# Application of Single-cell Genomics

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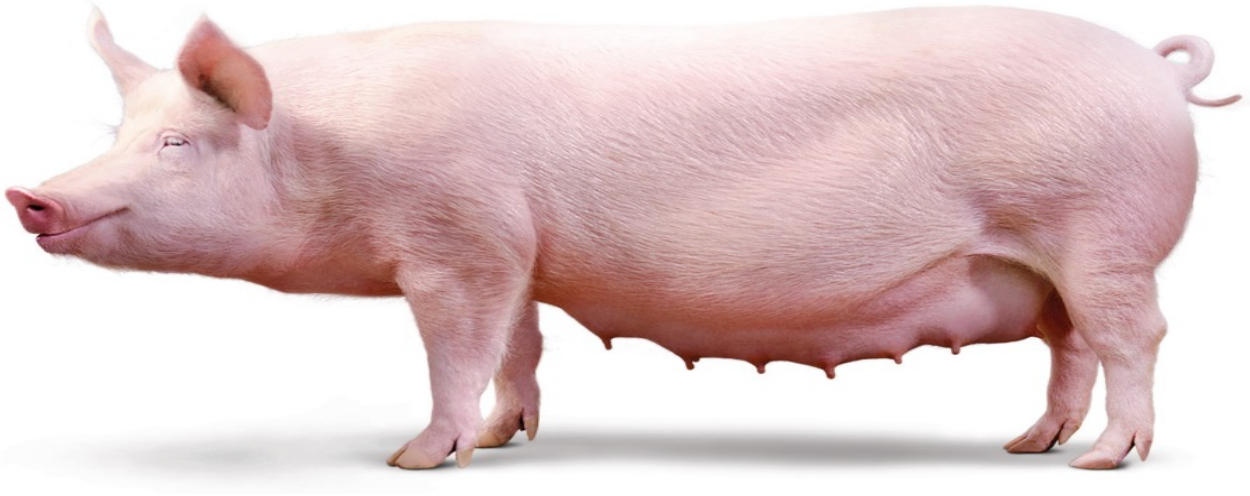
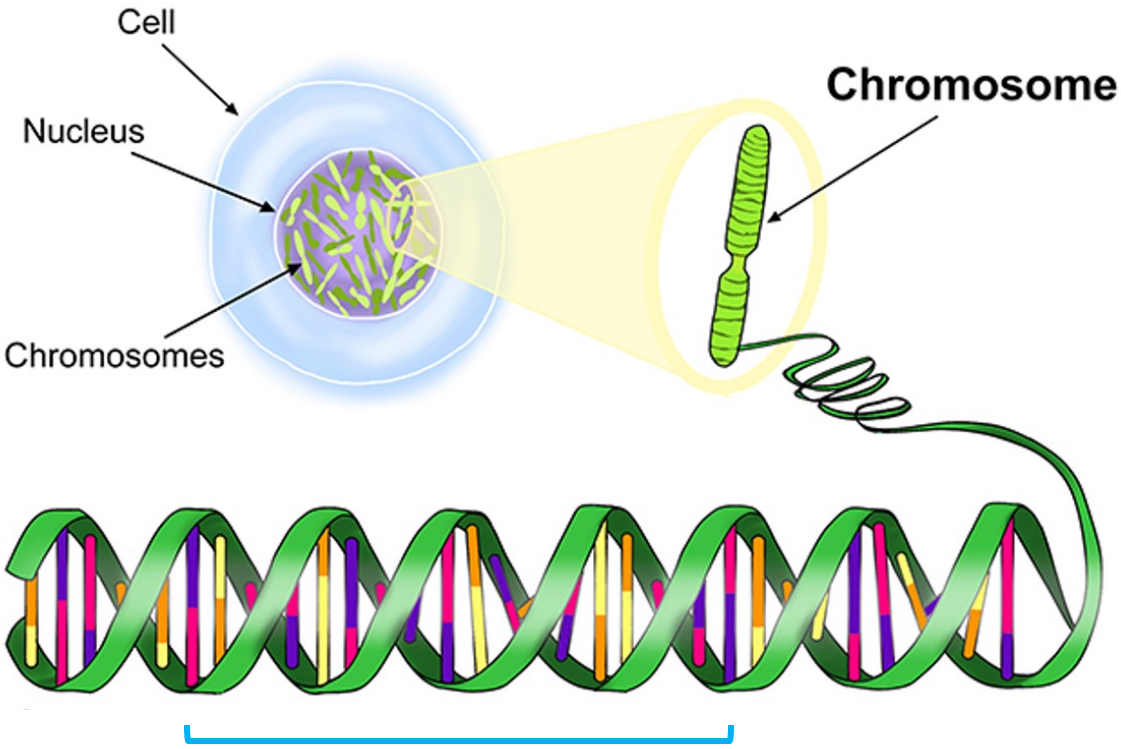


