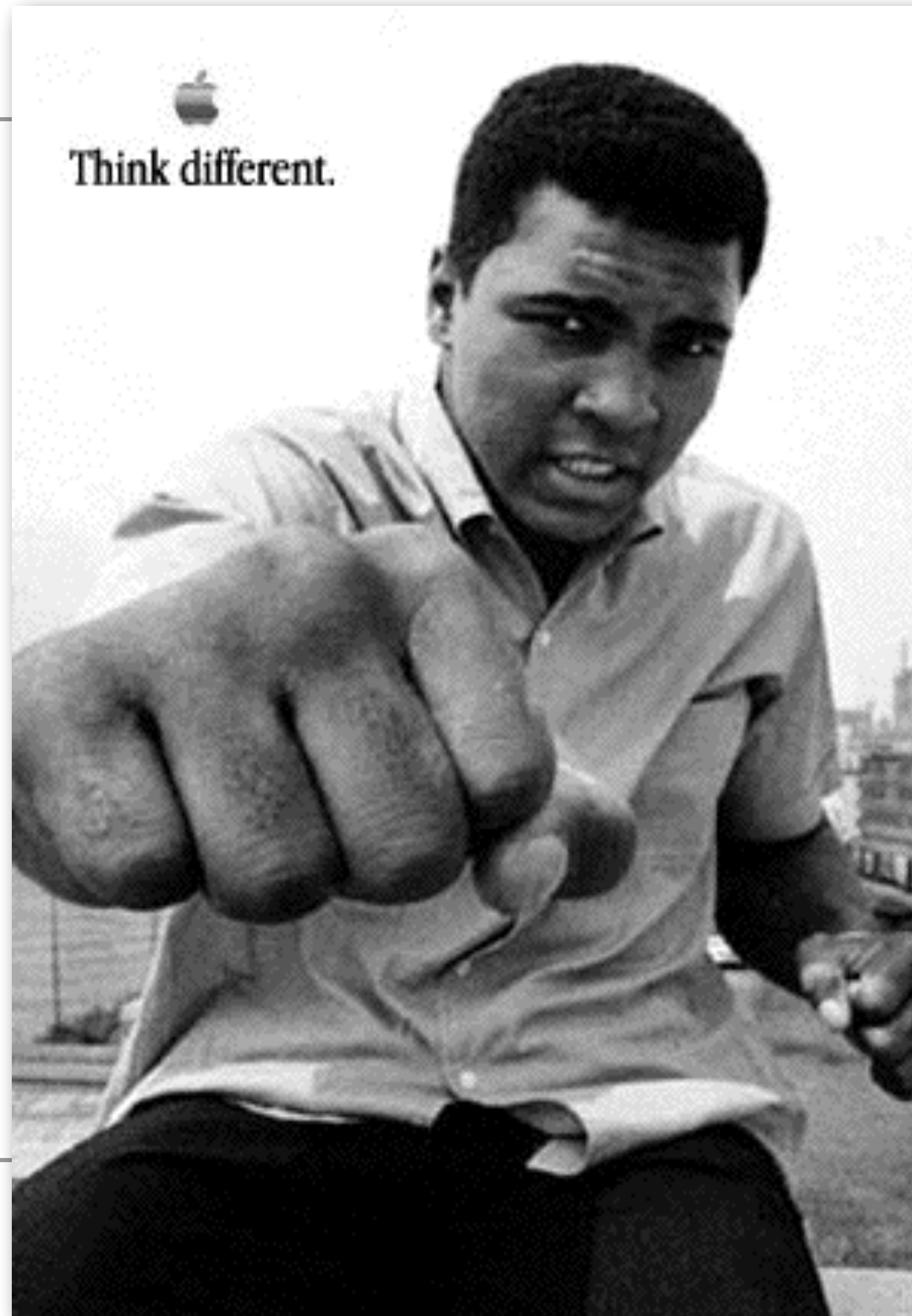


LB145-Fall 2023



1. **Pick up** Name Folder

- Pick up name folder and set it up at seat.

2. **Sit** with your group.

- laptops on outer perimeter (avoid distracting)

3. **Clicker** Attendance

- Launch your Top Hat, and get ready to click.

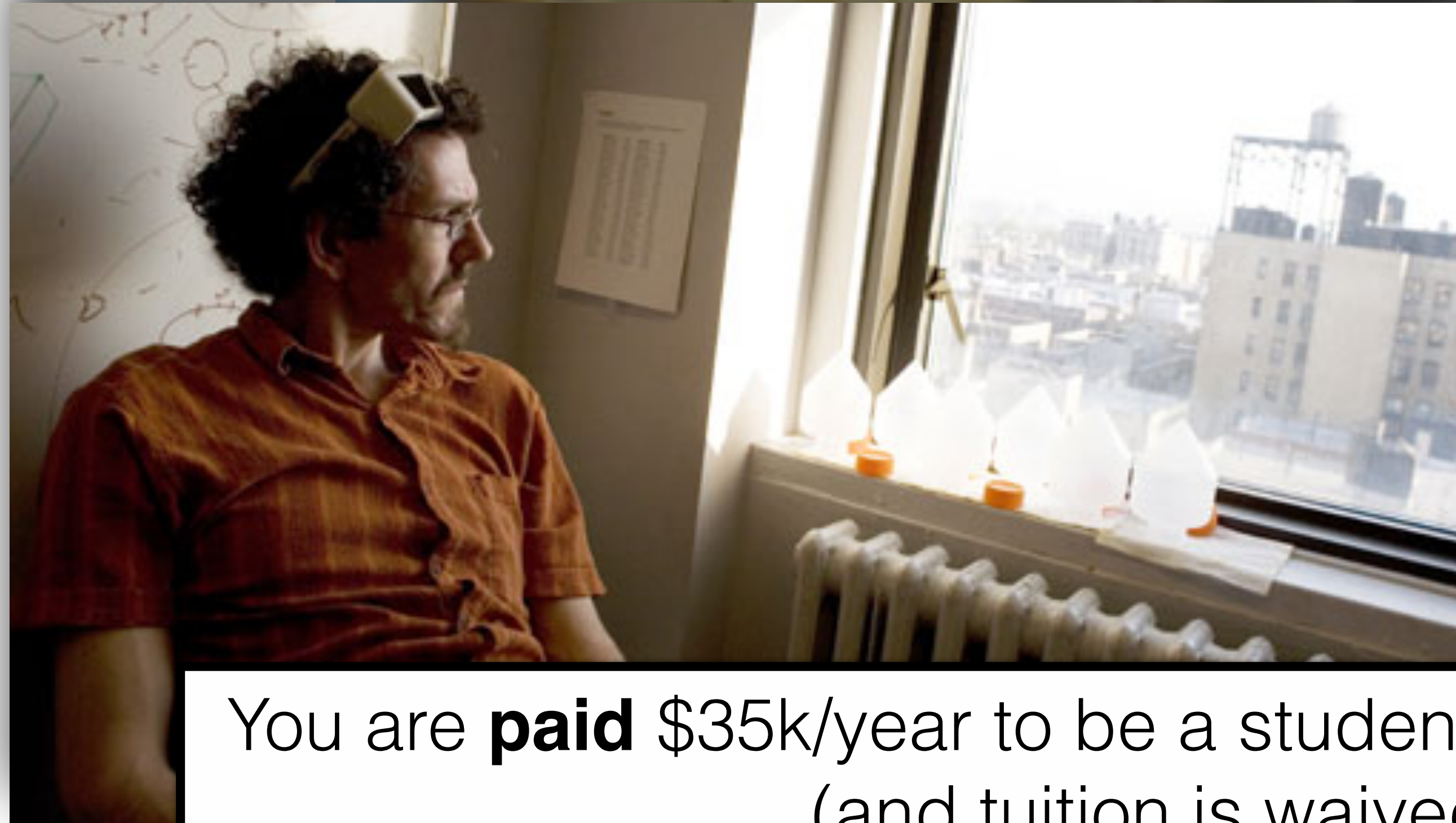
NATURALLY OBSESSED

The Making of a Scientist

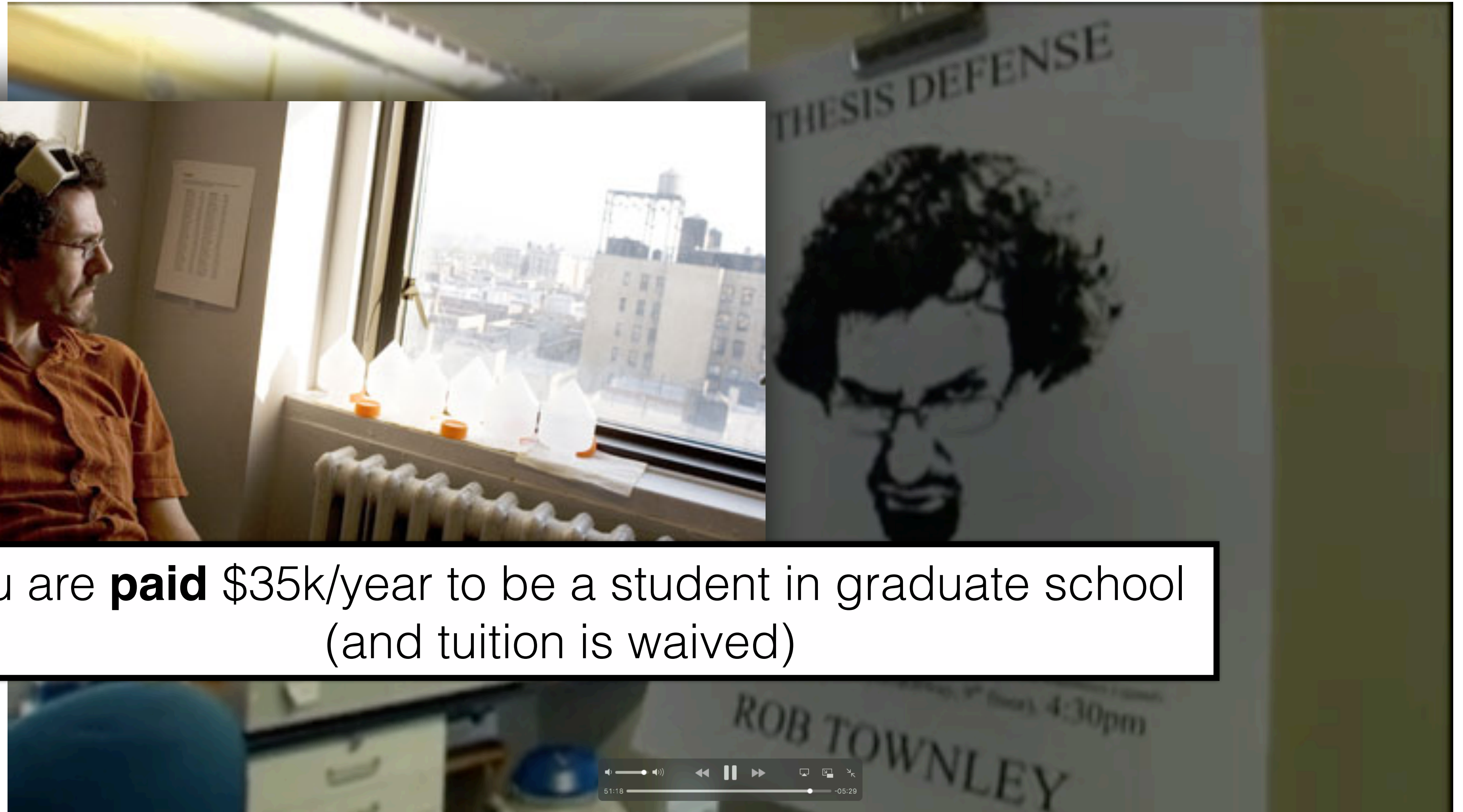


Mixing humor and heartbreak, *Naturally Obsessed: The Making of a Scientist* delves into the lab of charismatic professor Dr. Lawrence Shapiro, and follows three irrepressible graduate students on their determined pursuit of a PhD and scientific success. As if the pressure of scientific discovery isn't enough, the students are also competing in a worldwide race to be the first to publish their findings. Their challenge: to decipher the structure and mechanism of AMPK, a tiny protein that controls the burning and storage of fat. Their road to success: years of trial and error, unflinching dedication, rock-climbing, rumors of pickle juice, and the music of The Flaming Lips.

