香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Triple the mRNA Vaccine Efficacy via Tailored Tail Sequence

BECKI YI KUANG 曠怡

RNA ENGINEERING AND SOFT MATERIALS LAB

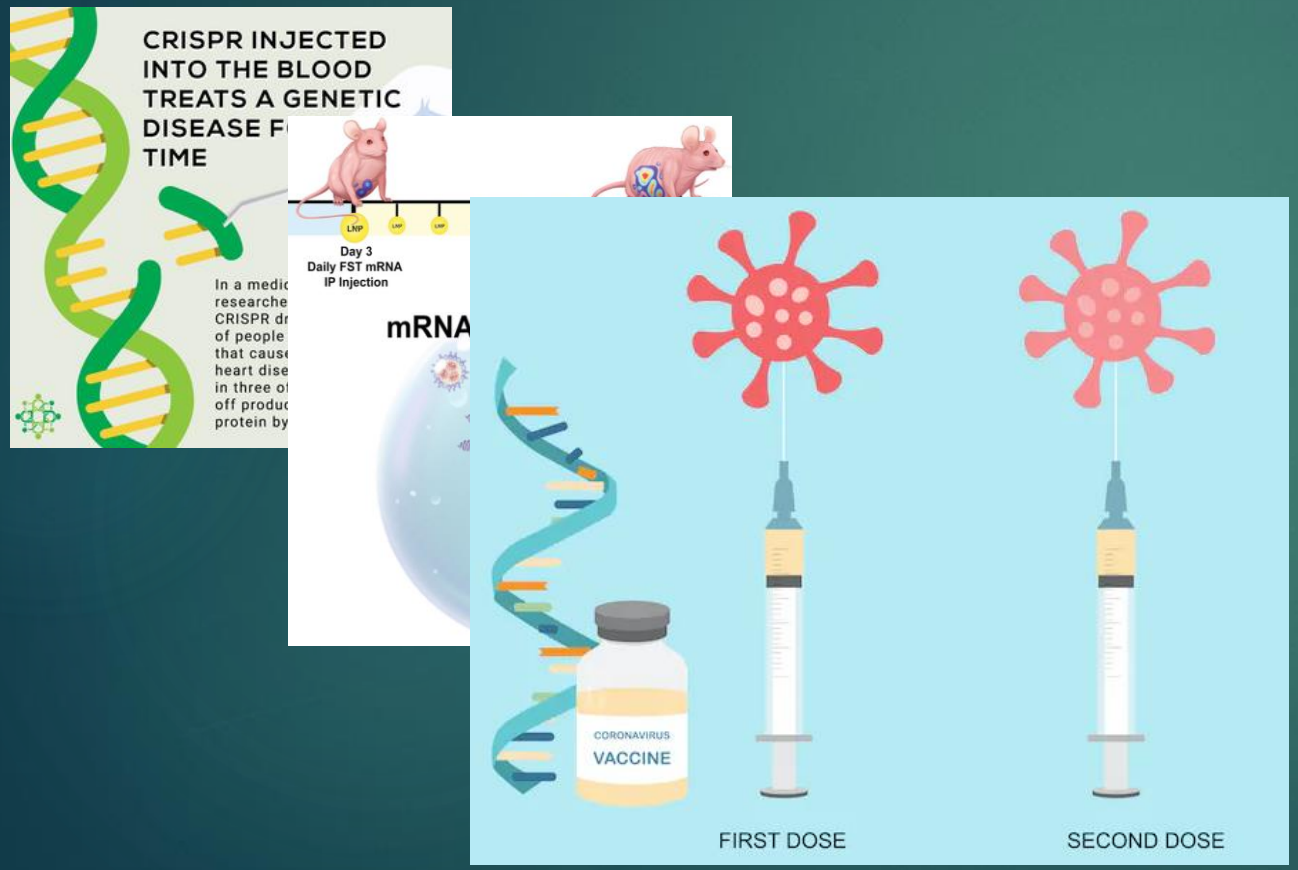
ASSISTANT PROFESSOR

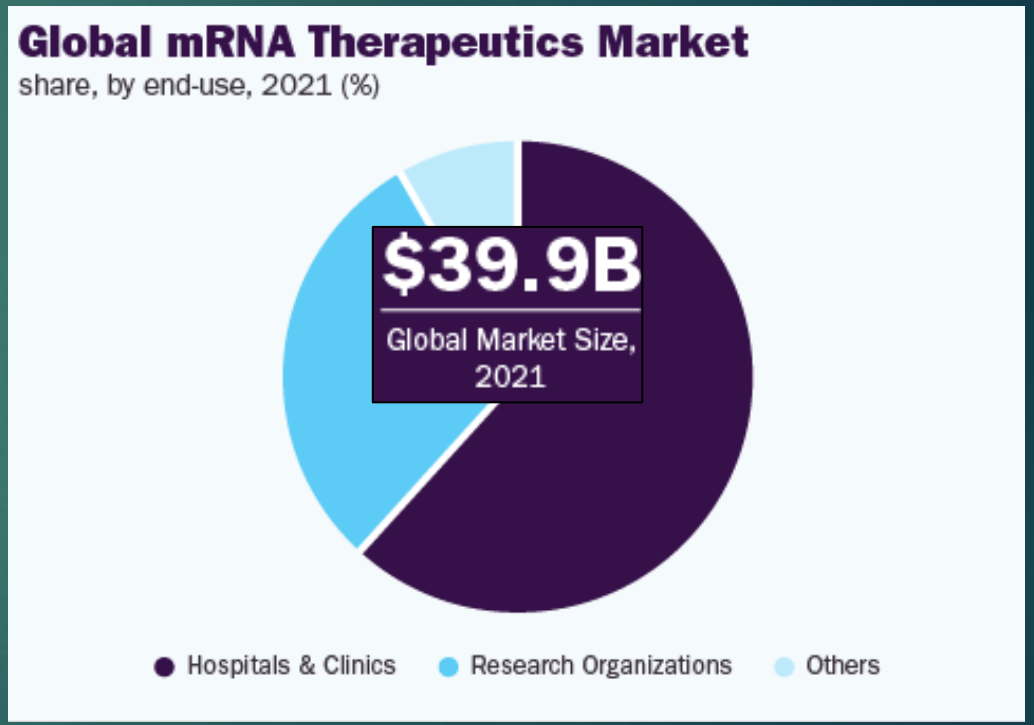
DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING

HKUST

Era of synthetic mRNA-based therapeutics

- The global mRNA therapeutics market size is expected to continue expanding.

