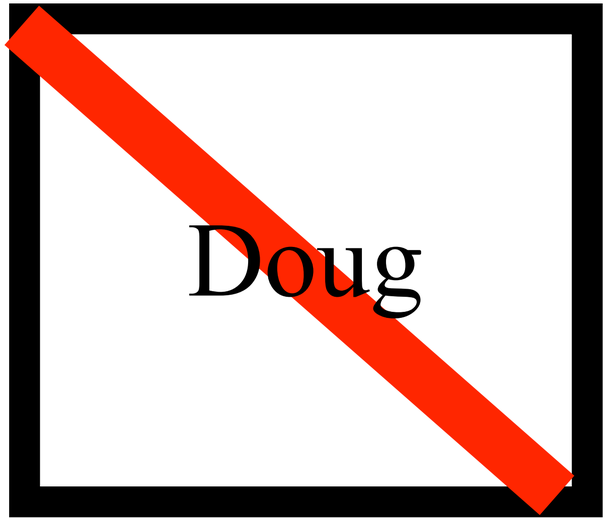
1. Clicker Attendance

- Launch your Top Hat app on your smart phone, or load the TopHat.com website, or text to the course phone number.

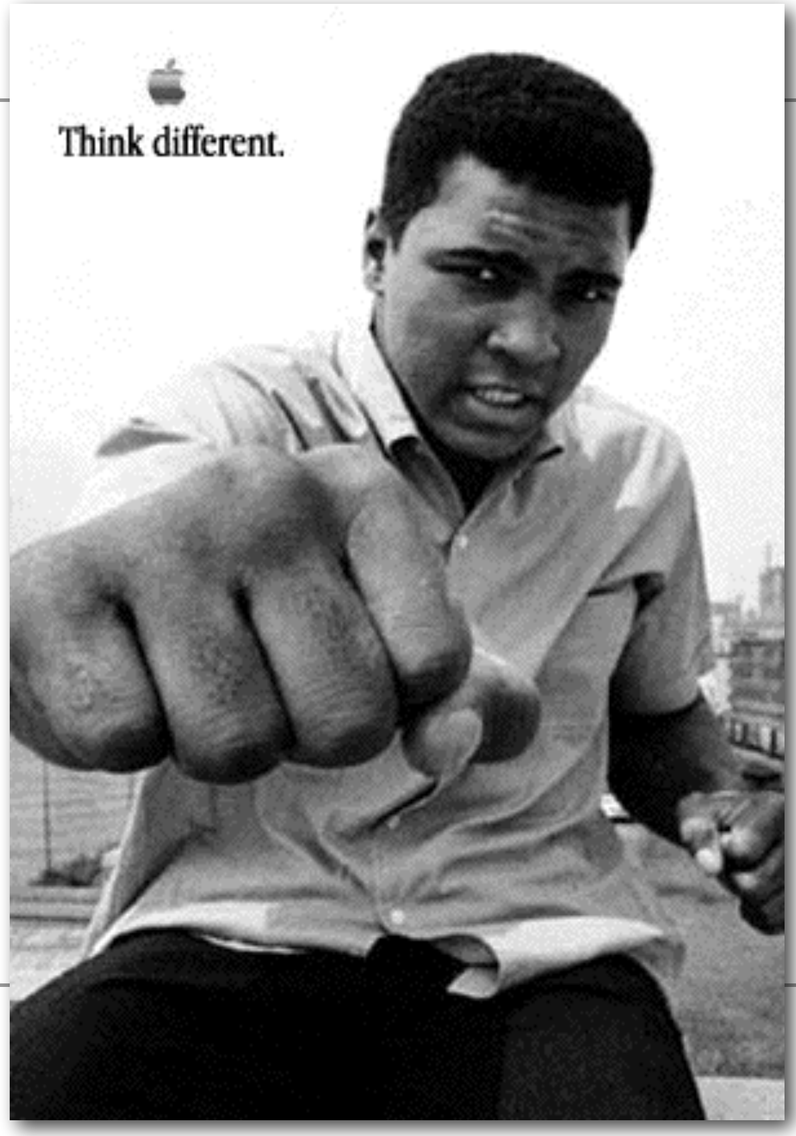
2. Sit with your group in lecture & lab

3. To Opt-OUT of being called upon

- Name Card with red stripe means you Opt-OUT (can Opt-OUT 3 times)