Consider graduate school



You are **paid** \$35k/year to be a student in graduate school
(and tuition is waived)

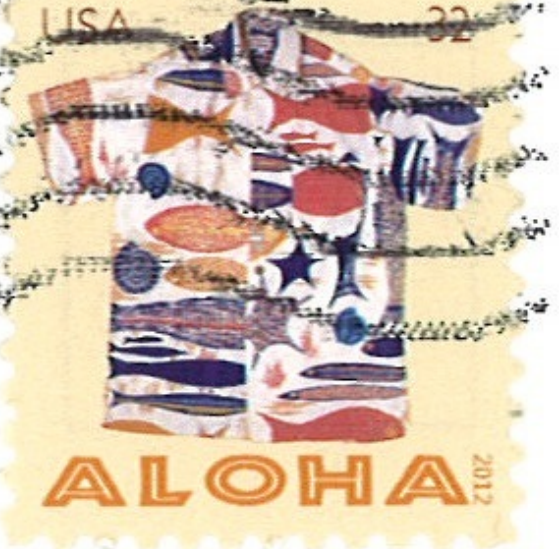


Apply for a REU

Dr. Luckie,
Ni hao!
I am currently on a bullet train going about 300 km/hr on its way to Beijing. So far I have visited Shanghai, Nanjing, Yangzhou, Da Feng, and Siyang. My research at Nanjing Forestry University involved gene cloning and transformation in a popular Chinese tea plant. My experience here has been incredible and I can't thank you enough for giving me this opportunity and preparing me for this work. I am the youngest and one of the few students that has experience in the lab. I hope you are having a great summer! - Joanna

POSTCARD

ADDRESS ONLY



Dr. Douglas Luckie
W-26 D Holmes Hall
Michigan State University
East Lansing, MI, 48823
USA

The Nanjing Changjiang River Bridge

南京长江大桥

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Research Experiences for Undergraduates (REU)

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https://www.nsf.gov/crssprgm/reu/reu_search.jsp

Enter full or partial research areas/keywords separated by commas:
(e.g. geophysics, ecology, nano, robot, ethics)

And/Or State:

All

Search Clear

[List all REU sites](#)

Pepperdine University Seaver College Undergraduate Research in Biology



In the summer 2023 (May 7-July 22), Pepperdine University will host the Summer Undergraduate Research Program in Biology (SURB) developed specifically for students who are interested in pursuing a career in biological research, science education, environmental science, biomathematics or biotechnology. Pepperdine biology faculty will work closely with selected students in diverse areas of biological research. Successful applicants will be provided a generous stipend, on-campus housing, a unit of biology research credit, funding for travel to Malibu, and a budget for the purchase of research supplies. Students will be introduced to varied research tools and techniques and will partner with a faculty member

HOMEWORK:
Mutation Translation Exercise
(due last Friday)

Individual, p. 243 Course Pack

The sense strand of a given gene includes the sequence 5'-C T T G T A T G A G G T G A-3'.

- a) What is the sequence of the mRNA strand?

- b) What predicted protein sequence is made?

Be sure to indicate 5' and 3' ends.

| | | Second base | | | | | | |
|------------|---|--|---|--|---|------------|---|---|
| | | U | C | A | G | | | |
| First base | U | UUU } Phenylalanine F UUC } UUA } Leucine L UUG } | UCU } Serine S UCC } UCA } UCG } | UAU } Tyrosine Y UAG } UAA } Stop codon UAG } Stop codon | UGU } Cysteine C UGC } UGA } Stop codon UGG } Tryptophan W | Third base | U | C |
| | C | CUU } Leucine L CUC } CUA } CUG } | CCU } Proline P CCC } CCA } CCG } | CAU } Histidine H CAC } CAA } Glutamine Q CAG } | CGU } Arginine R CGC } CGA } CGG } | | C | A |
| | A | AUU } Isoleucine I AUC } AUA } AUG } Methionine start codon M | ACU } Threonine T ACC } ACA } ACG } | AAU } Asparagine N AAC } AAA } Lysine K AAG } | AGU } Serine S AGC } AGA } Arginine R AGG } | | A | G |
| | G | GUU } Valine V GUC } GUA } GUG } | GCU } Alanine A GCC } GCA } GCG } | GAU } Aspartic acid D GAC } GAA } Glutamic acid E GAG } | GGU } Glycine G GGC } GGA } GGG } | | G | A |

(notebook)

Translation: 3 parts

- **Language** (AUG!)
- **Translators** (tRNA & synthetase)
- **Factory** (Ribosome subunits)

Language (AUG!)

What words are hidden in this mRNA sentence?

5' UUAAG | AUG | GGG | UAU | AAG | UCA | ACC | UUG A 3'

What additional *information* do you need?

?????????? | THE | DOG | AND | MAN | EAT | HAM | STOP

In-frame mutation (delete AND)

?????????? | THE | DOG | MAN | EAT | HAM | STOP

Translators (tRNA & synth)

- **tRNA** is a translator/transfers amino acids.
- **Aminoacyl-tRNA Synthetase** (Charging enzyme loads aas on tRNAs)

- **Aminoacyl-tRNA Synthetase**

In order for translation to occur, the tRNA molecules must be "charged" with the **amino acid** appropriate for its **anti-codon**. The enzyme that covalently links the amino acid with its cognate tRNA is called an amino-acyl tRNA synthetase, or **charging enzyme**.



