Plant Tissue Culture

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- *What is it ?* **Definition**
- *How did it develop ?* **History**
- *How does it work ?* **Regeneration Pathways**
- *How is it done ?* **Stages**
- *How is it used ?* **Applications**

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Plant Tissue Culture - What is it ?

Aseptic culture of isolated plant cells, tissues or organs under chemically defined nutrient media and controlled growth conditions

History

Haberlandt – 1902

Introduced concept of plant “totipotency”

Hypothesis - All (*living*) plants cells, under the appropriate conditions, have the capacity to regenerate the entire plant body - Theoretical framework for research

1920’s – 1940’s

Development of defined culture media – basic nutrients, organic supplements, and plant growth regulators (PGR’s)

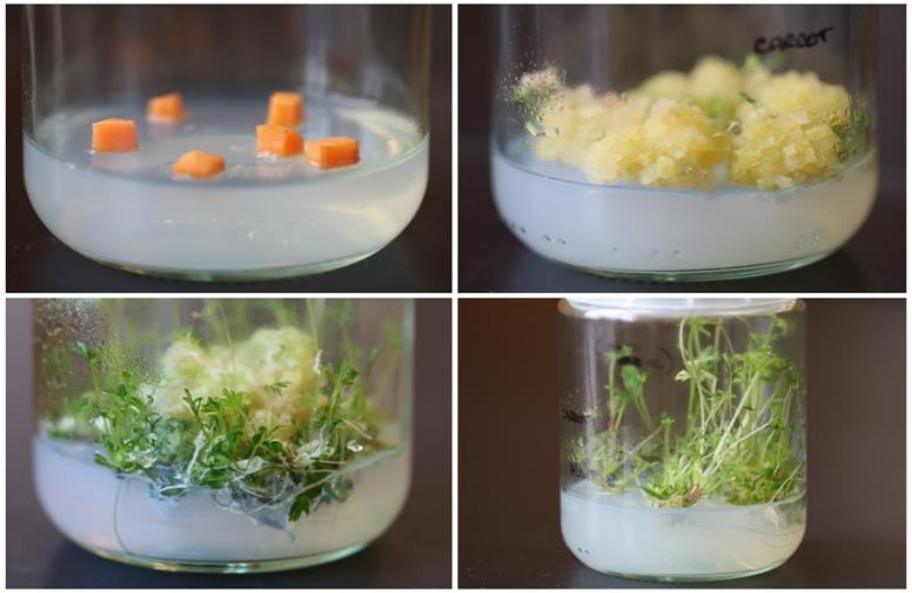
Sustained growth of isolated cells, tissues, organs

1950’s – 1960’s

Studies with tobacco and carrot cultures of PGR effects and demonstration of totipotency!