Which one of them is highly productive to farmers?

# Genetic mapping of characters






*Adapted from mamothmemory.net*

# Single cell sequencing

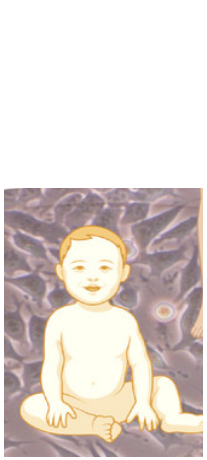
- Powerful tool to explain gene expression, first described in 2009 (Tang et. al, 2009).
- Explains the genes and their functions in single-cell level.
- Very rare and specific changes (like somatic mutations) can be detected.

# Application of sc-RNA sequencing technology

High Vs. Low Fertility in Pigs

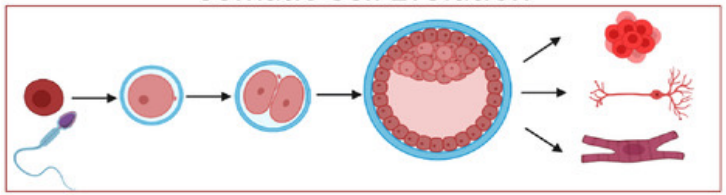
Host response in clinical mastitis

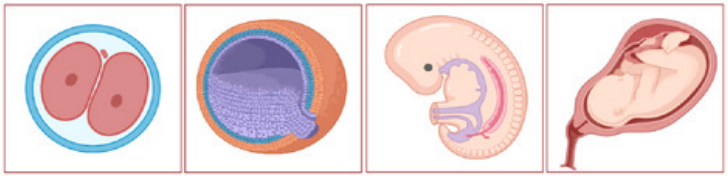
# Application of sc-RNA sequencing technology



Development

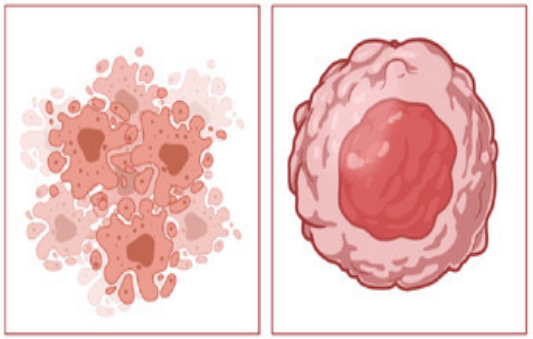
Somatic Cell Evolution



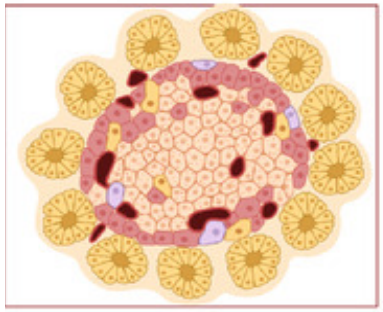


Reproductive biology | Embryogenesis | Organogenesis | Prenatal genetic diagnosis