Exit

Previous

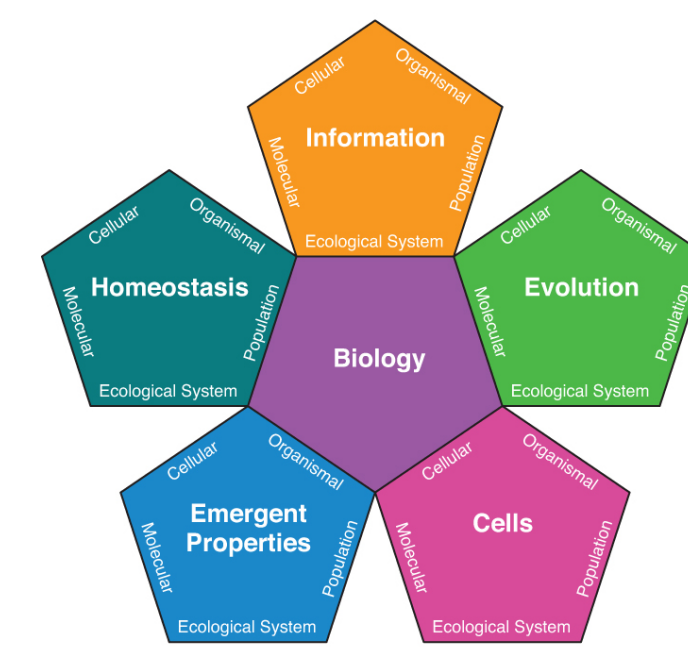
Slower

Section 3

Faster

Next

Play

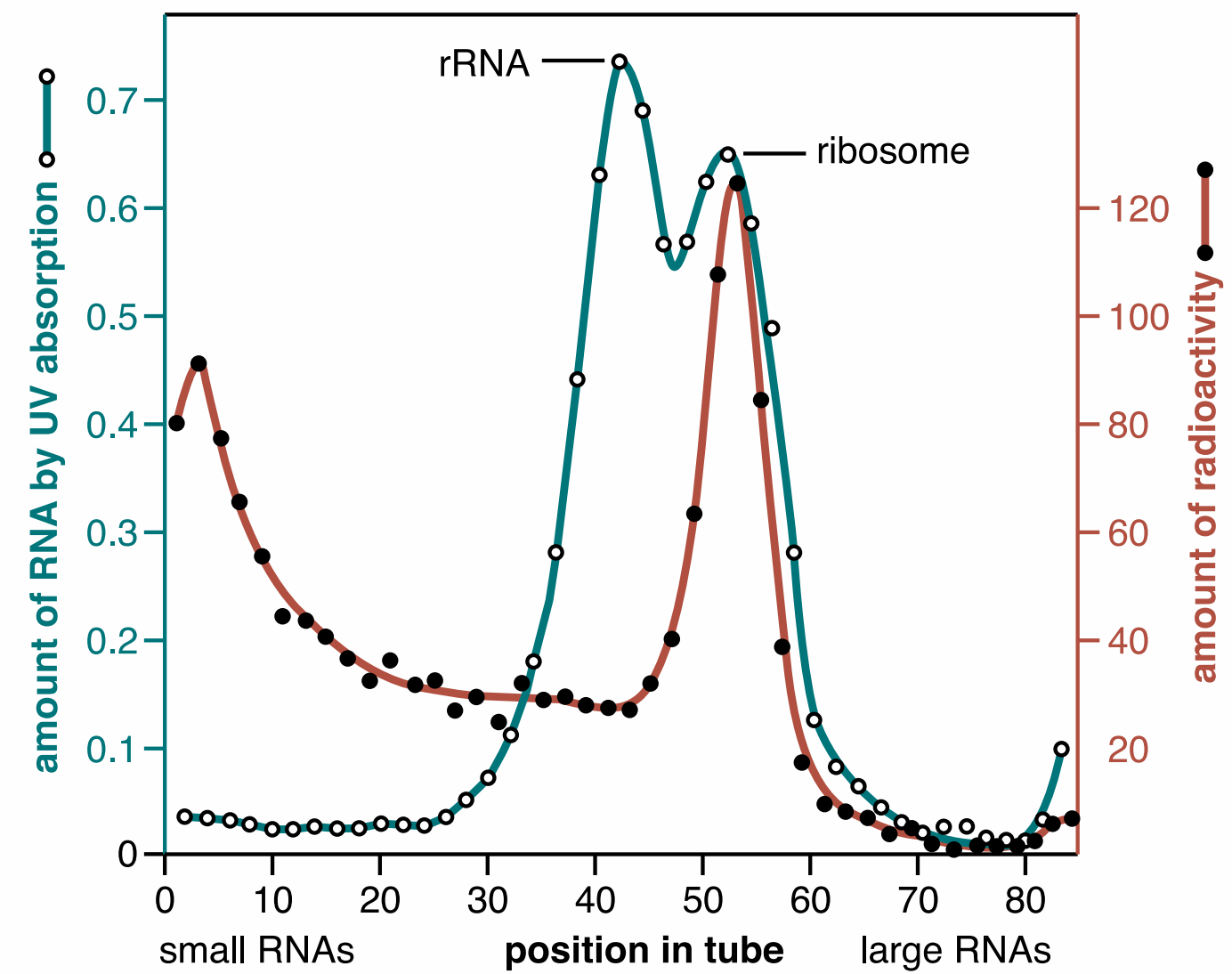
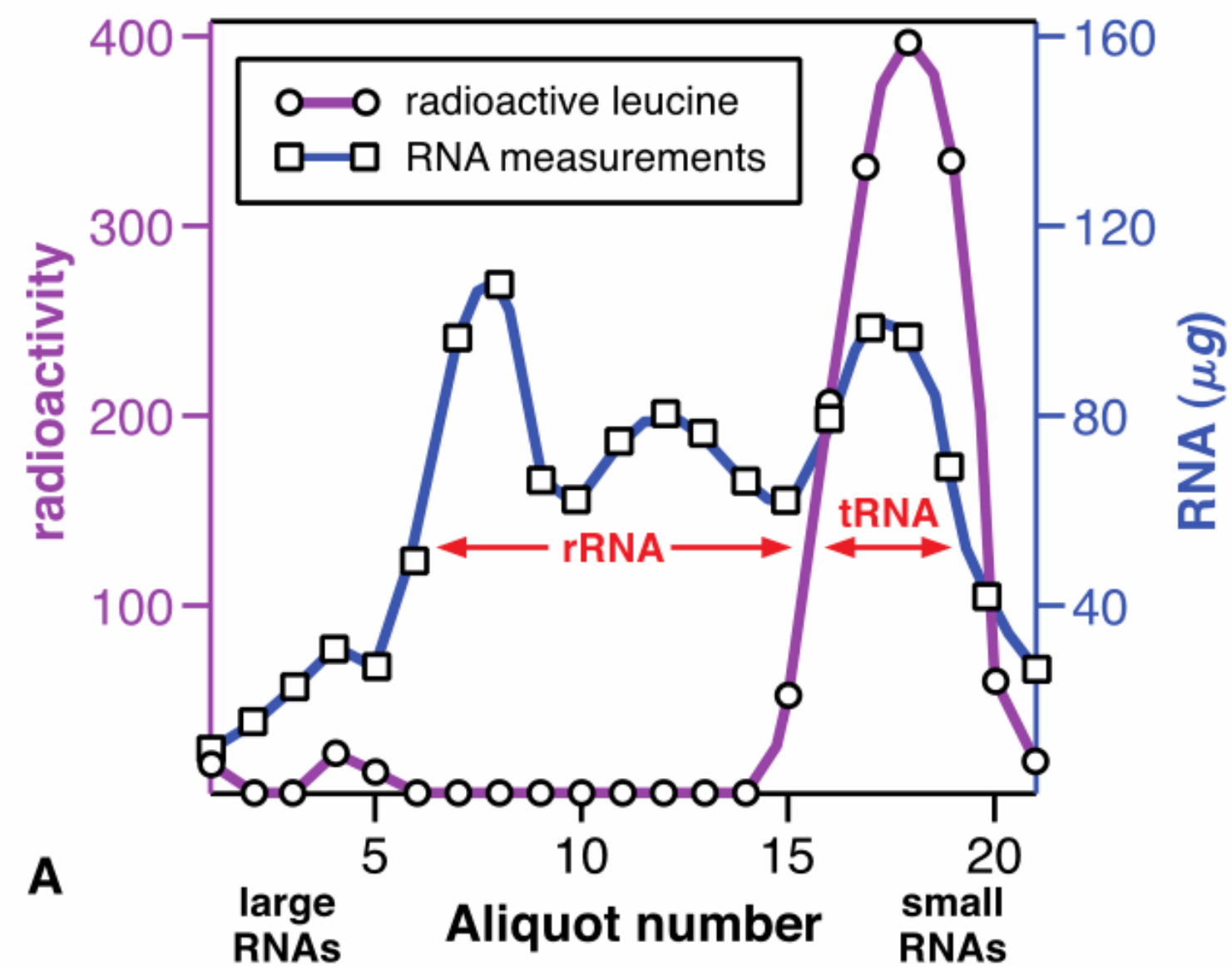
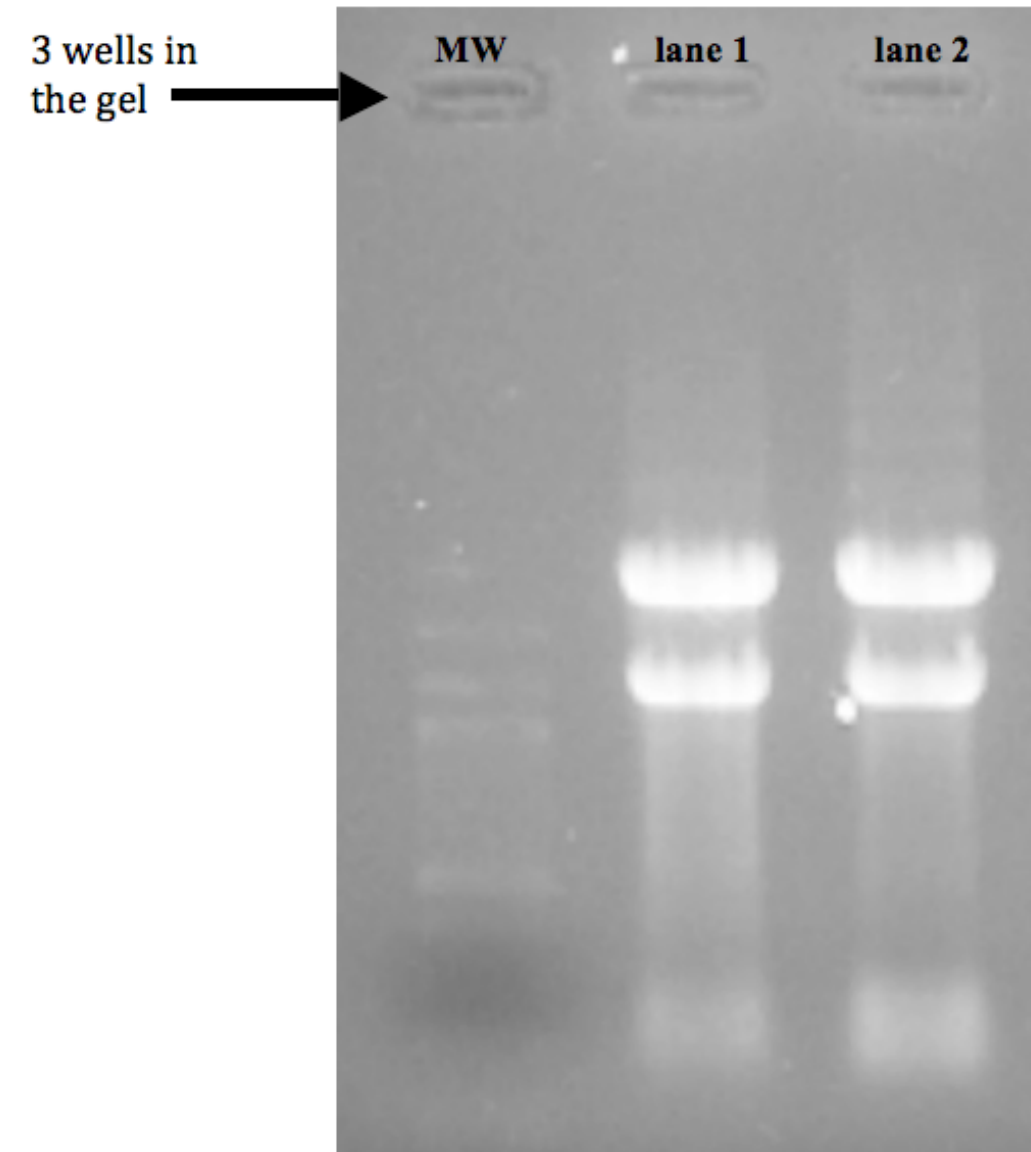


Integrating Concepts in Biology

2.1 How does DNA communicate information to the cell?

Biology Learning Objective

- Describe the three major types of RNA and their functions.



POP Trifecta?

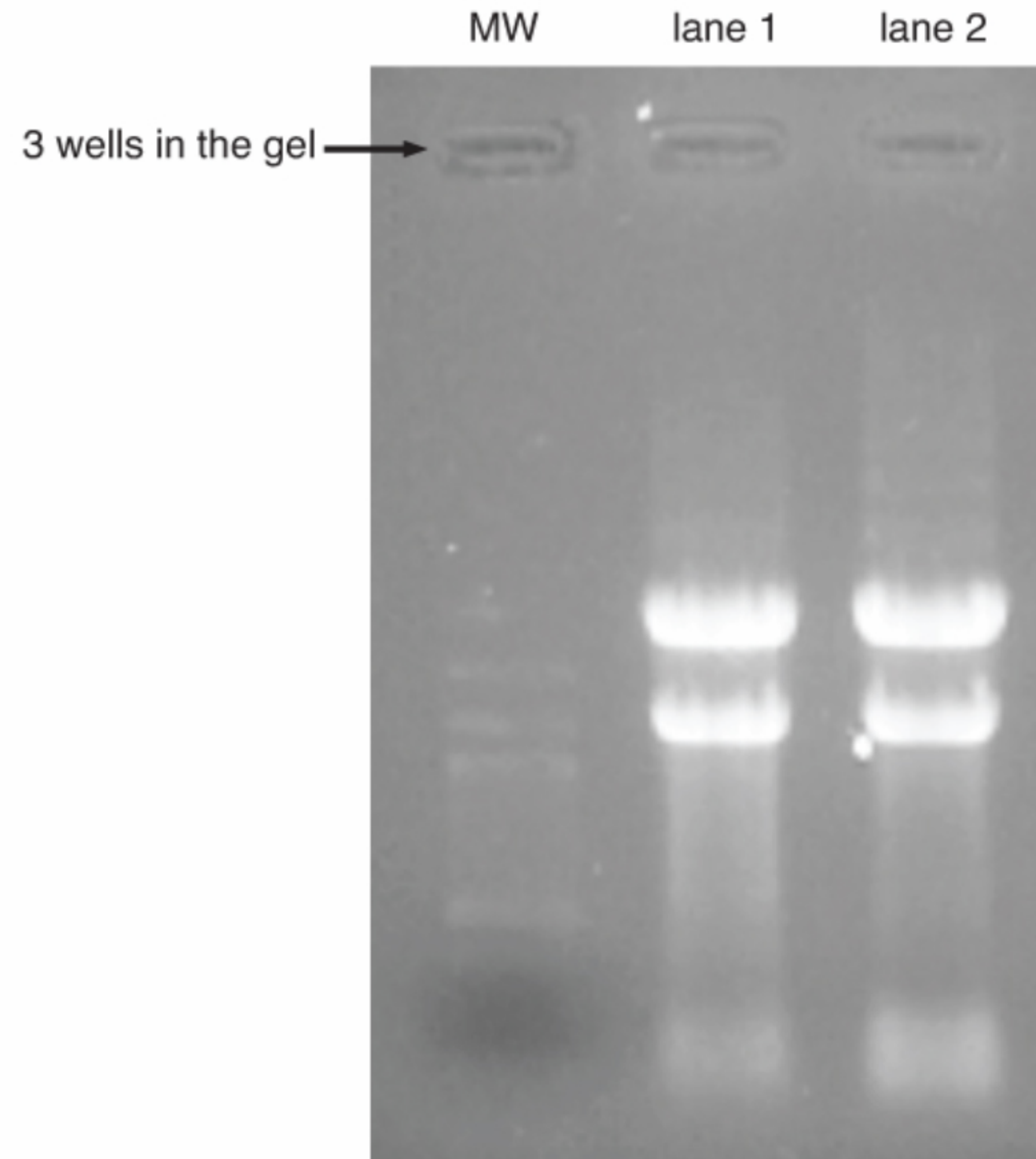


Figure 2.3 Black and white photo of gel electrophoresis for two RNA samples. Molecular weight (MW) markers are DNA molecules of known sizes for use as a molecular ruler. RNA samples came from yeast with ample glucose for food (lane 1) and yeast with very little glucose (lane 2). Photo courtesy of Dr. Todd Eckdahl, Biology Department, Missouri Western State University.