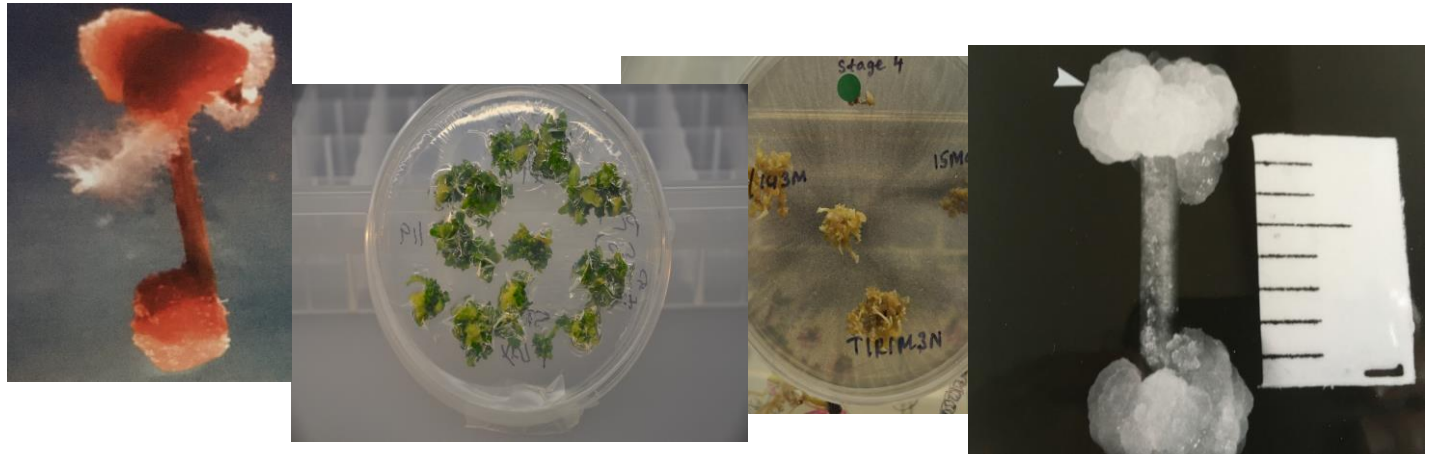
1970’s to present

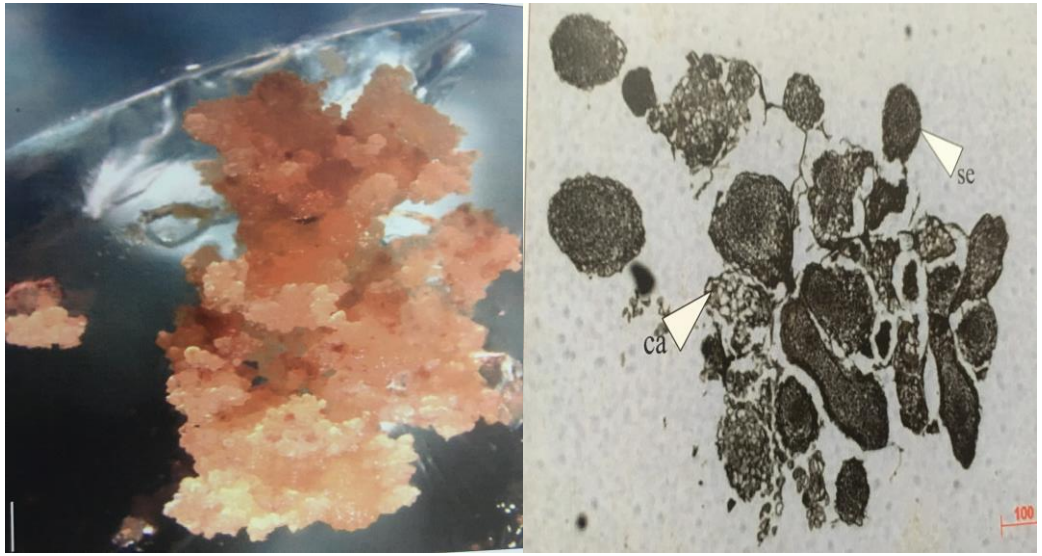
Regeneration of shoots, roots and embryos for many applications

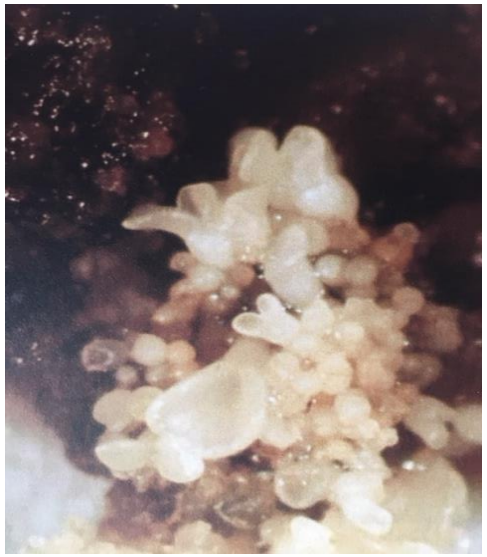


Regeneration Pathways

- Organogenesis – shoots, roots
- Embryogenesis – embryos
- Direct / Indirect (callus)







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Regeneration Pathways

Regeneration from pre-existing meristems

Shoot tips – terminal and axillary locations

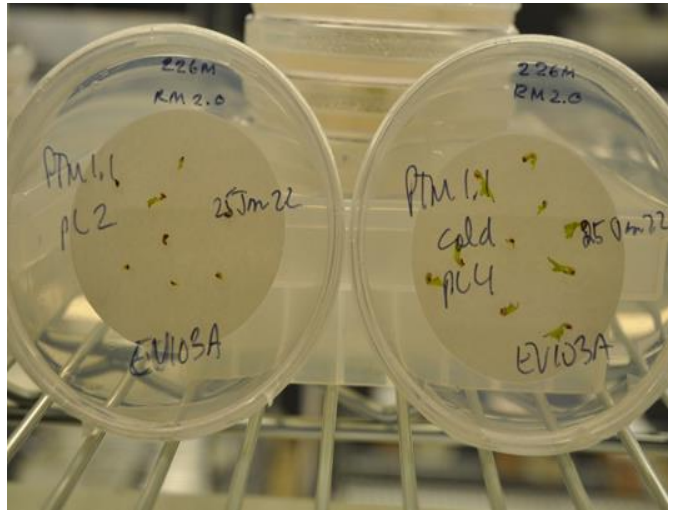
How is it done ?