LB144-Pandemic *2022*



Lecture14 - (Preparing for) **The LIVE in-person lecture**

Budgeting homework time (40 min): Chapter 3, section 3.4 (mitosis) is 2514 words in length with four photographic figures that do not require much thinking and notetaking for Trifectas. Reading at 200 words per minute would mean the section might take 13 minutes to read. Of course, when done properly, when you pause to review figures, try Integrating Questions, and take notes, this assignment will take you more like 40 minutes.

5. _____ **For the in-person lecture**, read Chapter 3, section 3.4: and as you read it be sure to take handwritten notes..

6. _____ **Try to answer some Integrating Questions and Review Questions.** As you read the ICB textbook always attempt to test yourself a little, answer at least one of each set.

7. _____ (Tip): **Prepare to explain (aloud) what's generally happening/being explained in Figures 3.19, 3.20, 3.21 and Table 3.5 in class.**

8. _____ **Advanced**: Take a peek at some of the published research papers in the Bibliography at the bottom of the page.

Reading Chapter 3 (section 3.4)

- Do eukaryotes produce new cells the same way as bacteria?

Bottom line: Mitosis → chromosomal movements → paired nuclei

L.O.

Explain how mitosis works + its genetic outcomes

Intro

Cell division happens frequently... is it same as prok cell fission?

Fig 3.19 | Compare physical structure of chromosomes.

E. coli vs human →
1 circular 23 pairs linear (46)

Some aspects are similar, prok+euk, must replicate DNA ~~before~~ divide

IQ 23- What criteria used for numbering human chromosomes

24- Go to NCBI learn how many chromos in species
Which organism most chromosomes? Why humans listed as "24"?
virus=105 king crab=99 fish, birds X Y = 2 separate also MT

How does human cell divide one nucleus into two and have proper separation of each pair of chromosomes?

Fig 3.20 | newt chromosomes under light microscope during nuclear division (after DNA replicate)
6 photos in sequence

IQ 25. - Possible advantage of chromosomes condensing? (before separating)

26. - when chromos "pulled" pulled from what part of chromo?
"What movie" link

- spindles - long tubes extend from two 'cleared' zones
Mendels Law of Segregation

Chapter 3.4 (cont.)

Usually a human chromosome is one long linear ds strand of DNA
BUT in G2 right after S phase (DNA replication) two identical twins
Yet those two twins/clones remain attached to each other at centromere of each chromo
these twins/clones are referred to as "chromatids" until separation.
clones
- DNA polymerase can make errors so even these might not be identical in every base.

(Mitosis) - separating chromosomes/nuclear division

Fig 3.21 | . mitosis movies with fluorescent tags

orange labels - spindles = microtubules
small tiny green dots = centromere attachment sites

(cell (cytoplasm) division called cytokinesis

4 steps Mitosis

1. Pro-phase - before
2. Meta-phase - in middle
3. Ana-phase - separation begins (after)
4. Telo-phase - arrive at end + mem reforms

before cytokinesis have one cell two nuclei (92 chromos)

Table 3.5 | Cycle (Cell Cycle) asexual reproduction

Mitosis (M) + Interphase (Cytok → G1 → S → G2)