Yeast RNA Separated by Size

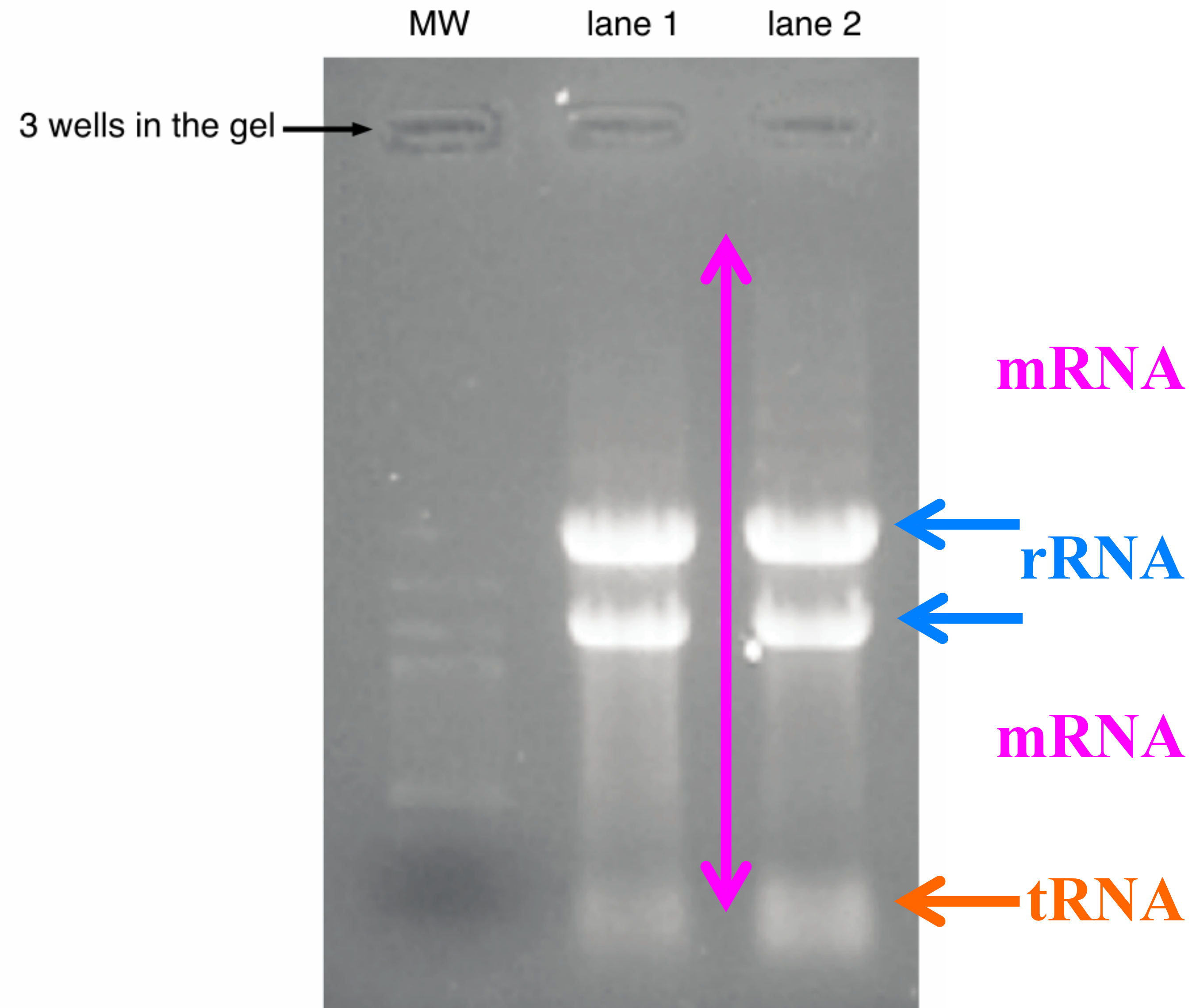
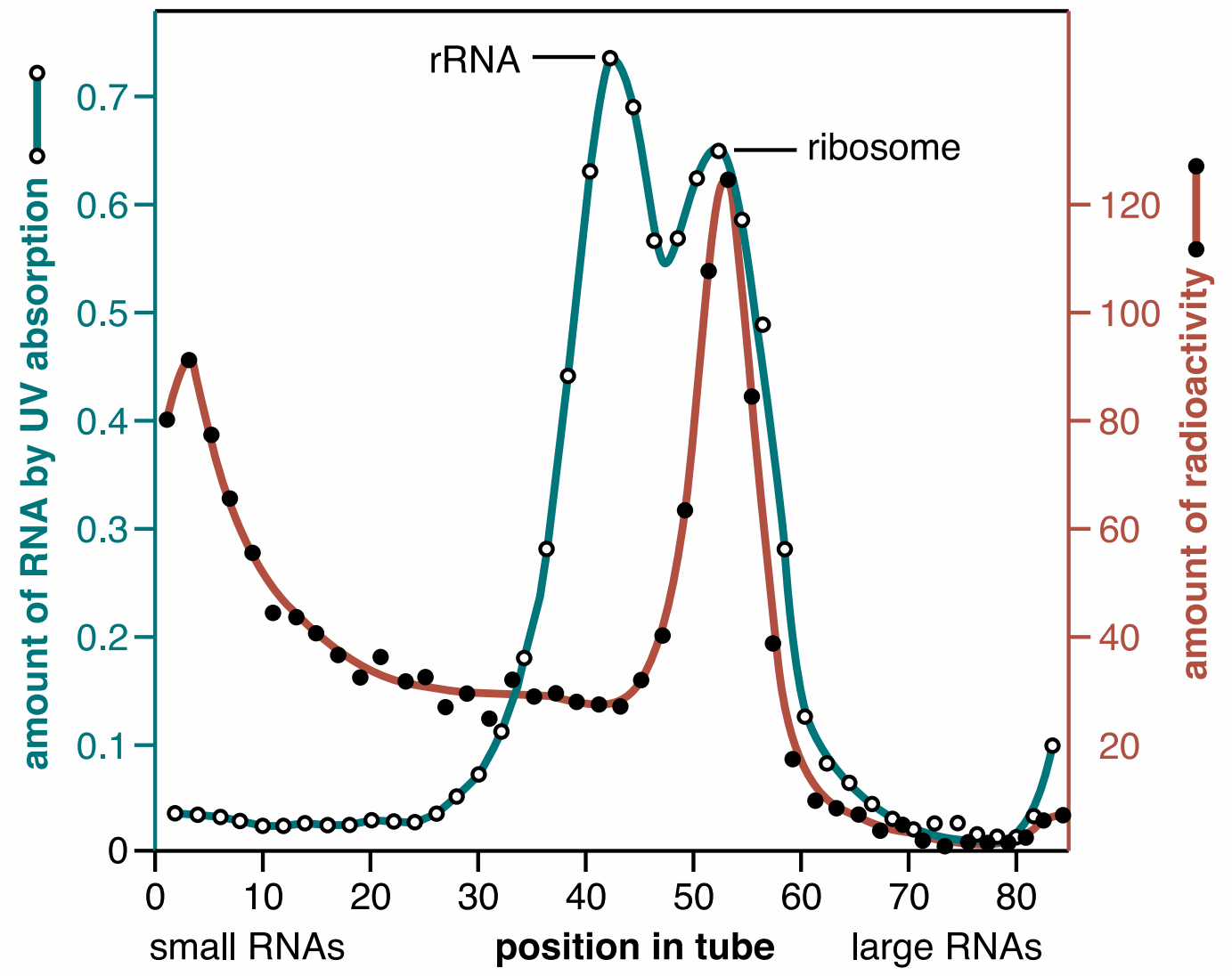
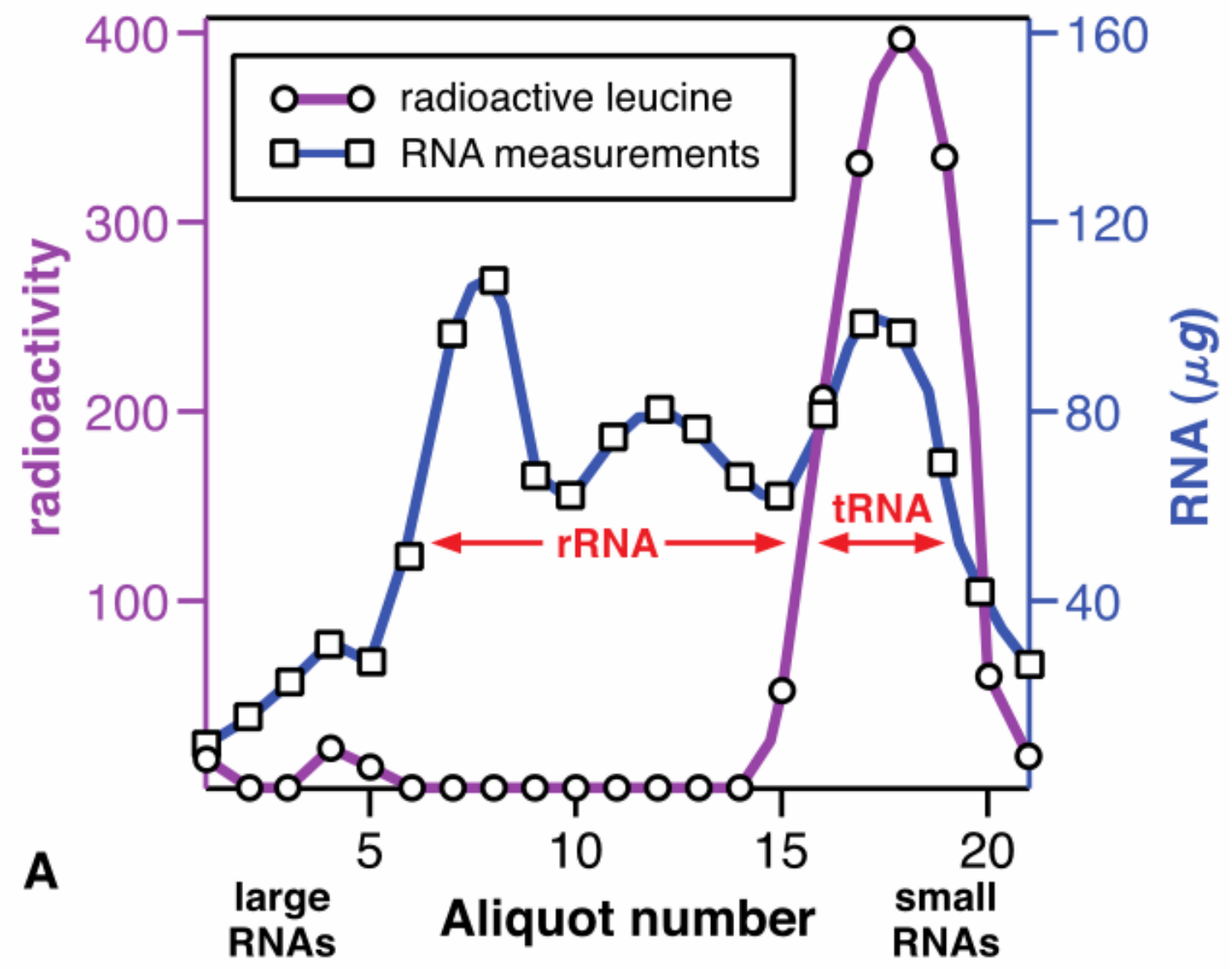


Fig. 2.3



Trifecta?