Applications

Conservation: *Germplasm bank*

Micro-propagation: *Mass production*

Pathogen control: *Clean planting stock*



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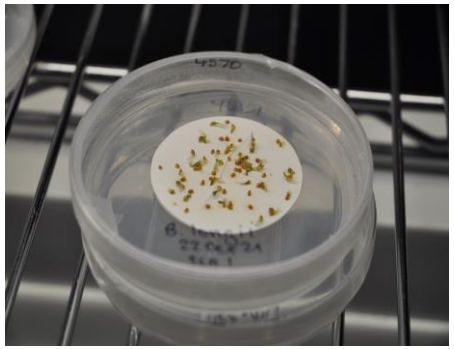
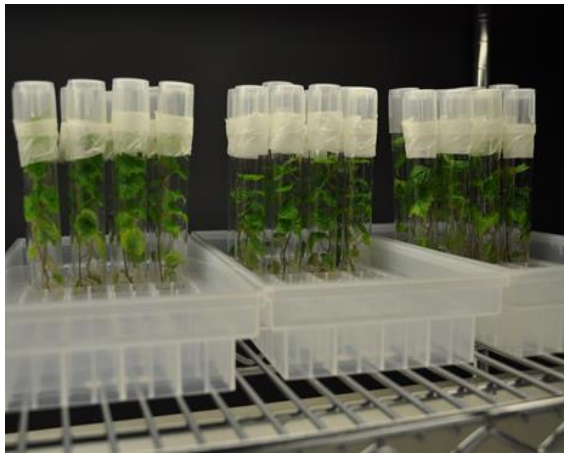
Applications - Conservation

Native species



Clonal crops



Grapevine - > 40 cultivars (hybrids and *vinifera*) + 10 rootstocks

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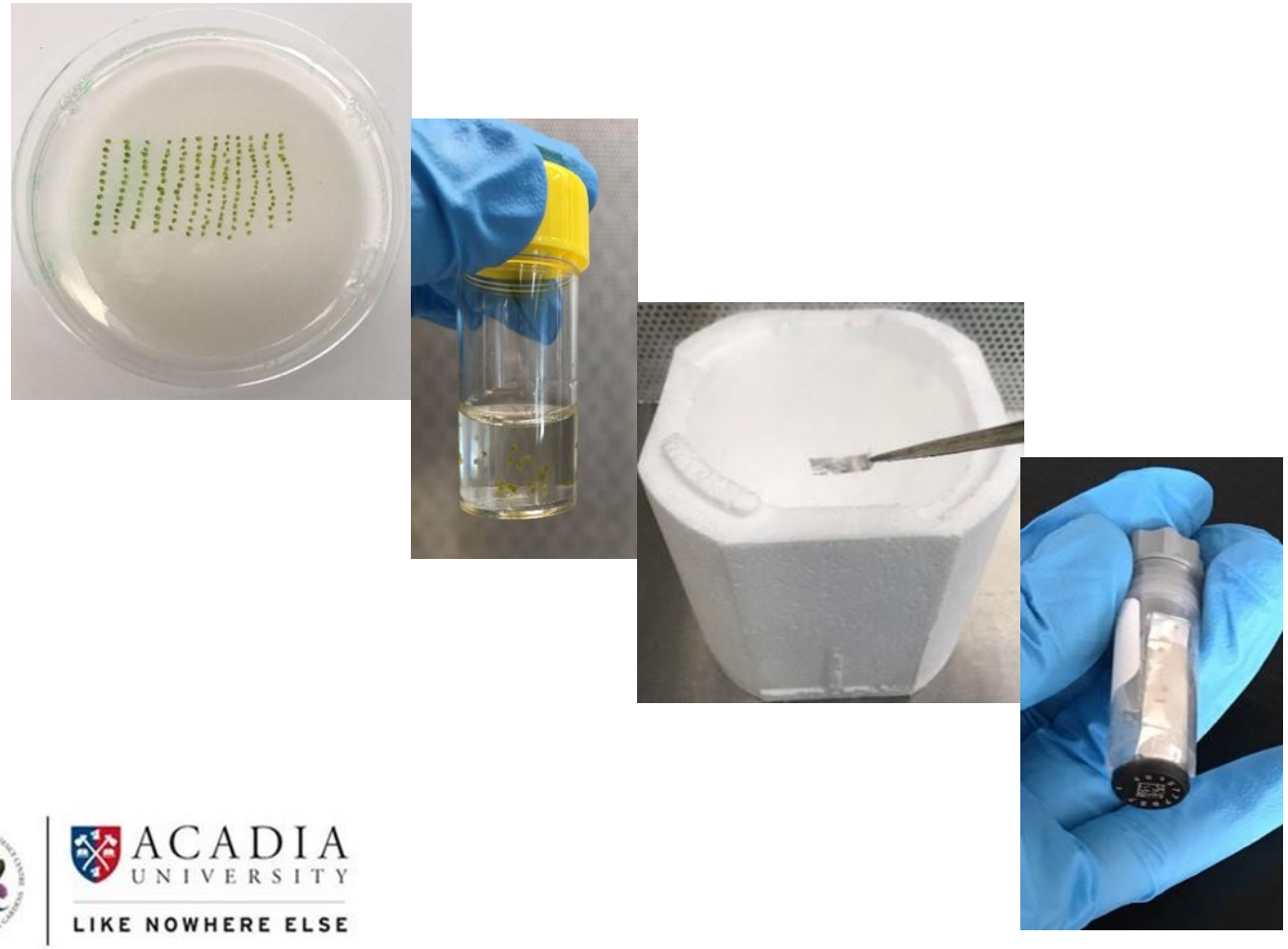
Applications - Conservation