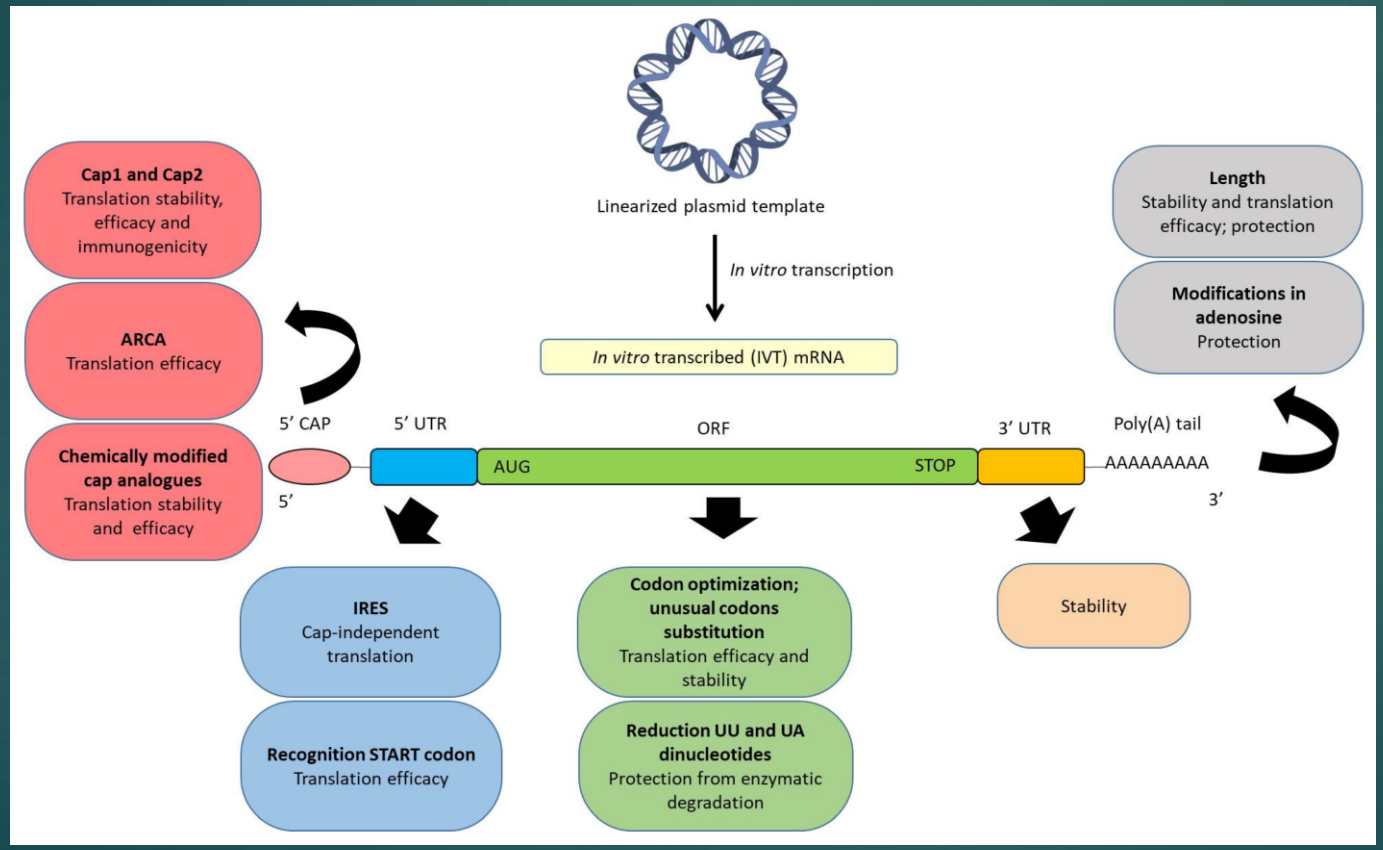




N Engl J Med. 385,6, 2021; CDC; Small, 18,44,2022; grandviewresearch

Engineering of synthetic mRNA: overlooked part

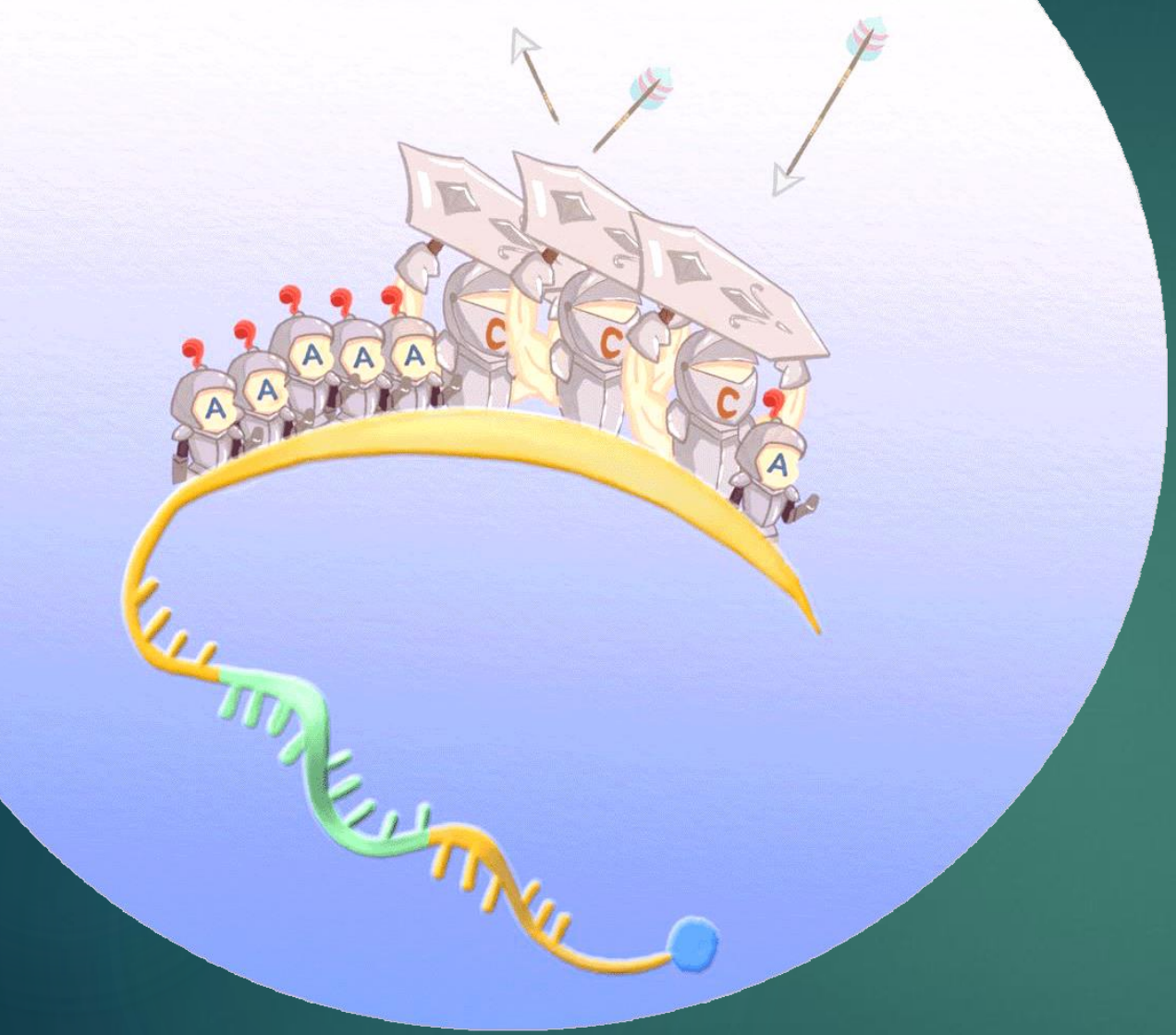
- Tail gives mRNA its identity: translation cannot happen without the tail.
- Removal of the tail leads to a degradation of the RNA.



Many natural mRNAs have UGC in their tails.

So why don't we optimize the tail sequence?