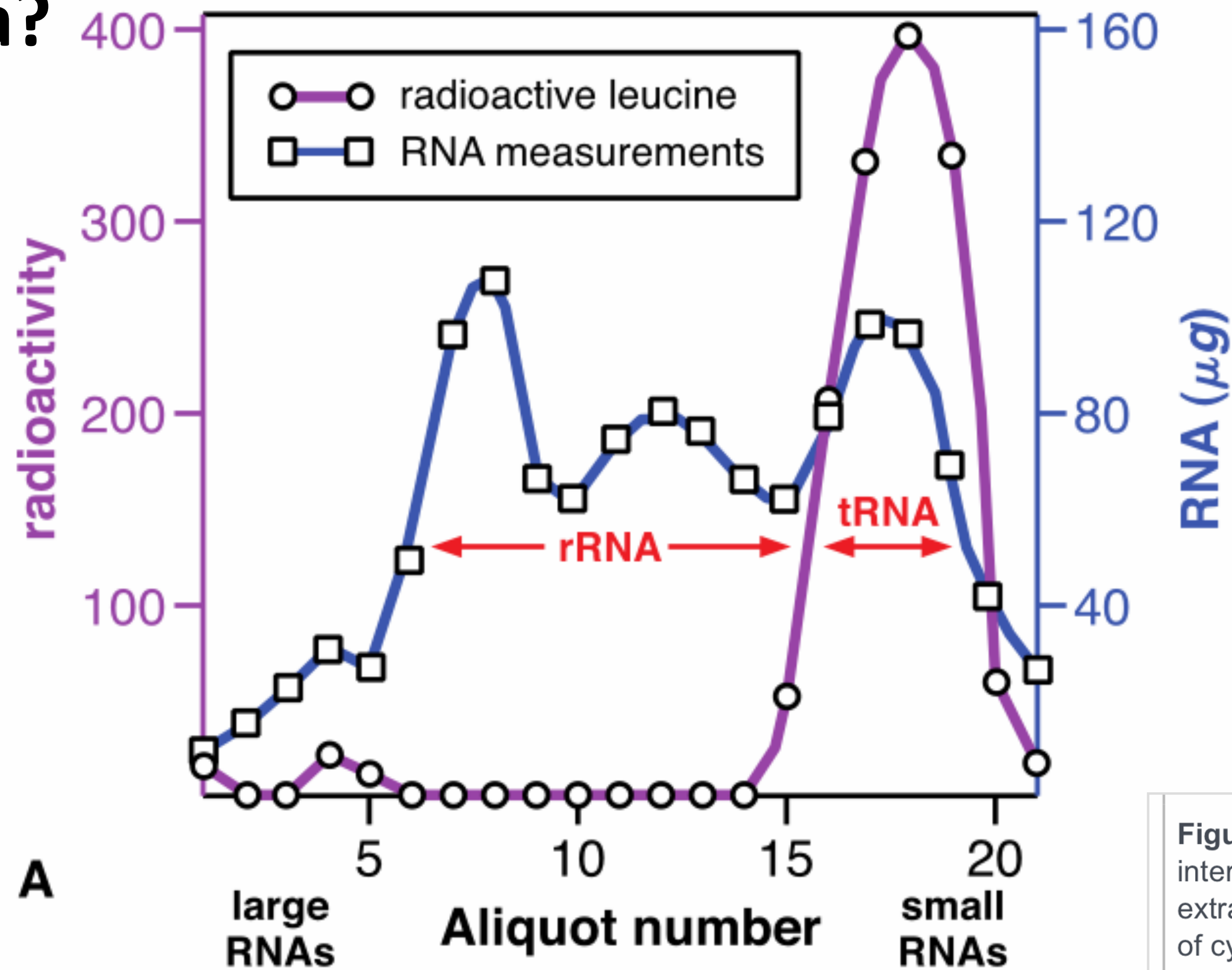


FIG. 2.—Size distribution of nuclear RNA and localization of transfer RNA on a sucrose density gradient. Sucrose density gradient (20 ml) of 20–5% sucrose in .01 M tris (pH 7.1) and 1% phenol was set up according to Bolton *et al.*¹⁷ and overlaid with an inverse gradient of approximately 1 mg RNA in a sucrose gradient of 4–0%. A covering layer of paraffin oil prevented tubes from collapsing and rendered gradients more stable for handling. The tubes were centrifuged 12–14 hr in the Spinco rotor No. 25 at 24,000 rpm, then pierced and 1 ml fractions collected. Each fraction was precipitated with ethanol/acetate (66/2%), thoroughly washed to remove the phenol, and then tested for C¹⁴-leucine incorporation as described in Table 1.

Figure 2.5 Structure and function of tRNA. **A**, RNA molecules interact with radioactive leucine. Total RNA from peas was extracted and incubated with radioactive leucine in the presence of cytoplasm from the peas. RNA molecules were separated by size. Radioactive leucine and non-radioactive RNA were detected separately as shown. **B**, Two-dimensional representation of tRNA