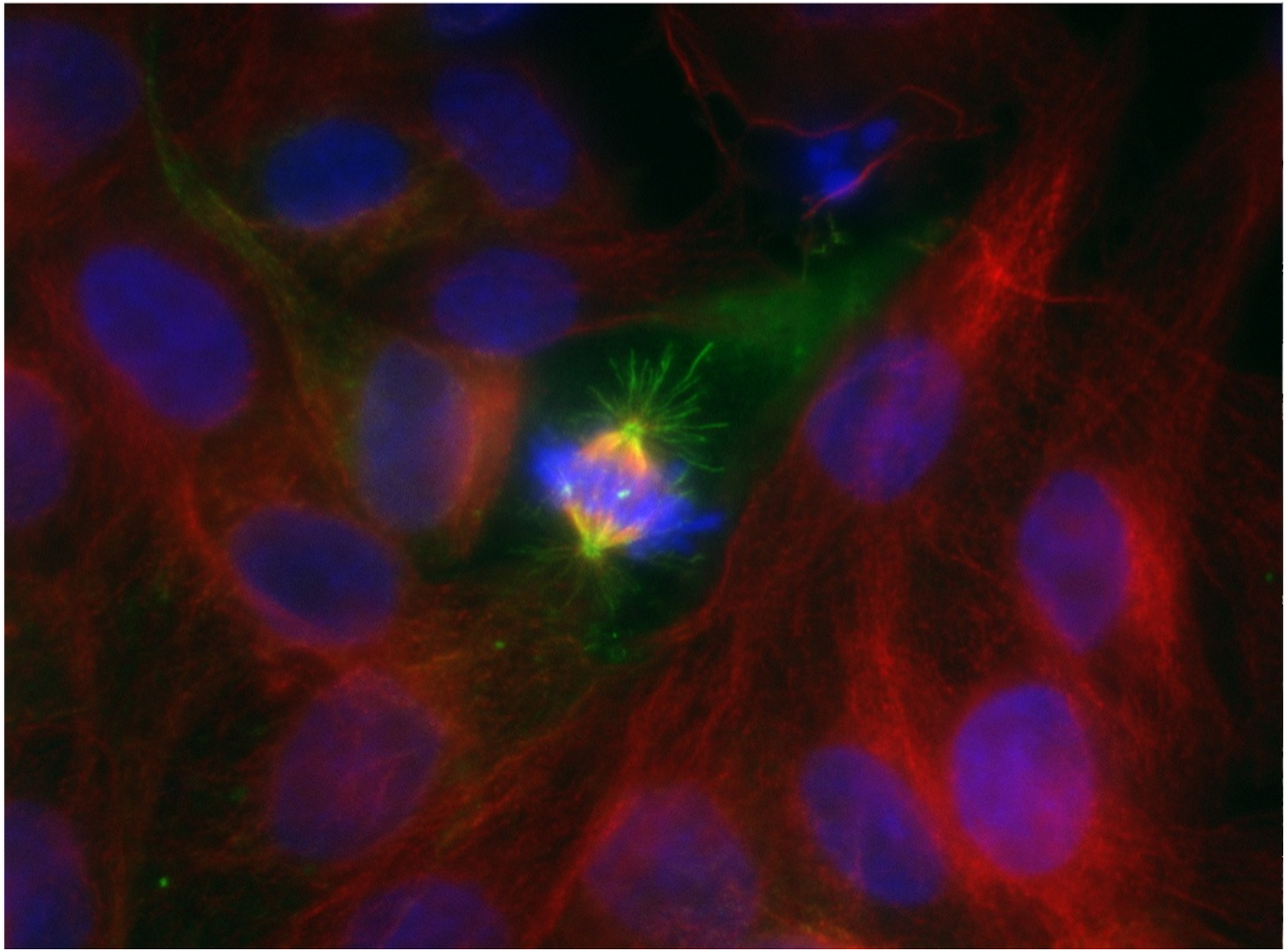
G0 (out)