Cryopreservation – NZ Plant and Food Research Institute



Potato cryo-bank 170+ cultivars

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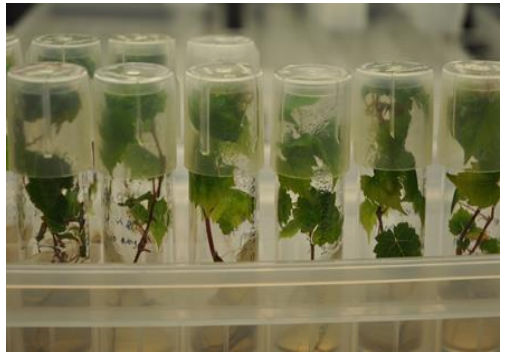
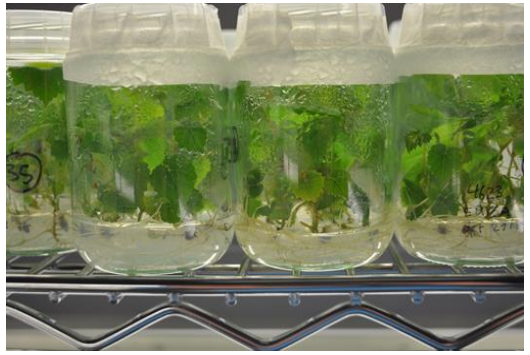
Applications – Micro-propagation

