



Multomics, AI and the Data Behind Modern Biology

A. Let's talk omics

Reminder

Remember where to stress a word that ends in -ics?

↪ Can you match these omics with their correct phonetic spelling? Practice saying each field name with a partner.

_____ multiomics	A. /ˌproʊtiˈoʊmɪks/
_____ genomics	B. /ˌɛpɪdʒiˈnoʊmɪks/
_____ transcriptomics	C. /ˌmʌltiˈoʊmɪks/
_____ proteomics	D. /ˌmɛtəboʊˈloʊmɪks/
_____ metabolomics	E. /dʒiˈnoʊmɪks/
_____ epigenomics	F. /ˌtrænskɹɪpˈtoʊmɪks/

Genomics is defined as *a biological analysis approach that studies the complete DNA sequence to get a genetic blueprint.*

↪ Can you suggest a definition for each of the other five fields?

B. Multomics is changing the game - hear from researchers using it

Illumina, October 2021, <https://www.youtube.com/watch?v=Xsyp0qqKzkY>

1. Previewing

↪ Match the following words from the video with their correct definition.

multiomics	•	•	a series of connected steps in a cell process
holistic	•	•	a measurable sign of a disease or condition
novel	•	•	new and original
biomarker	•	•	looking at the whole system, not just one part
pathway	•	•	combining several "-omics" to study one problem

genetic variant•	•	studying cells one by one / all together as an average
single-cell / bulk•	•	a pattern that identifies something
orders of magnitude•	•	impossible to find or measure
constitute •	•	a difference in the DNA sequence between people
signature •	•	to make up (a part of a whole)
undetectable •	•	differences of 10×, 100×, 1000×

2. Predicting

↪ Based on the vocabulary above, predict two things that you expect to hear in the two segments of the video.

What is multiomics

Benefits of multiomics

↪ After viewing the video once, discuss these questions with a partner.

- In one sentence, what is multiomics?
- Are the speakers mostly positive, negative or neutral? What words or tone tell you that?
- Did you hear any of your predicted ideas?

3. Comprehension

↪ Watch the video again and assess if the following statements are true or false. Correct false statements.

Multiomics uses a single approach to study a problem.

Cell processes such as the transcriptome and proteome are tightly connected.

In genetic diseases, multiomics helps researchers find new pathways and biomarkers.

Mapping quantitative trait loci for African-Americans had already been done many times.

The variants found in that study could also be found in other populations.

Single-cell methods are especially useful for complex organs such as the kidney and brain.

Important cell types that make up 1–2% of an organ are easy to detect in bulk approaches.

↪ With a final viewing, fill in the missing words in the following sentences.

Multimomics gives biological _____ to disease-causing genetic variants, enabling the _____ of novel pathways and biomarkers.

It gives you multiple views into the same _____.

You are just looking at the same problem from different _____ or different layers.

Multimomics provides a deeper _____ at the single-cell level.

Single-cell approaches are ideally _____ to the study of complex organs.

Cell types vary in proportion by _____ of magnitude.