Mol Cancer 20, 69 (2021); Nanomaterials 10,364 (2020)



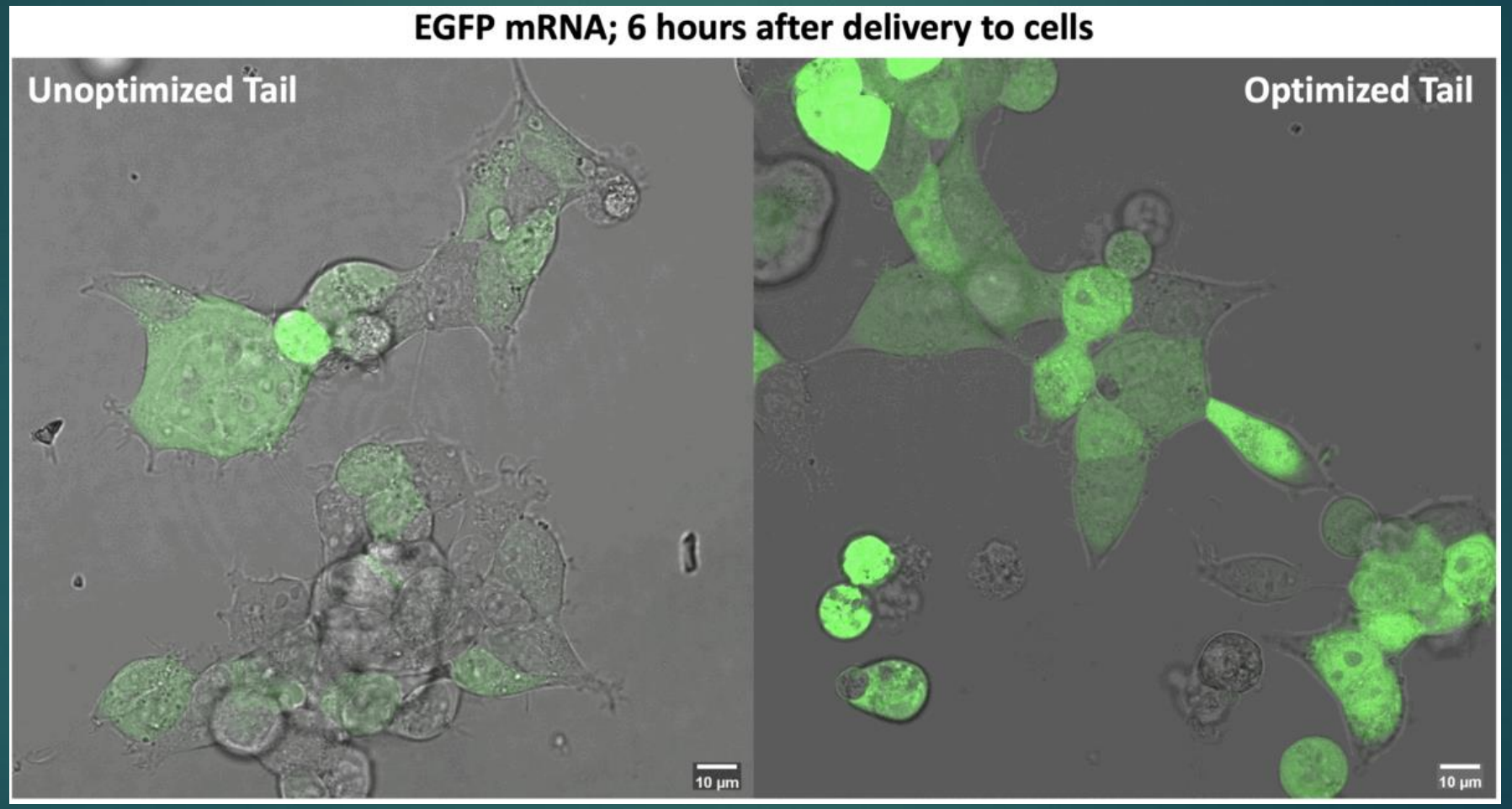
Optimized tail sequence to elevate and prolong protein production of synthetic mRNA.

mRNA vaccine can have stronger and long-lasting efficacy.

Kuang, Y.; Li, C.; Liang, Z.; Setiasabda, K. D. "Compositions and methods for increasing protein expression", International Publication Number WO2022028559, International Filing Date: August 6, 2021, International Publication Date: February 10, 2022