Grapevine





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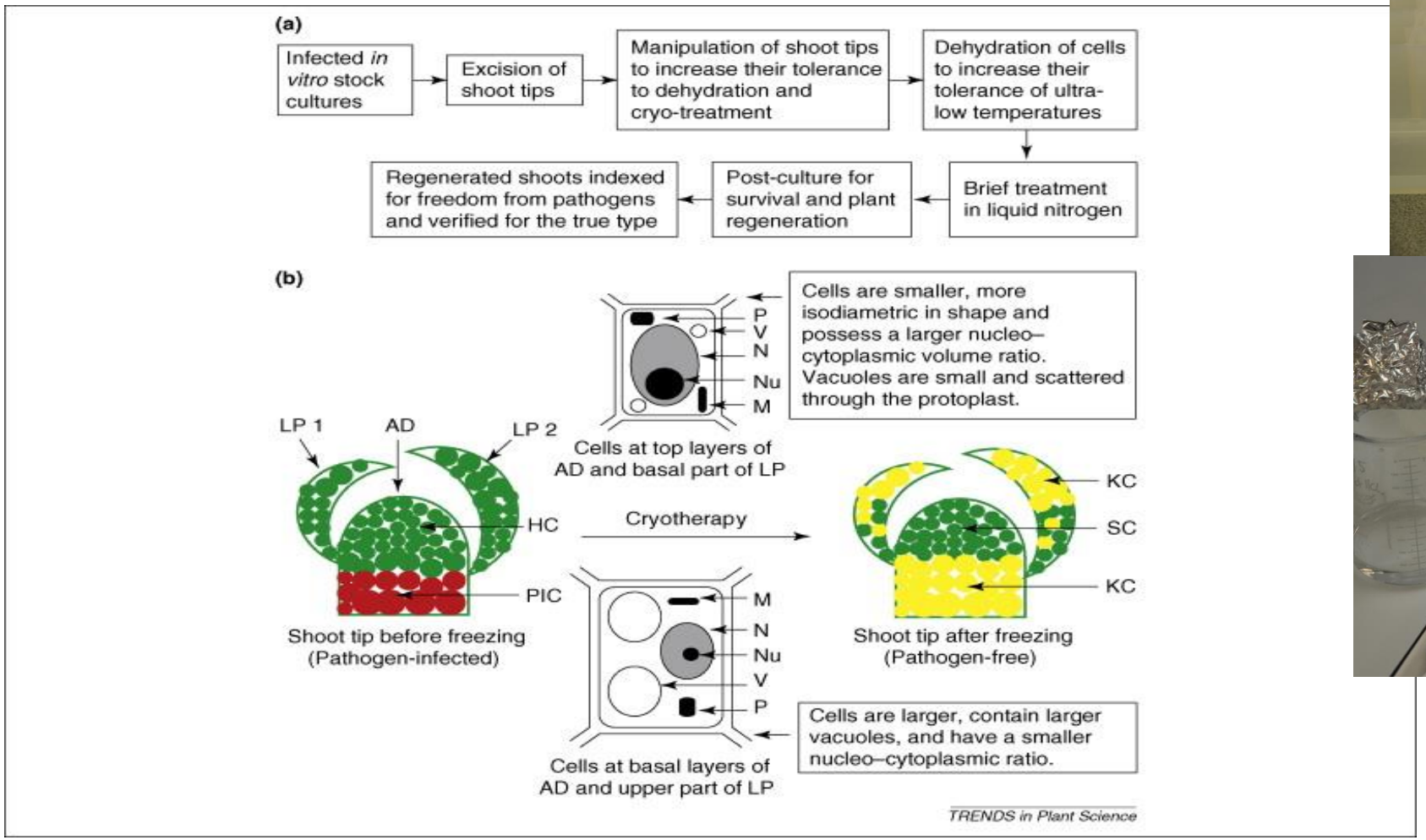
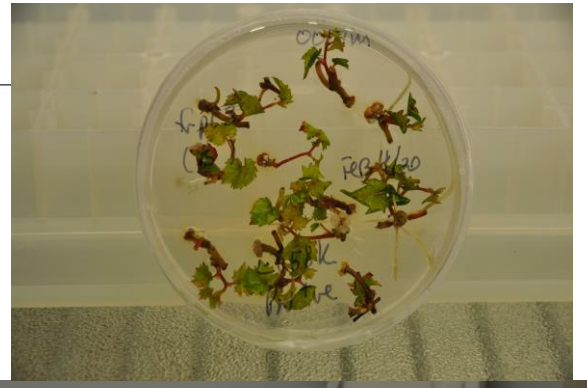
Applications - Pathogen control

Cryotherapy – novel approach for eradication of viruses





From Wang and Valkonen 2009 Trends in Plant Science 14:120

Thank you !

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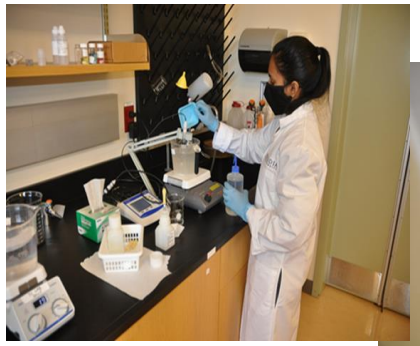

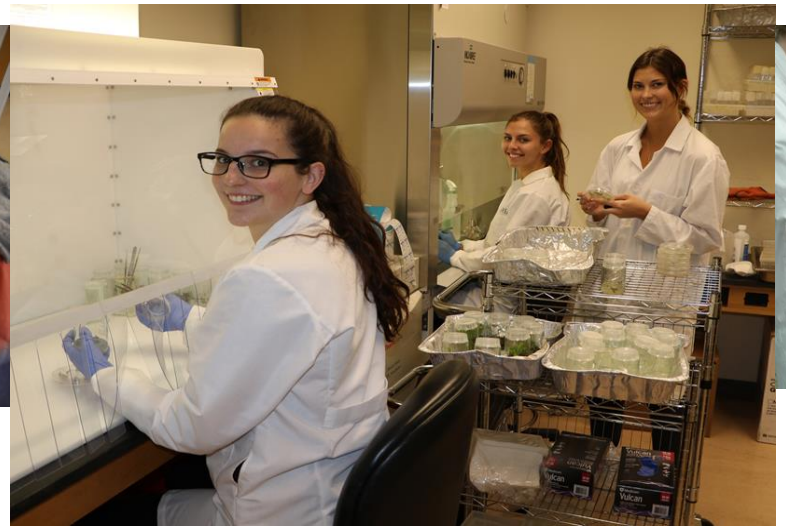

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