tRNA and Amino Acids Interact

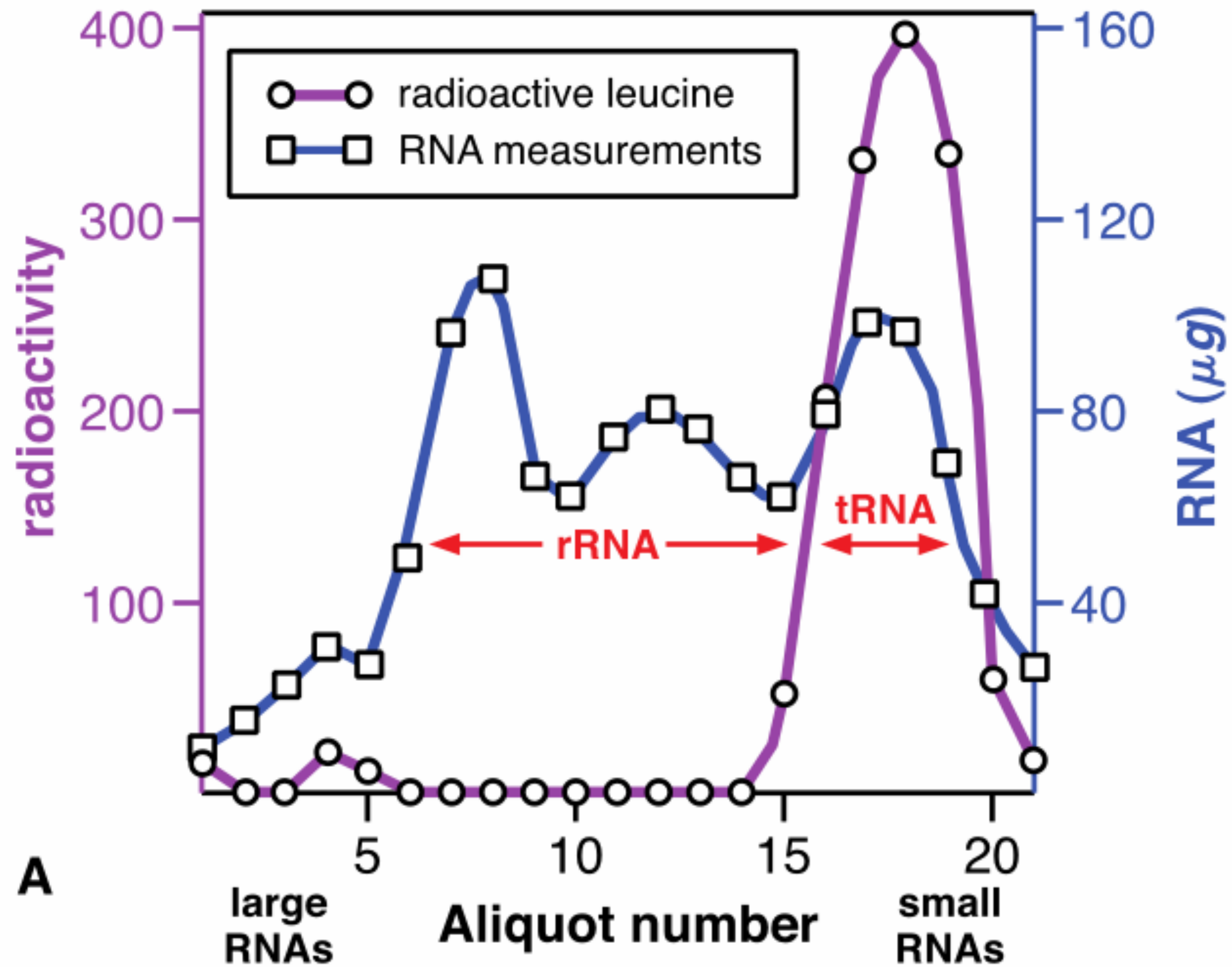
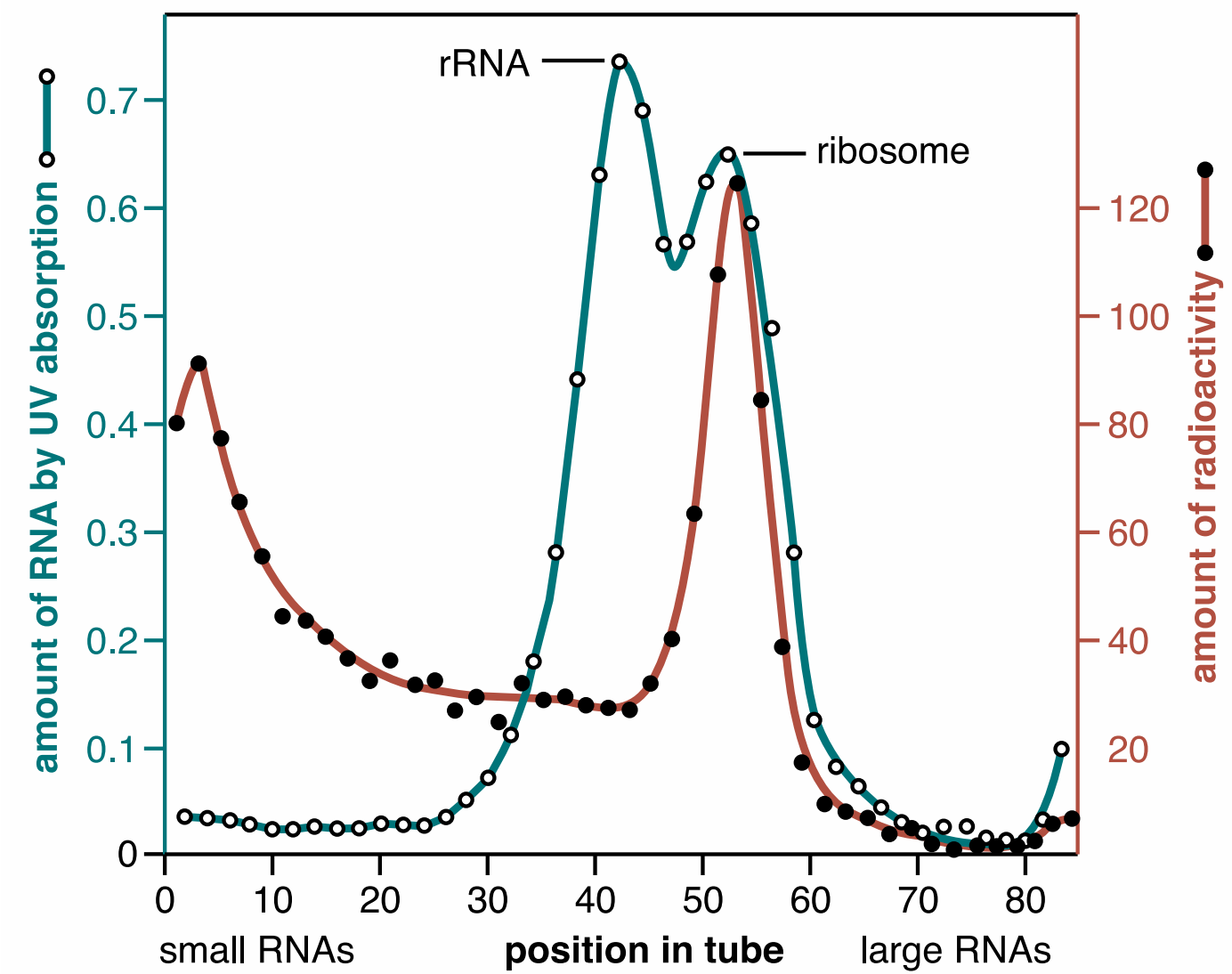
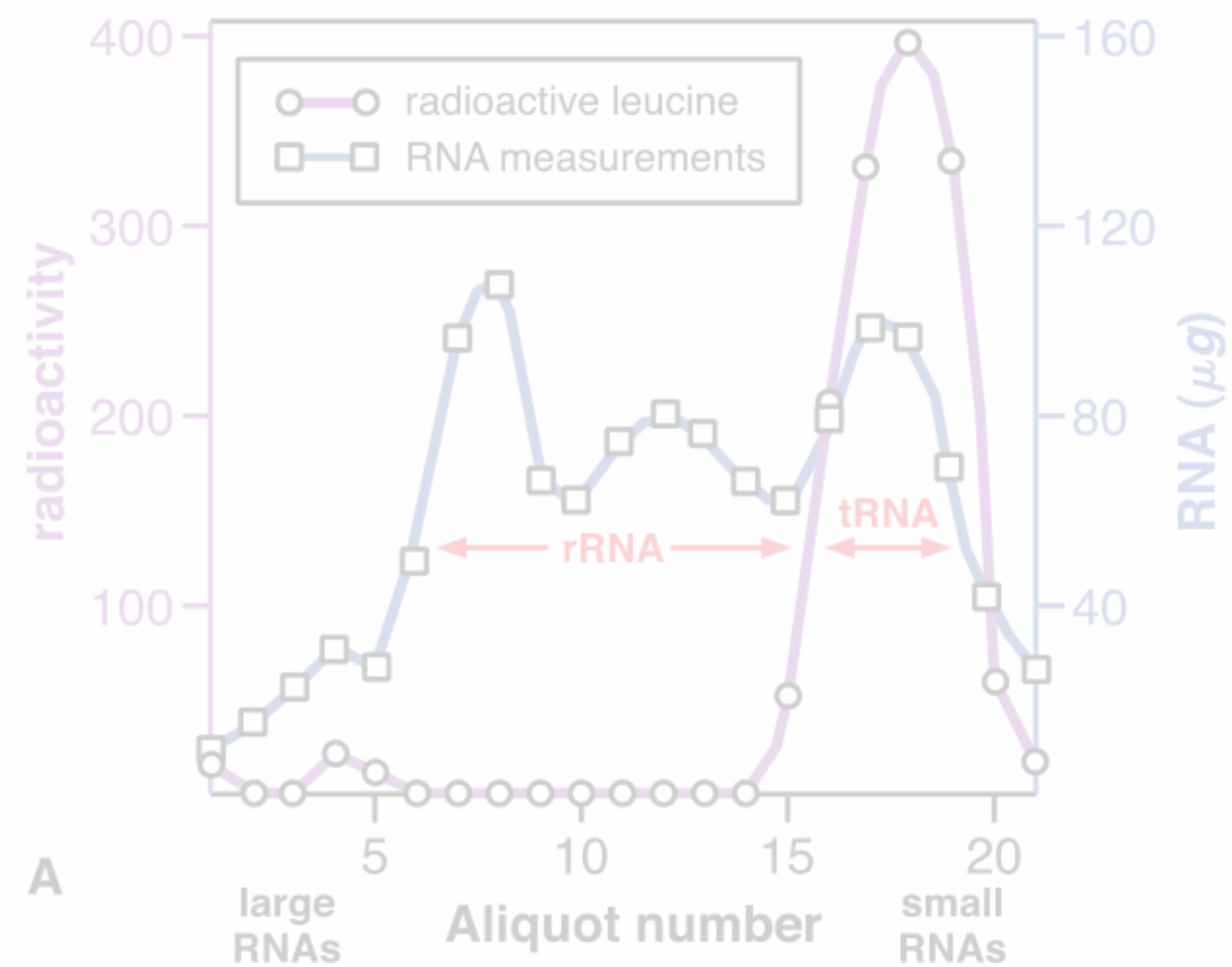


Figure 2.5A



Trifecta!

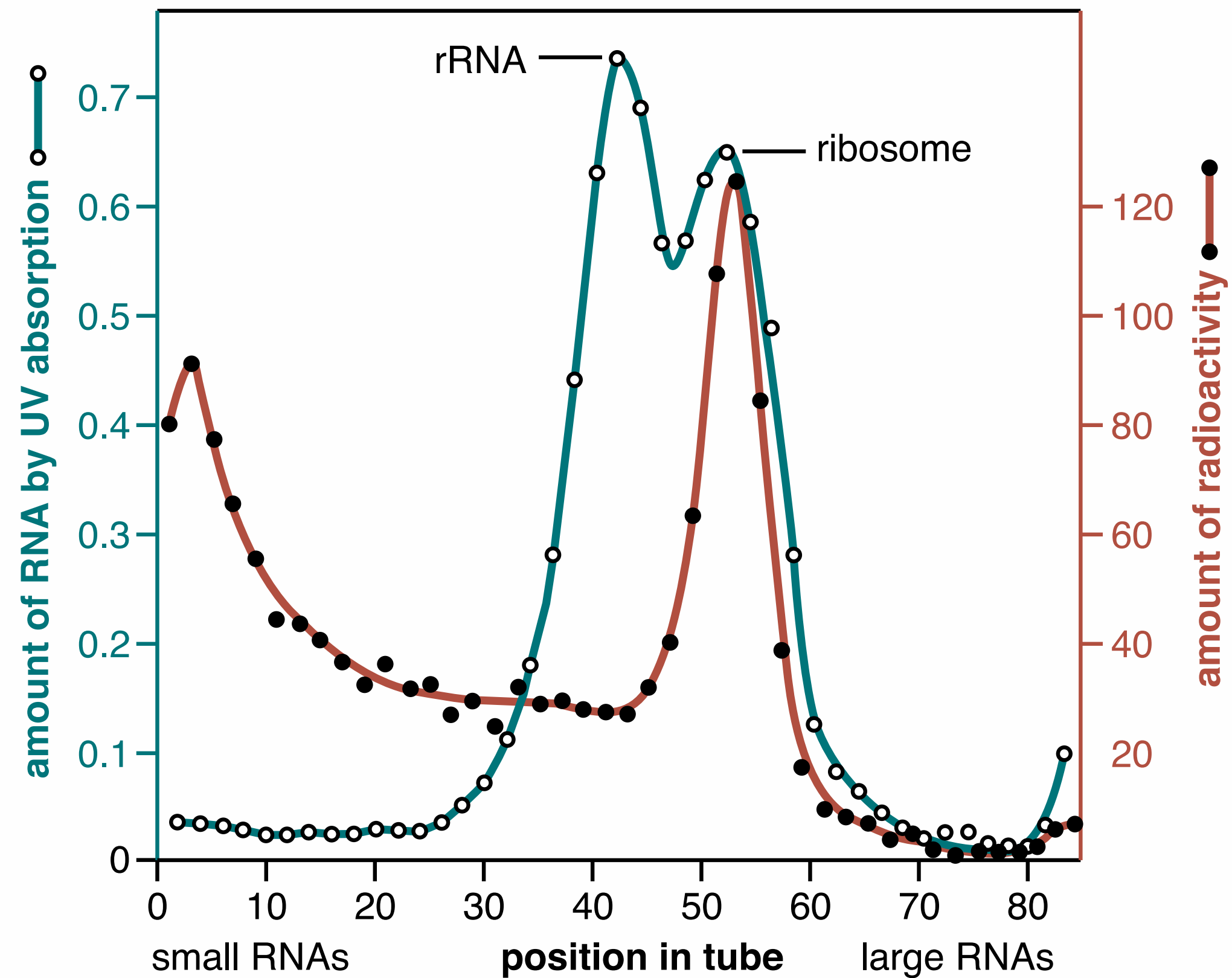


Figure 2.6 Centrifugation of RNA isolated from virally infected cells. The RNA was isolated in a way that protects ribosome stability. The RNA was separated by density, measured by UV absorption (teal line) and by radioactivity (brown line). After centrifugation, aliquots of liquid were removed from the indicated vertical positions in the tube (X-axis) and measured for RNA. Modified from Brenner *et al.*, 1961. Figure 4. Reprinted by permission from Macmillan Publishers Ltd: Nature, Brenner *et al.*, copyright 1961.