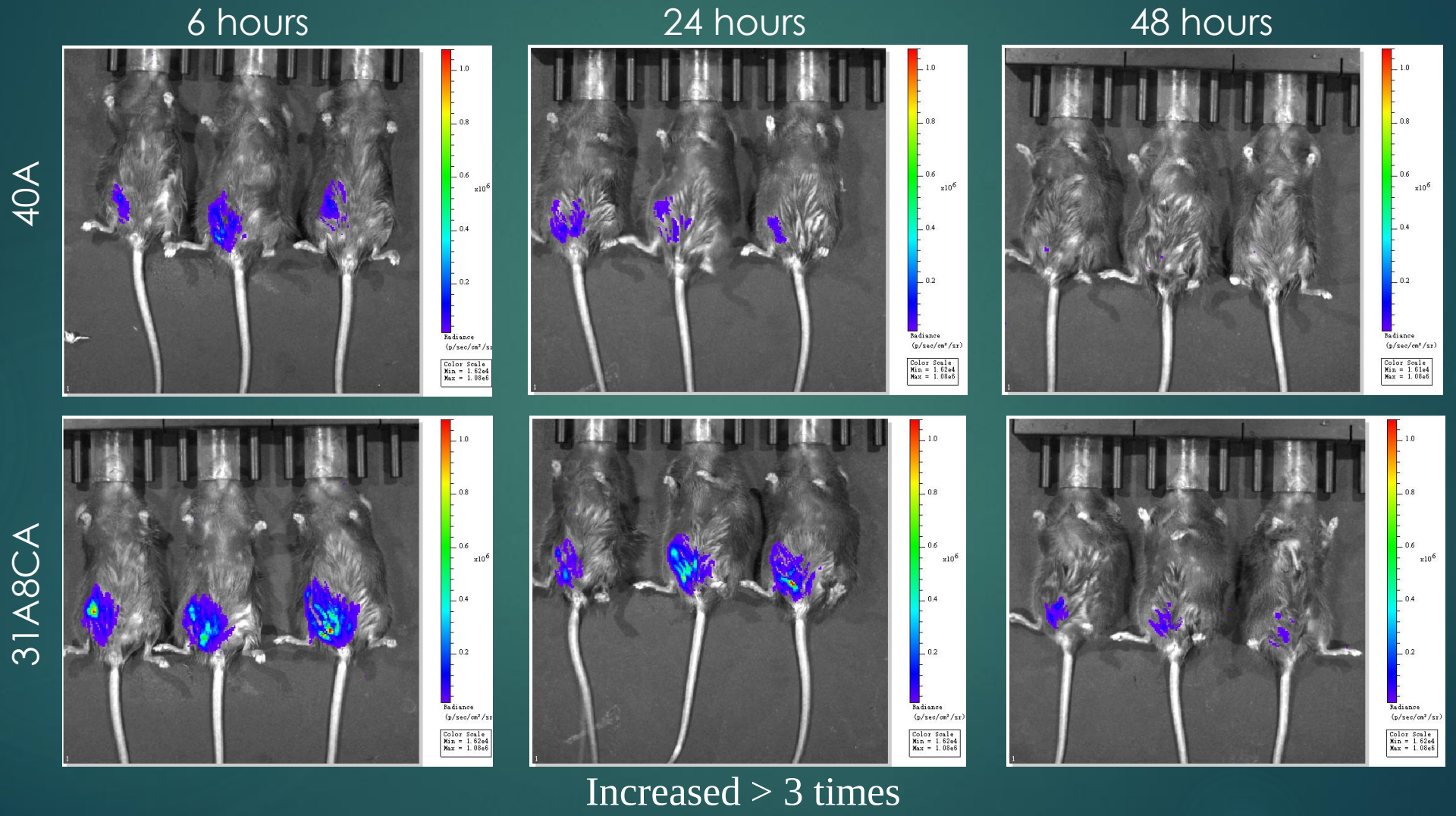
Kuang, Y.; Li, C.; Yau, W. "Compositions and Methods for Increasing Protein Expression", Application number 63/490,525, Receipt Date: March 16, 2023

C-tails enable high and stable protein production



Increased > 3 times

C-tails enable high and stable protein production



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In Situ Cell Purification for Stem Cell Technologies