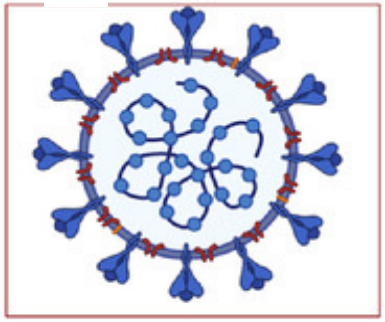
Cancer Biology



Diabetes



COVID-19





Clinical & Translational Med, Volume: 12, Issue: 3, First published: 29 March 2022, DOI: (10.1002/ctm2.694)

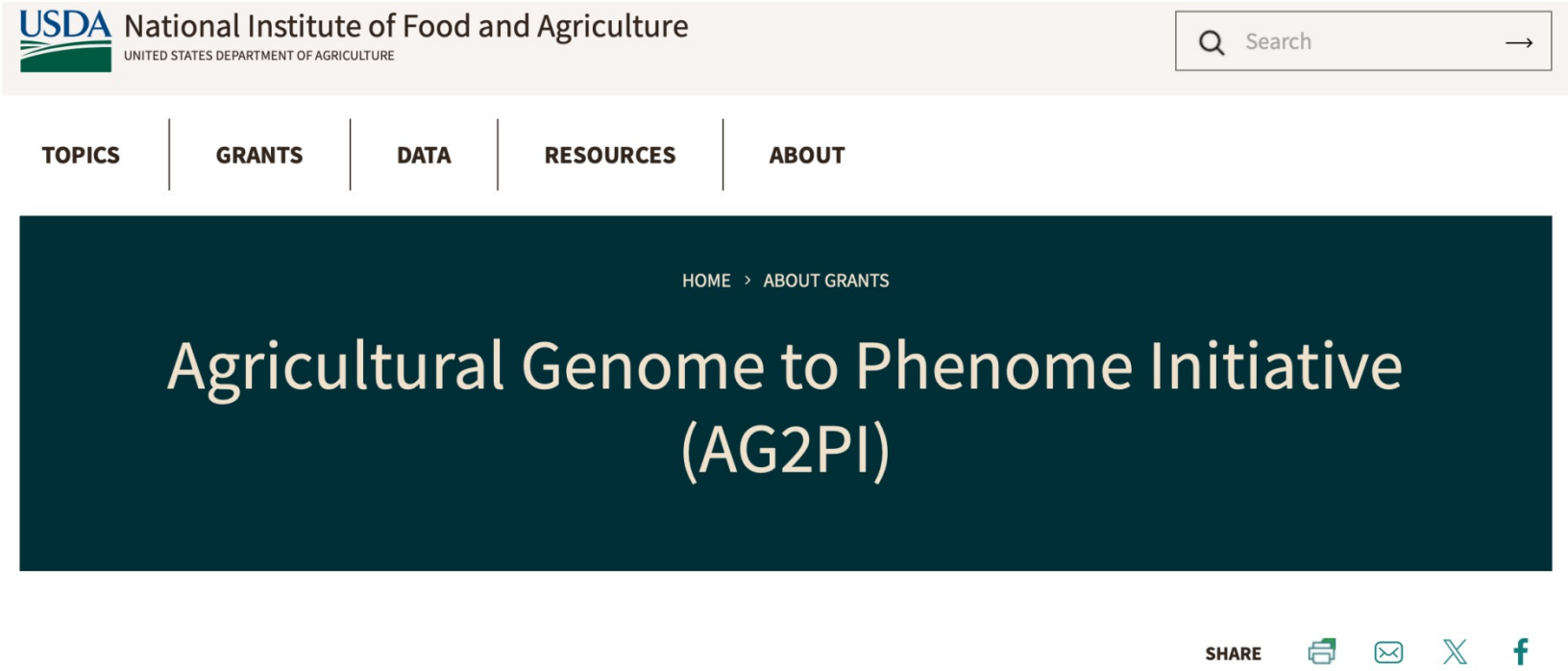
# METHOD OF THE YEAR, 2013!!!