Fig. 2.6

1. How do they visualize the molecules of interest?
2. How do they separate them in an orderly fashion?

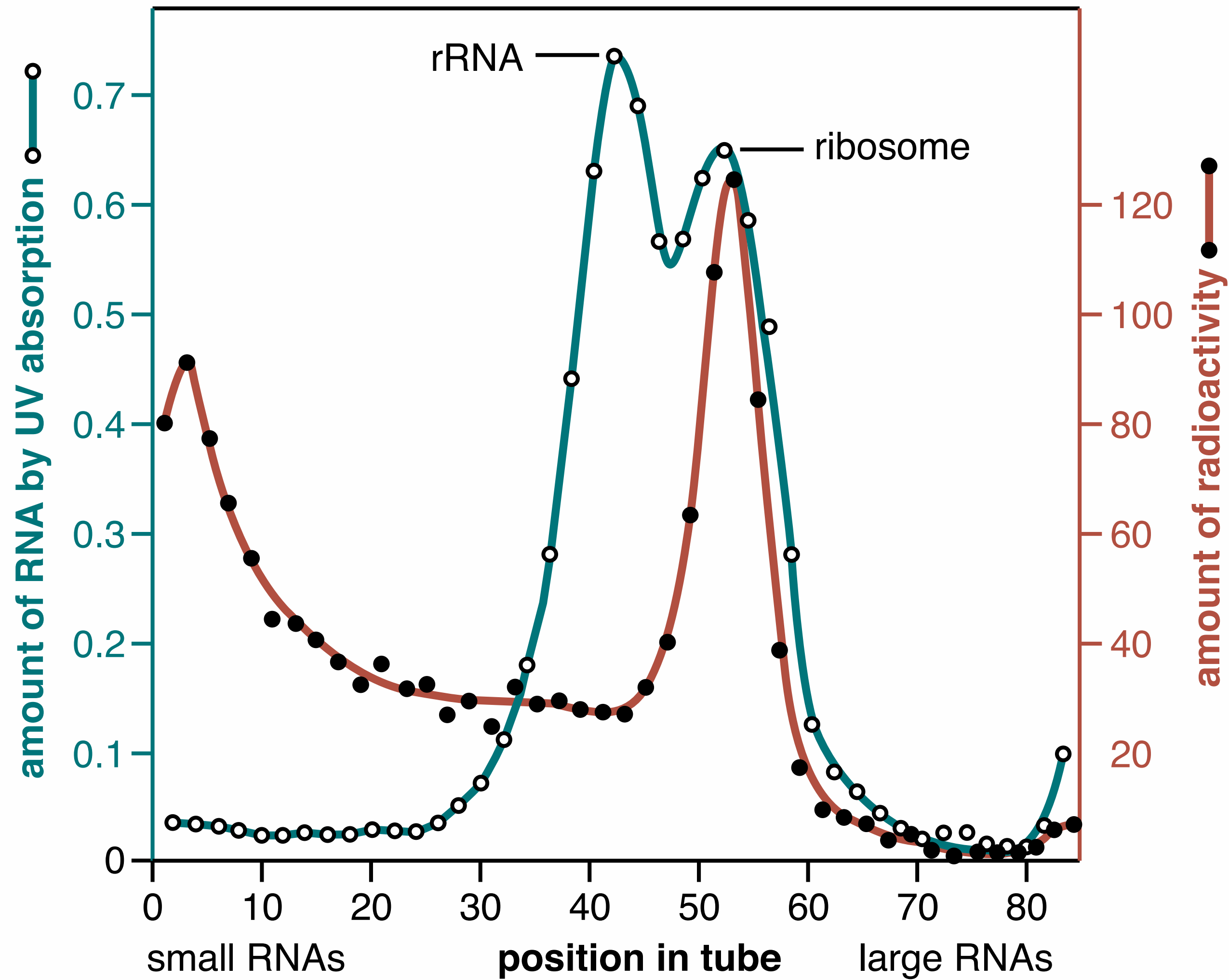


Fig. 2.6

Which RNA tells ribosomes what to make?

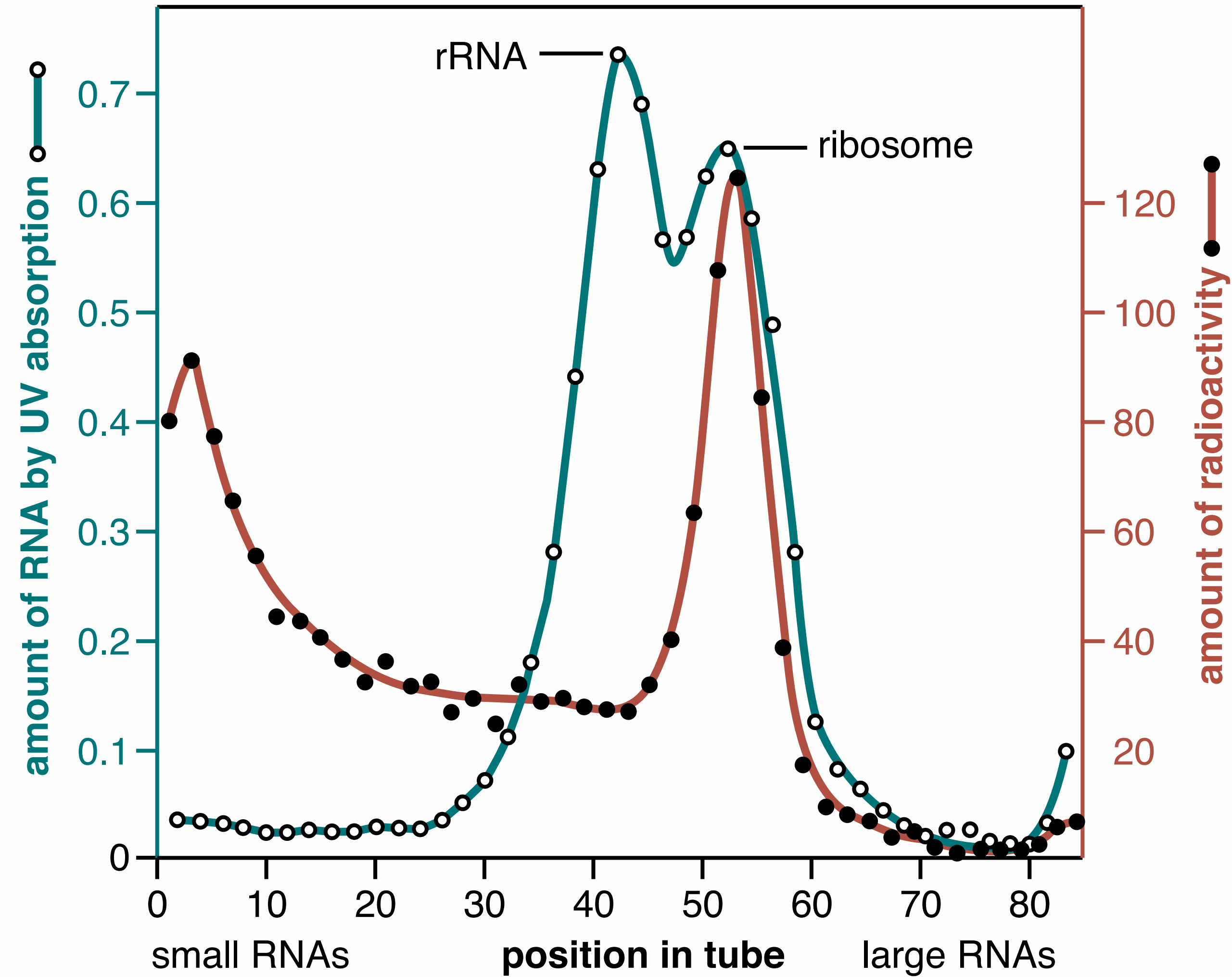


Fig. 2.6

Size Fractionation of RNA

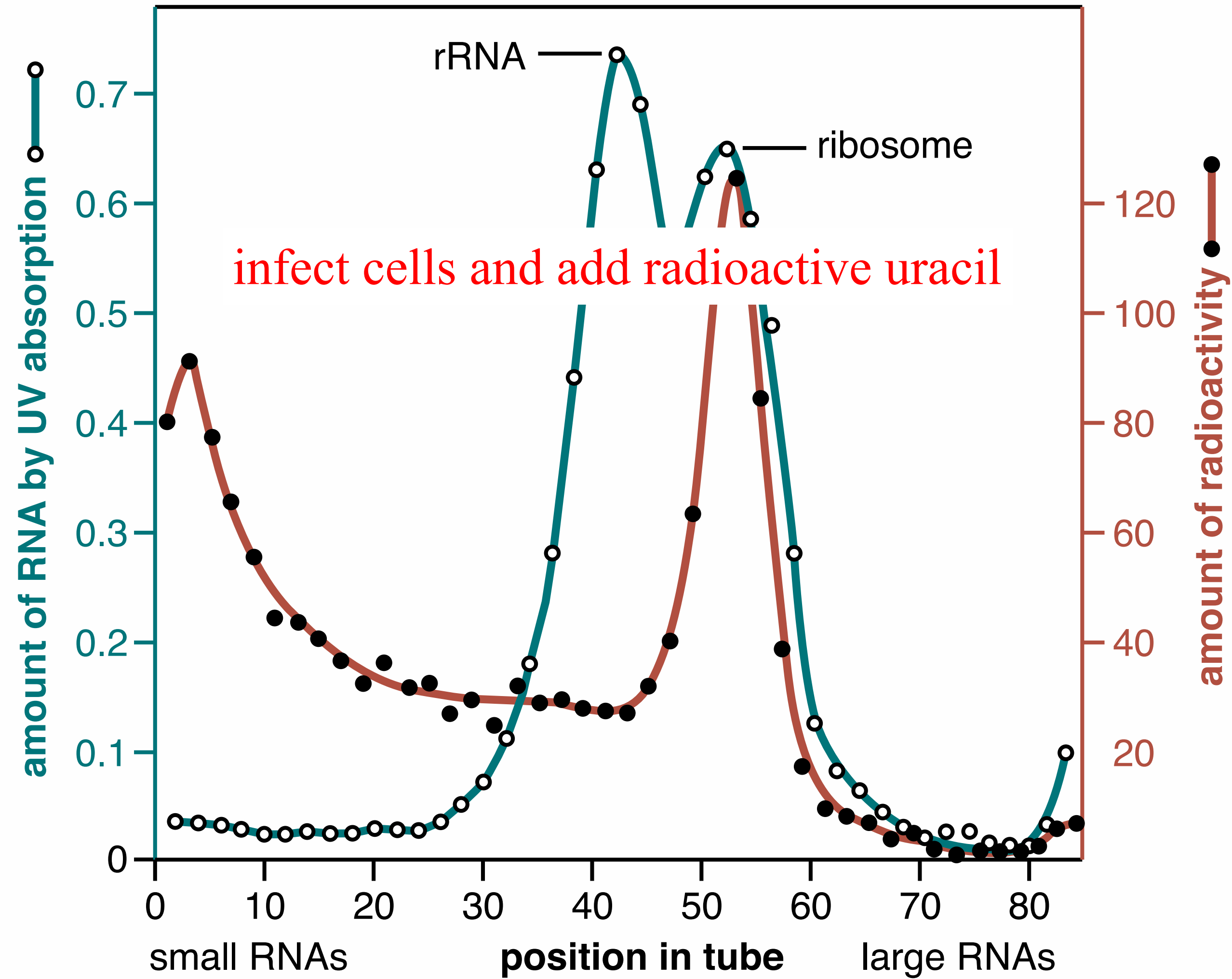


Fig. 2.6

Size Fractionation of RNA

Two graphs in the same space.