BECKI YI KUANG 曠怡

RNA ENGINEERING AND SOFT MATERIALS LAB

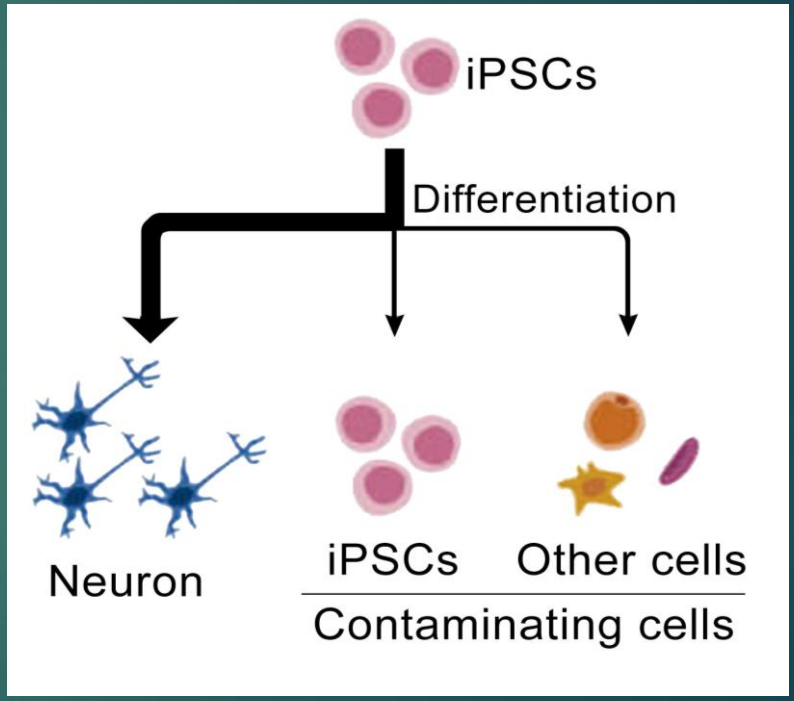
ASSISTANT PROFESSOR

DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING

HKUST

The key of stem cell application is differentiated cell purity

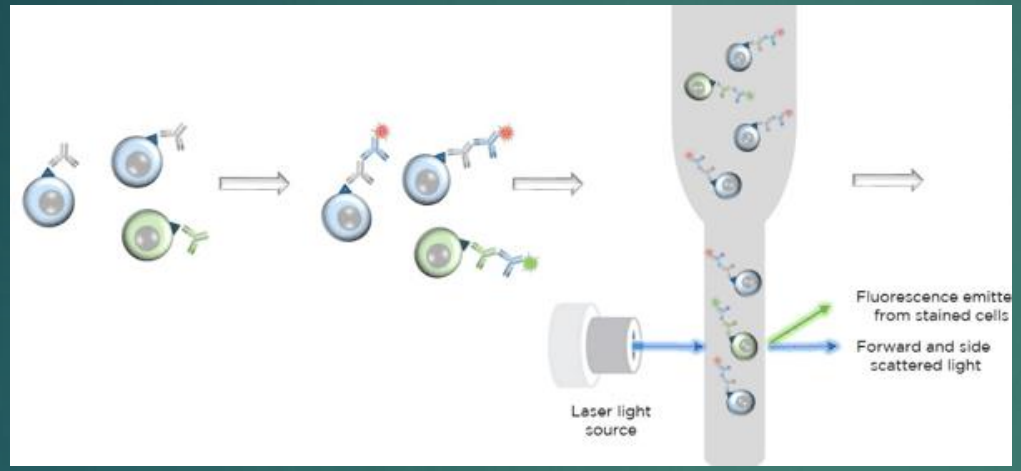
- Imperfect stem cell differentiation is common.

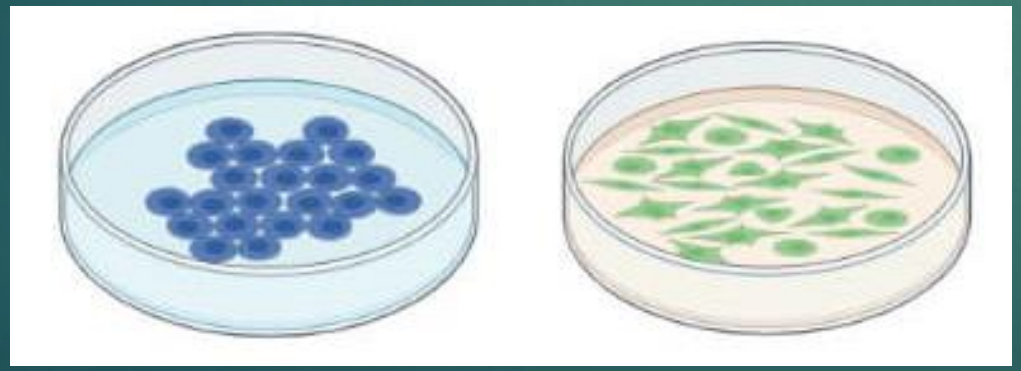


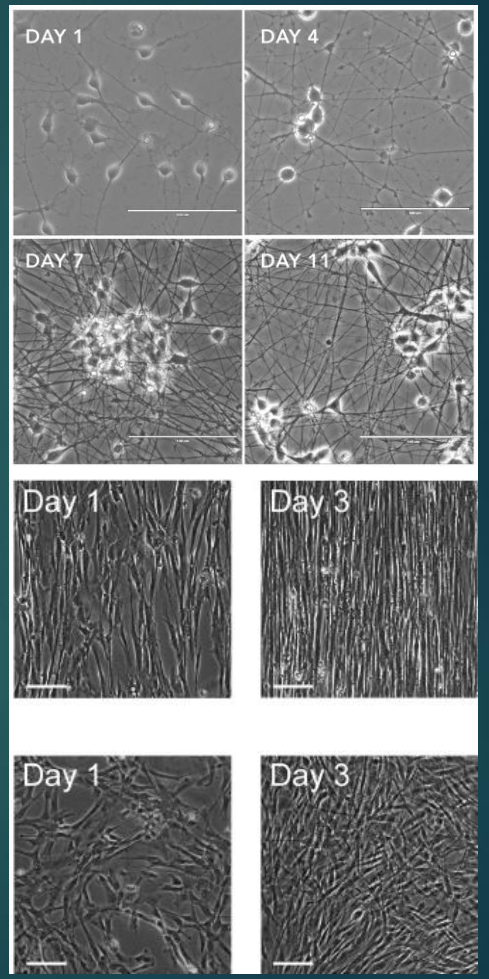
N Engl J Med. 385,6, 2021; CDC; Small, 18,44,2022; grandviewresearch