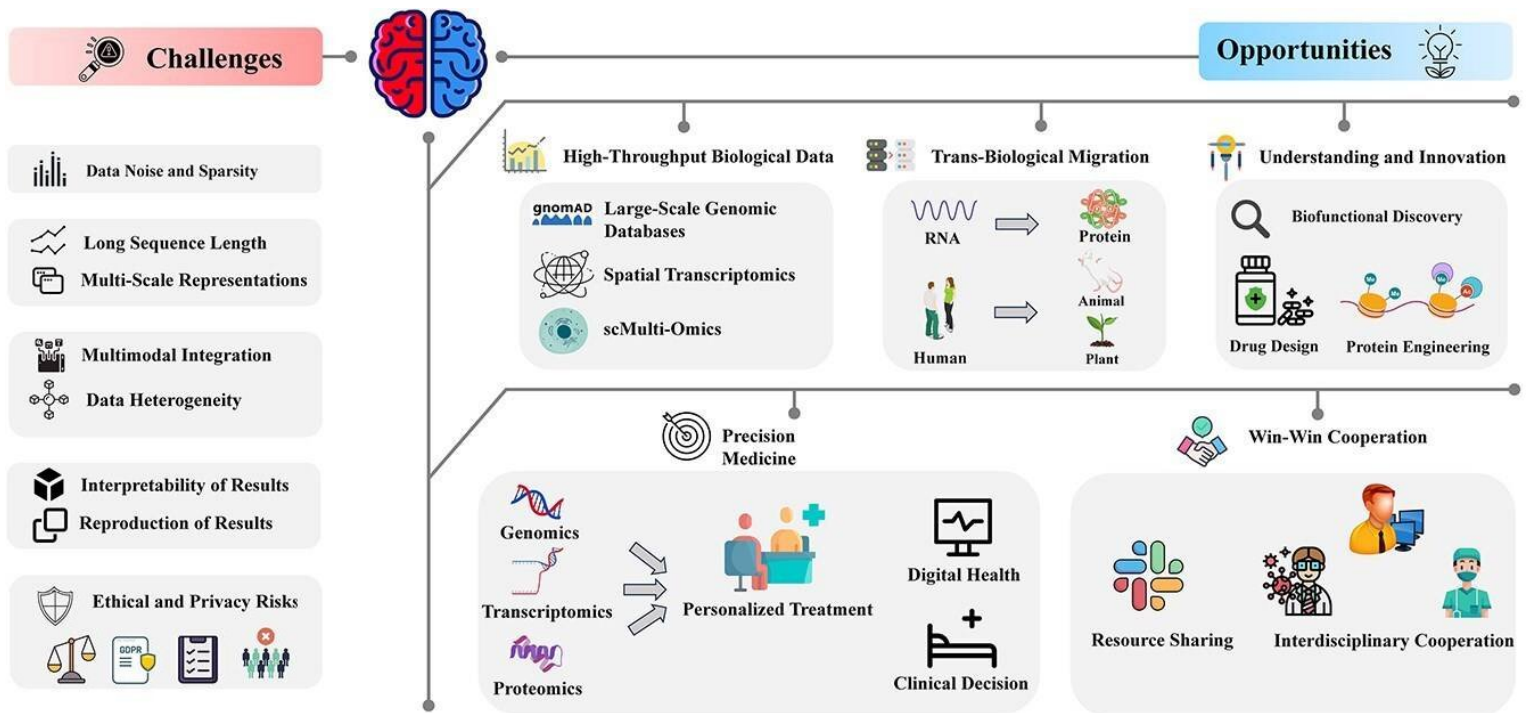
Many critically important cell types only _____ one or two percent of the whole.

In single-cell approaches, we detect them with _____.

↪ Return to your predictions about the video. Which were correct? What was missing?

C. The Double-Edged Sword of AI

Jiang J. et al., “Artificial intelligence in bioinformatics: a survey”, Briefings in bioinformatics, 2025 Nov 1;26(6)



What are the two main sections? What do the icons show?

Which ideas from the video can you find in the image?

Sort the challenges into “data problems” and “people and society problems”.

1. Opportunities Experts

↪ In groups of 3 or 4, investigate **one** of the five opportunities of using AI . What is promising about that practice? Prepare to explain to other partners.

High throughput biological data

Transbiological migration

Understanding and innovation

Precision medicine

Win-win cooperation

2. Speaking task

Scenario: A hospital wants to use an AI system that combines patients' genomic, protein and health-record data to recommend personalized treatment. The video suggests multiomics could reveal patterns that single-layer analysis misses. The infographic warns of risks.

In groups of 4, distribute these roles:

Doctor • Data scientist • Patient representative • Hospital manager.

Each person prepares arguments (using information from the video and the infographic), then the group holds a 6-minute discussion to decide:

Should the hospital adopt the AI system? Under what conditions?

Consider using the following structures:

One major benefit is... / A serious concern is... / As a result... / On the one hand... on the other hand...
It has the potential to... / We should make sure that...