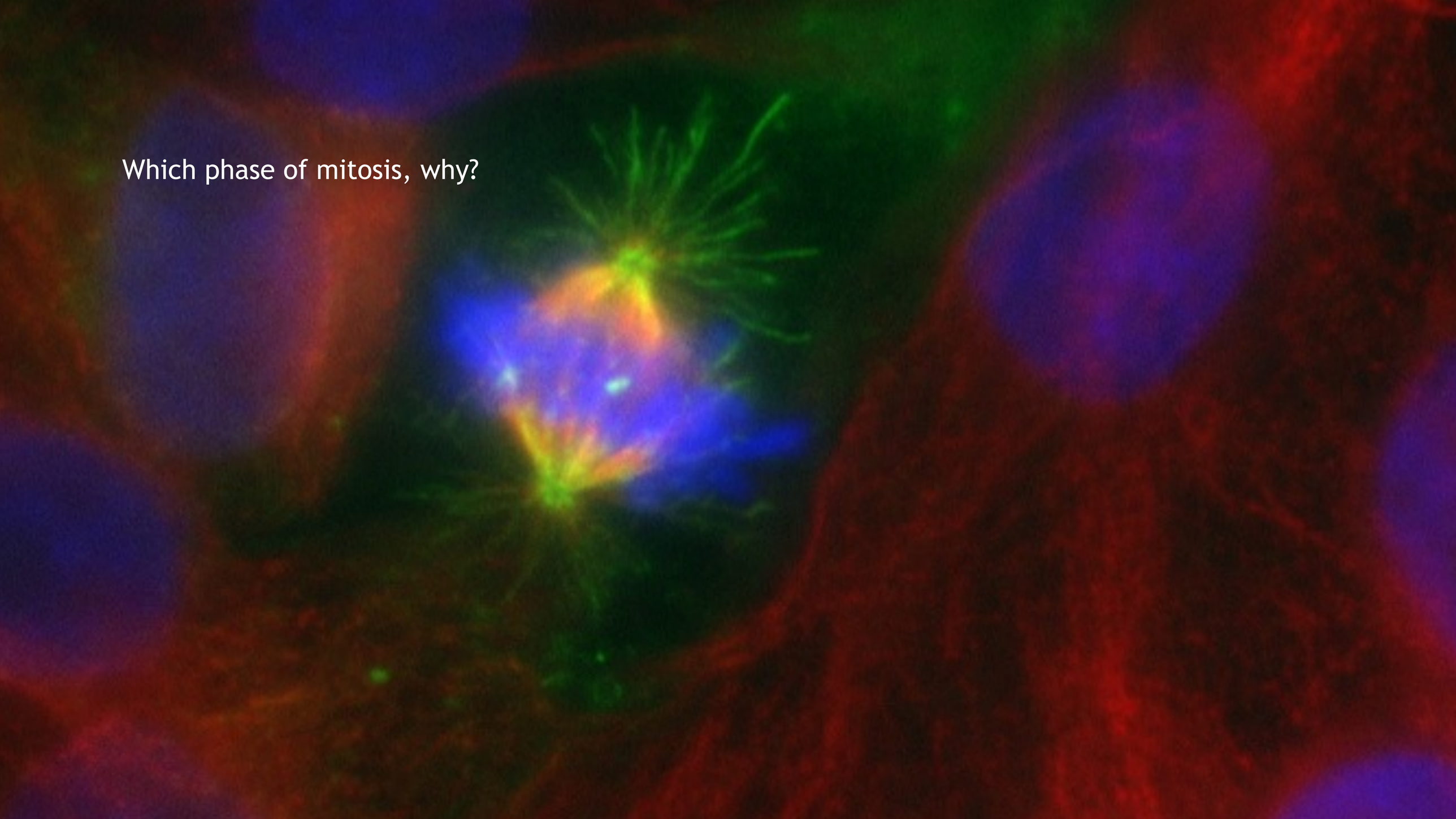
3.4 Do eukaryotes produce new cells the same way as bacteria?