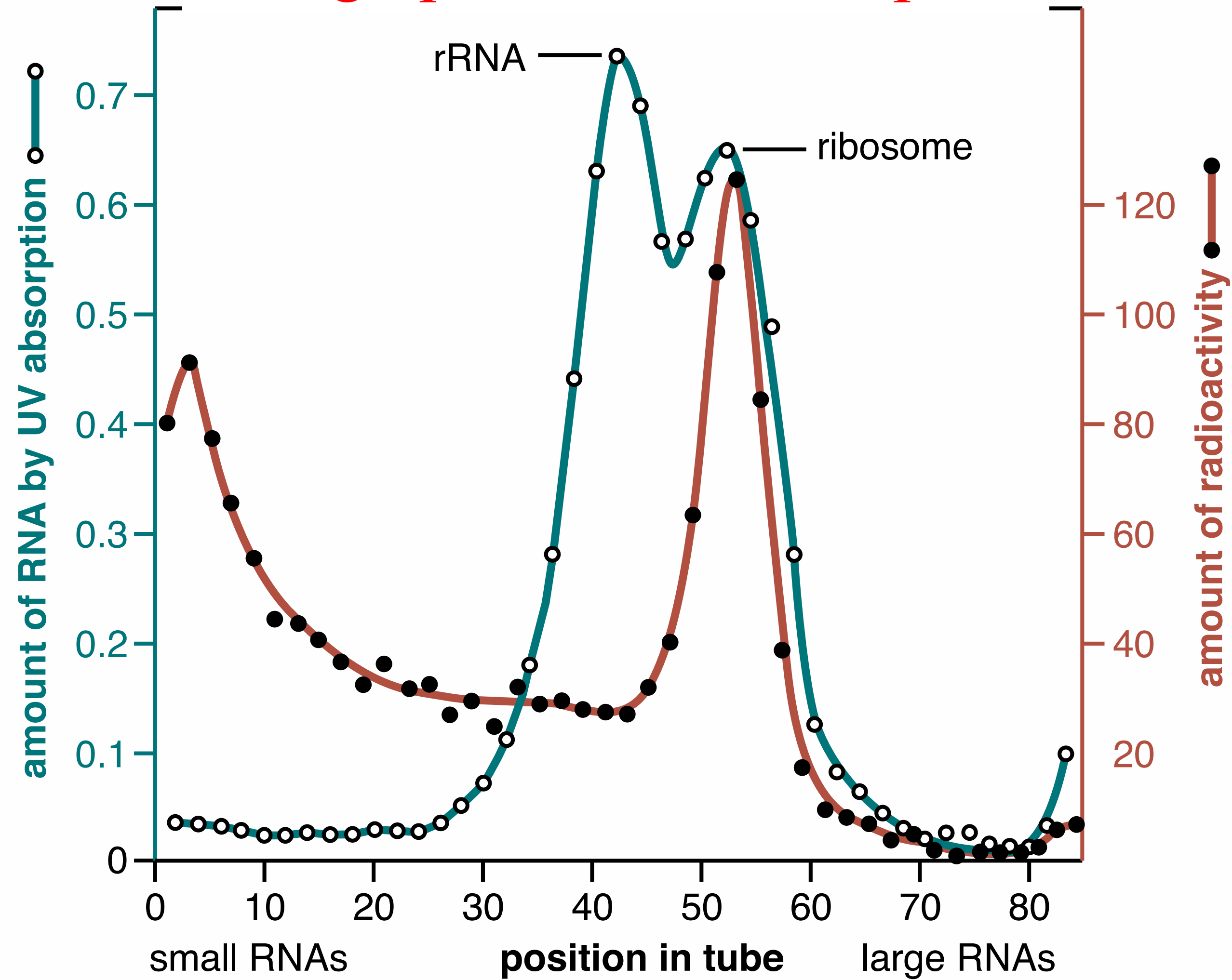


Fig. 2.6

Size Fractionation of RNA

separate RNA based on size

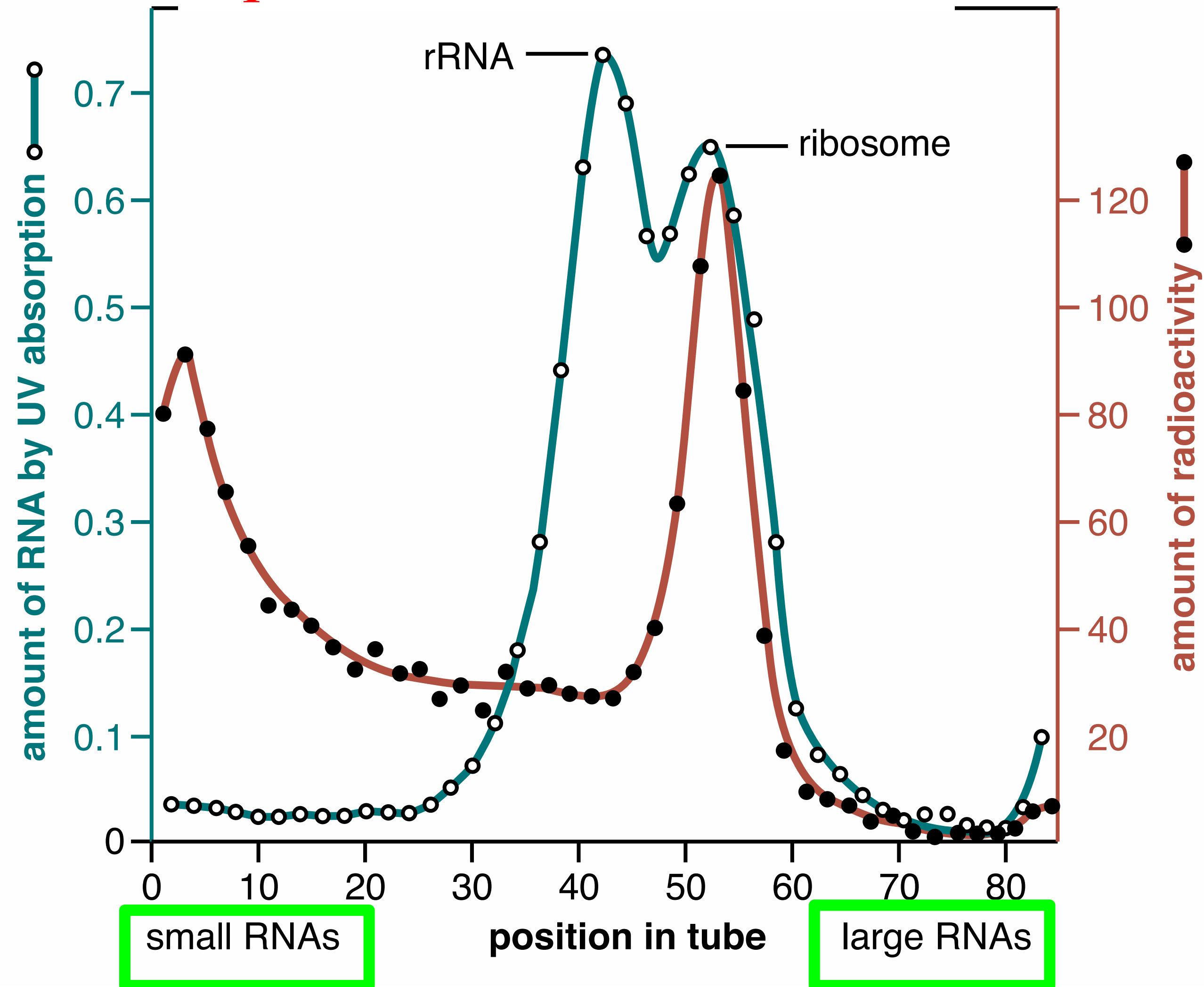


Fig. 2.6

Separation of Three RNAs

three major types of RNA

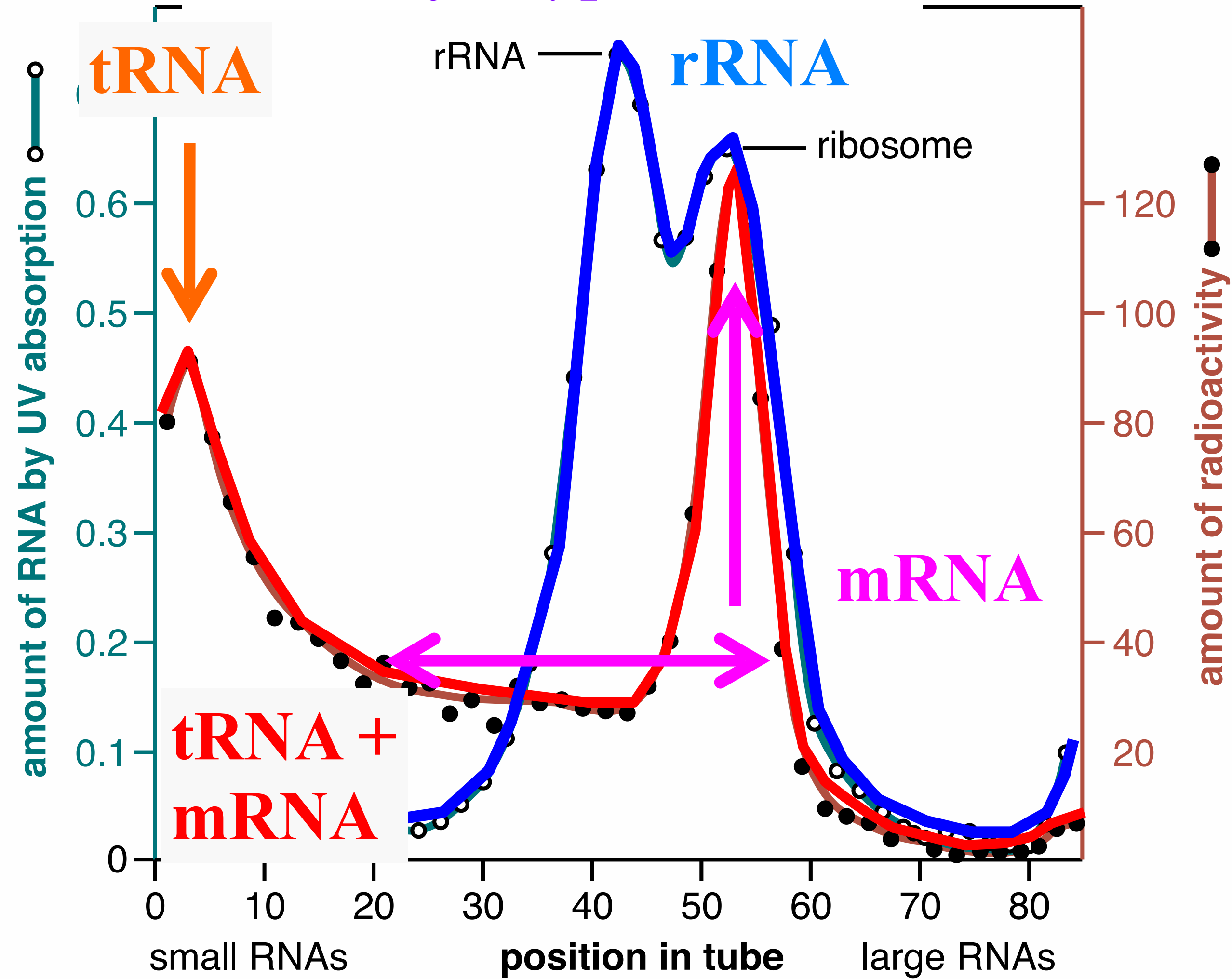


Fig. 2.6