Antibody-based cell purification must disturb cells

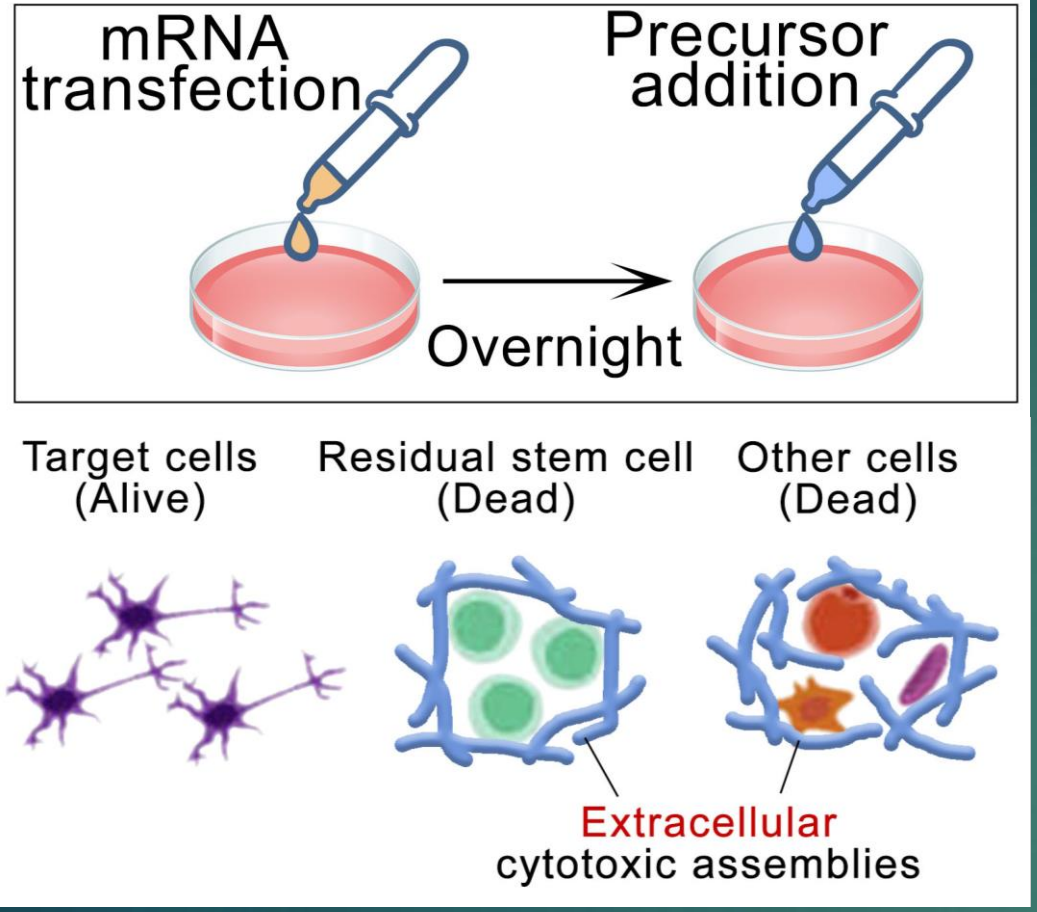
- Kills many fragile cells and completely destroy cell-cell interaction.







Li, C.; Liang, Z.; Liu, L.; Kuang Y.* Angew. Chem. Int. Ed. 2023, e202306533



Synthetic mRNA + synthetic peptide

⇩

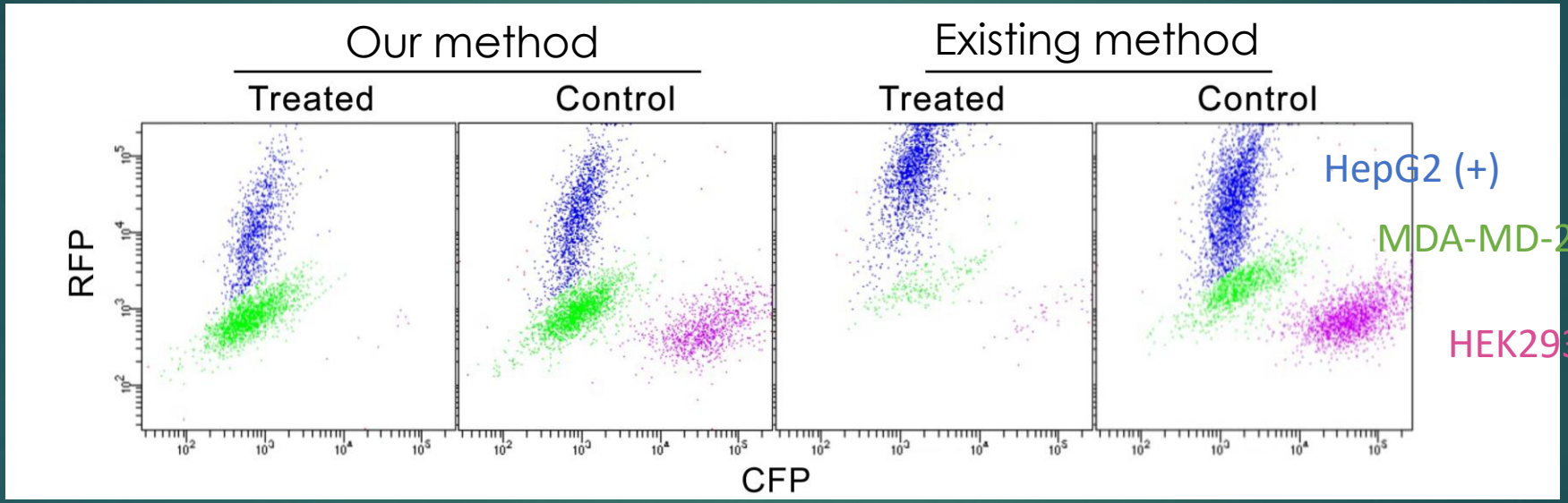
Remove all unwanted cells overnight

Kuang, Y.; Li, C.; Liang, Z. "Highly efficient in situ cell purification method based on synthetic mRNA switch(s) and a synthetic peptide", Application number 63/483,519, Receipt Date: February 06, 2023