Biology Learning Objective

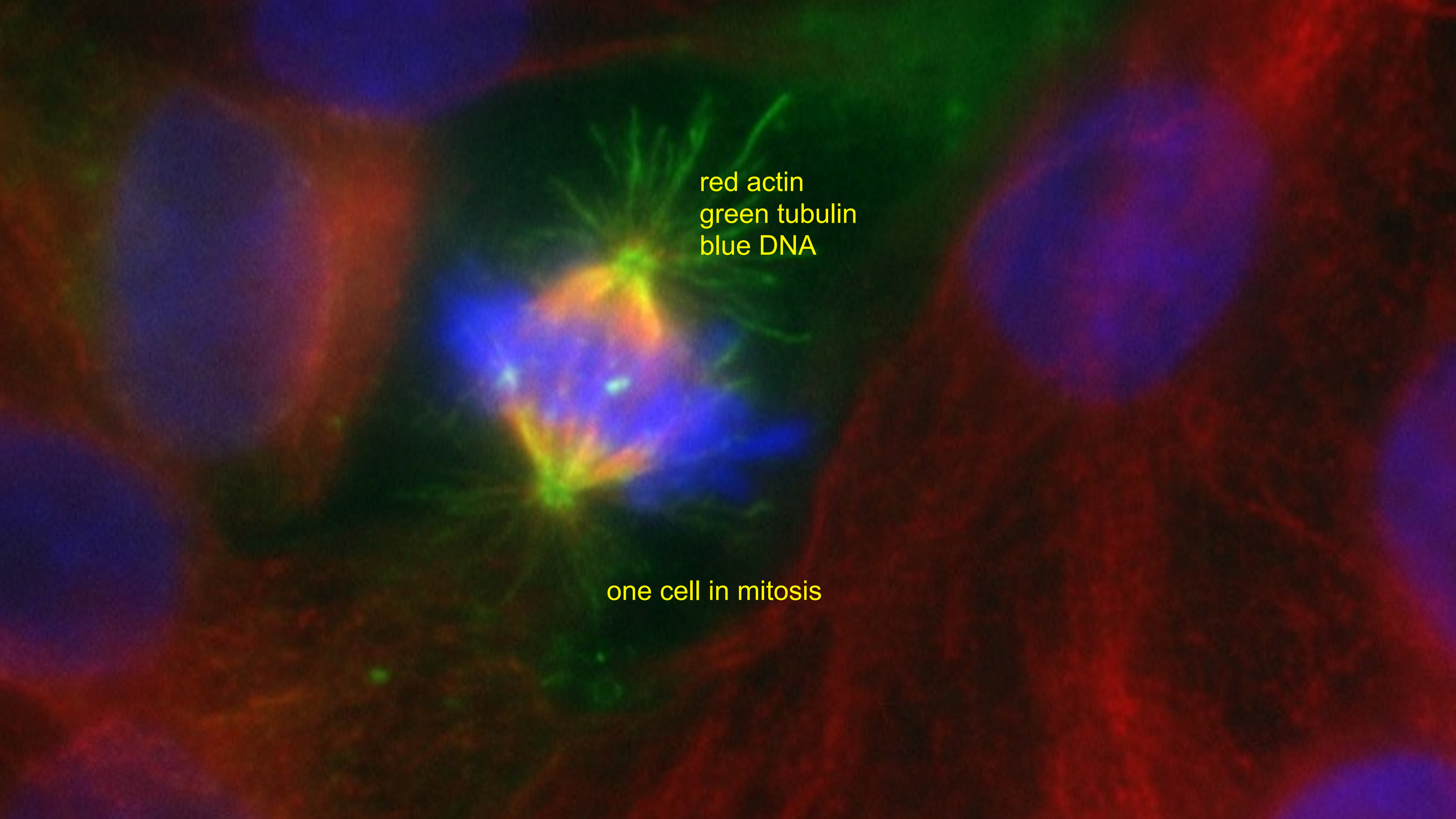
- Explain how mitosis works and its genetic outcomes.

Cells Make More Cells





Which phase of mitosis, why?


red actin
green tubulin
blue DNA
one cell in mitosis

Explain?