"Methods to sequence the DNA and RNA of single cells are poised to transform many areas of biology and medicine." -*Nature Methods*

- Potential to study biological life in a single unit of cell.
- Every cells are unique – but this procedure can reveal heterogeneity in cells.



Method of the Year 2013. *Nat Methods* **11**, 1 (2014). https://doi.org/10.1038/nmeth.2801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Agricultural Genome to Phenome Initiative (AG2PI)
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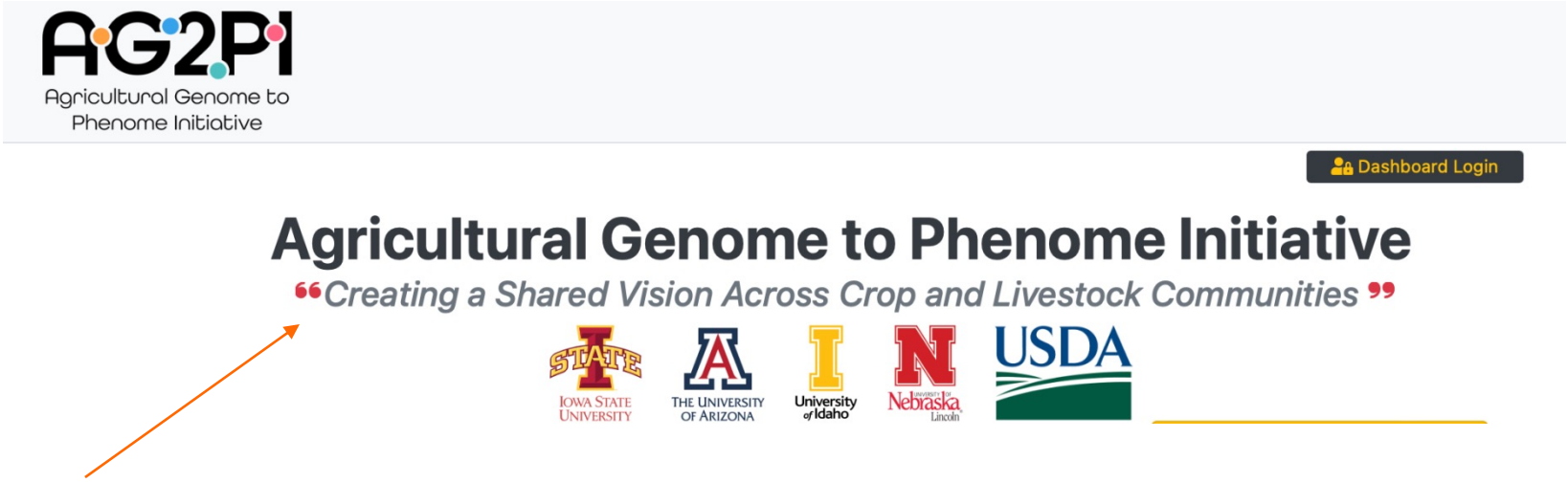
The 2018 Farm Bill directed NIFA to establish a competitive grant program to support collaborative research concerning genomes and phenomes of both crops and animals of importance to the agriculture sector of the United States.

# Leveraging genomics to improve both plant and animal agriculture



# Leveraging single-cell genomics in QTL mapping

AG2PI seed grant
Principal Investigator: Dr.  Susanta Behura

Aim:

Collaborate with animal, plant, and entomology scientists to initiate single-cell QTL mapping studies in both crop plants and livestock animals

# Difficulties

- Establishment of dedicated lab for single cell sequencing is very expensive (a sample analysis cost $1500).

- The data from millions of cells can generate to computational challenges.

# Implication and future direction

- Single-cell genomics holds huge promise in agriculture.
- It can precisely identify genes and cell types that control economic traits in both crop plants and livestock animals.
- Professional Development Programs focusing on single cell genomics.

https://www.worldatlas.com/articles/the-culture-of-nepal.html

# THANK YOU ☺