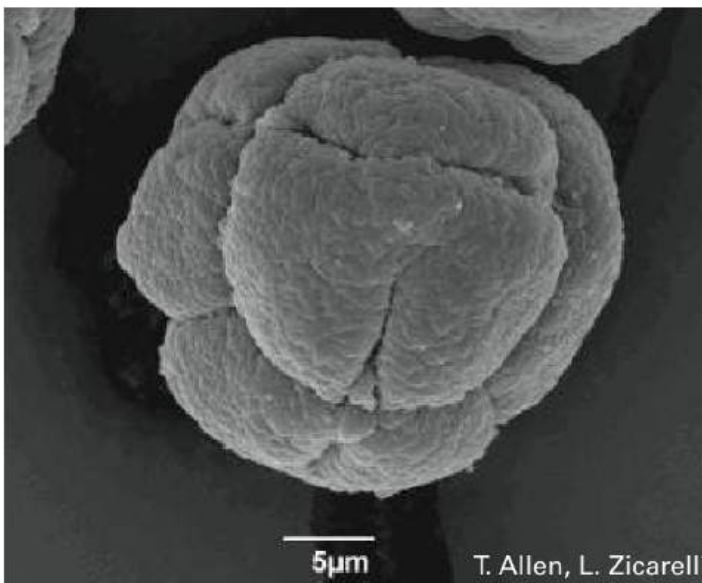
Tephroseris frigida (Asteraceae)



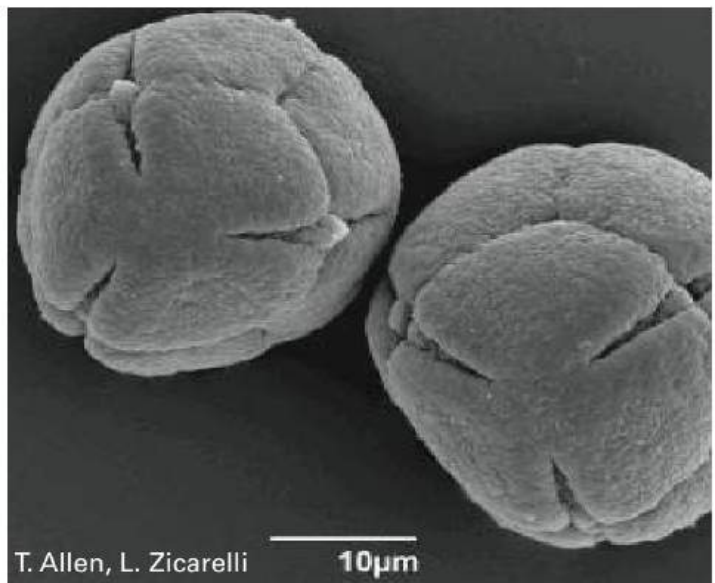
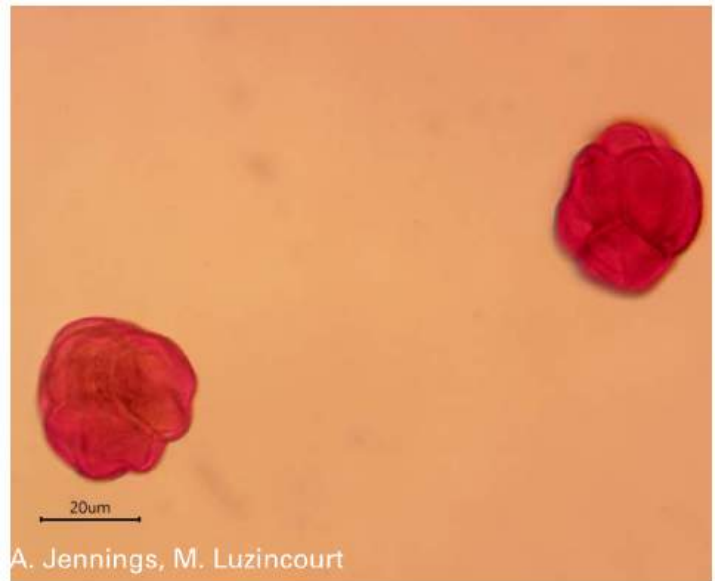
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