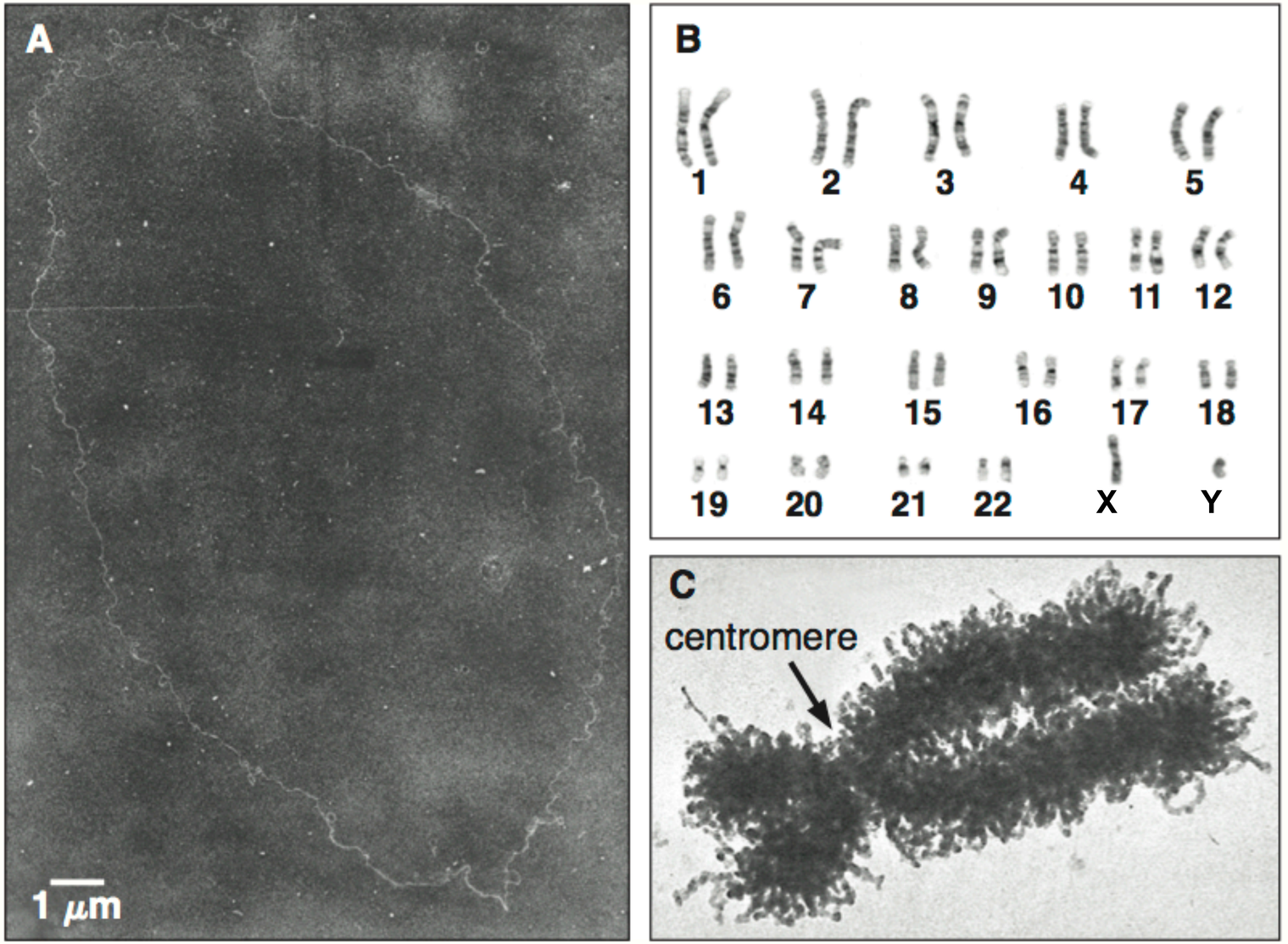
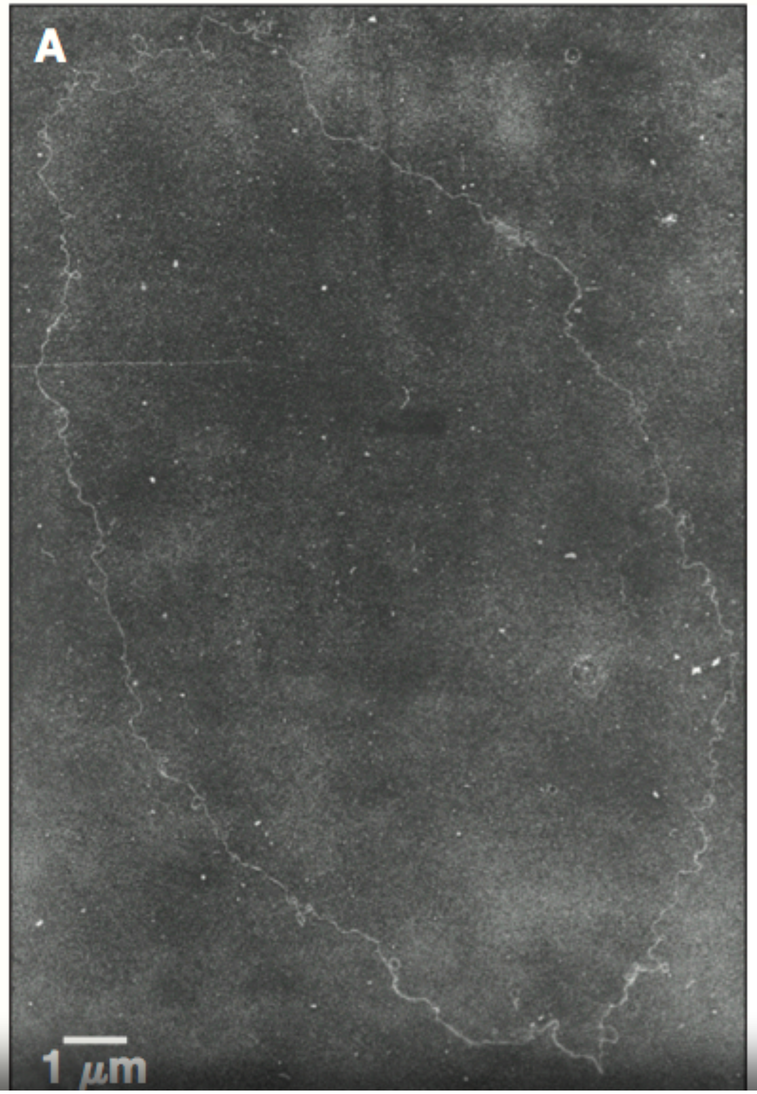