Li, C.; Liang, Z.; Liu, L.; **Kuang Y.*** "Intracellular Molecules Induced Extracellular Peptide Self-Assembly for Efficient and Effective In Situ Cell Purification" *Angew. Chem. Int. Ed.* **2023**, e202306533

Purification of cells based on their microRNA levels

- The whole procedure only involves change of culture media.

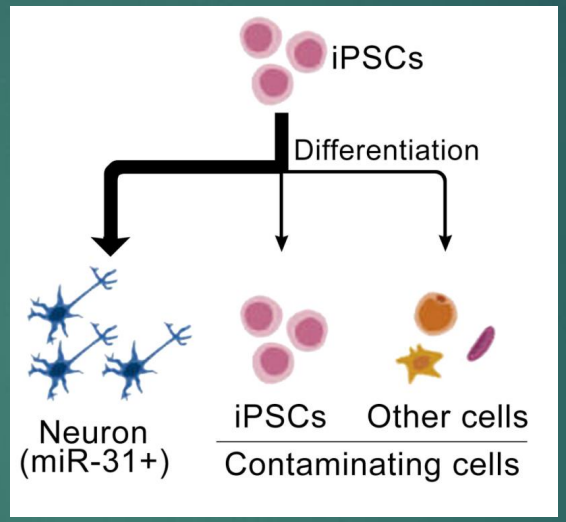


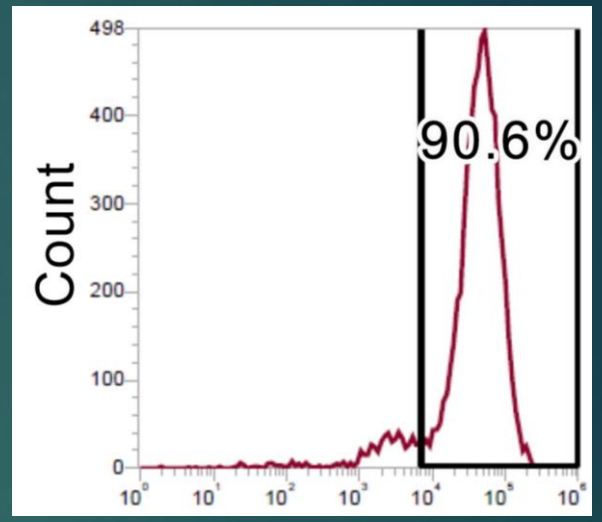
Angew. Chem. Int. Ed. 2023, e202306533

Easy to use; safe to use

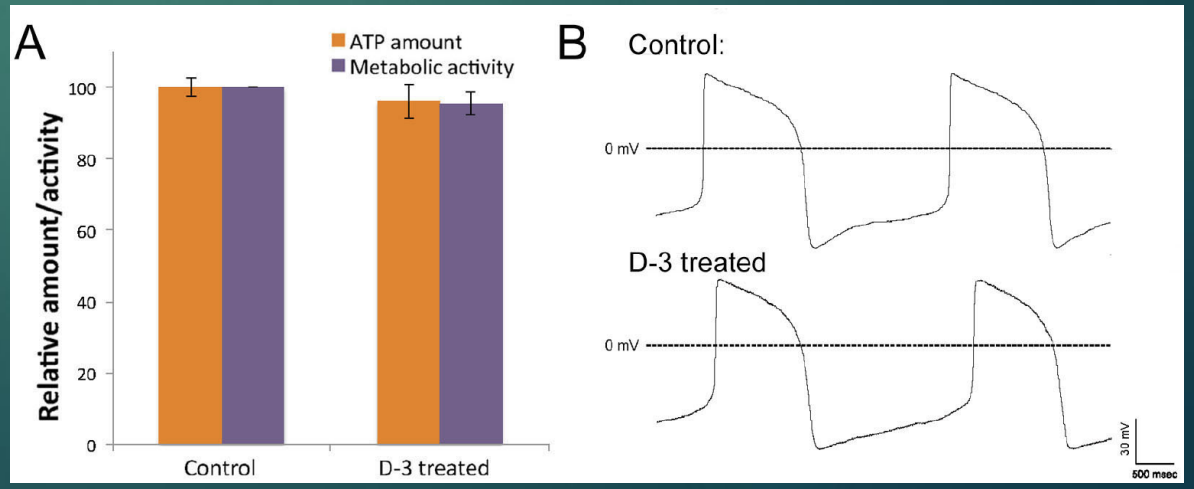
- The whole procedure only involves change of culture media.

iPSC: 13%
Neuron: 52%
Wrong types of cells: 35%





No detected damage on target cell.
All materials is nontoxic and quickly degraded.



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