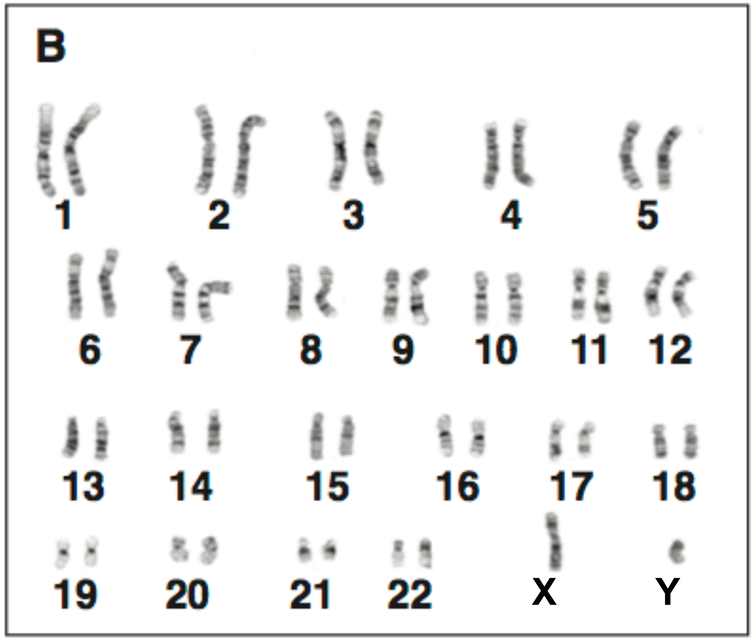


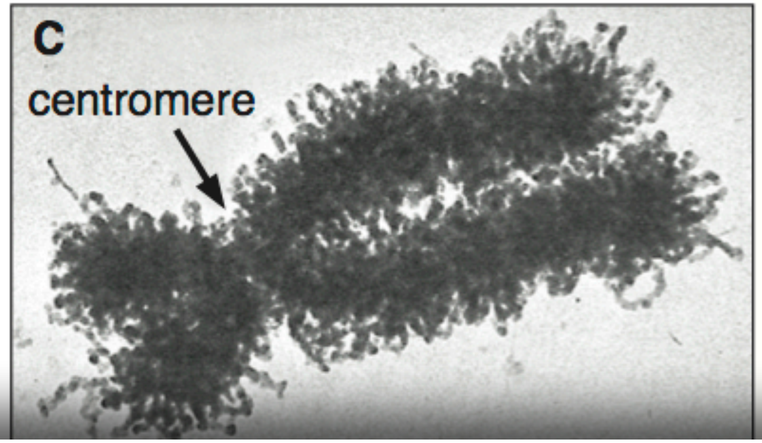
Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

Explain?







Integrating Questions

23. Look at the human chromosomes in Figure 3.19 and notice how they are numbered. What criteria were used to determine which chromosome was number 1, number 2, and so on, all the way to number 22?

Integrating Questions

23. Look at the human chromosomes in Figure 3.19 and notice how they are numbered. What criteria were used to determine which chromosome was number 1, number 2, and so on, all the way to number 22?
24. Go to the National Center for Biotechnology Information (NCBI) to see how many chromosomes are present in various species Directions: Go to the genome website. Click the "Filters" button (top right) and choose a range of organisms (*e.g.*, eukaryotes, animals). For each group of organisms, sort from largest to smallest number of chromosomes by clicking on the “Chromosomes” column heading. Click on the species name if you want to see what organism you have identified. Which organism has the most chromosomes? Do humans have the most chromosomes of all mammals (change the default of 50 organisms to 200)? Why are humans (*Homo sapiens*) listed with 24 instead of 23 or 46?

Google

Lysandra coridon

Sign in

All Images Shopping News Videos More Tools

About 71,500 results (3.50 seconds)

90 chromosomes

Chalkhill blue

Insects

https://en.wikipedia.org › wiki › Chalkhill_blue

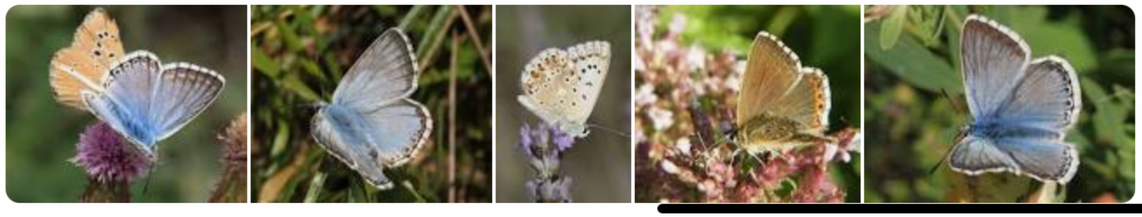
Chalkhill blue - Wikipedia

The chalkhill blue (**Lysandra coridon**) is a butterfly in the family Lycaenidae. It is a small butterfly that can be found throughout the Palearctic realm, ...

Ecology · Evolution · Factors that affect genetic... · Status and conservation

http://www.eurobutterflies.com › coridon

Lysandra coridon on euroButterflies by Matt Rowlings



About

The chalkhill blue is a butterfly in the family Lycaenidae. It is a small butterfly that can be found throughout the Palearctic realm, where it occurs primarily in grasslands rich in chalk. Males have a pale blue colour, while females are dark brown. Both have chequered fringes around their wings. Wikipedia

Scientific name: Polyommatus coridon

Conservation status: Least Concern (Population stable) Encyclopedia of Life

Higher classification: Polyommatus

Rank: Species

Feedback

People also search for

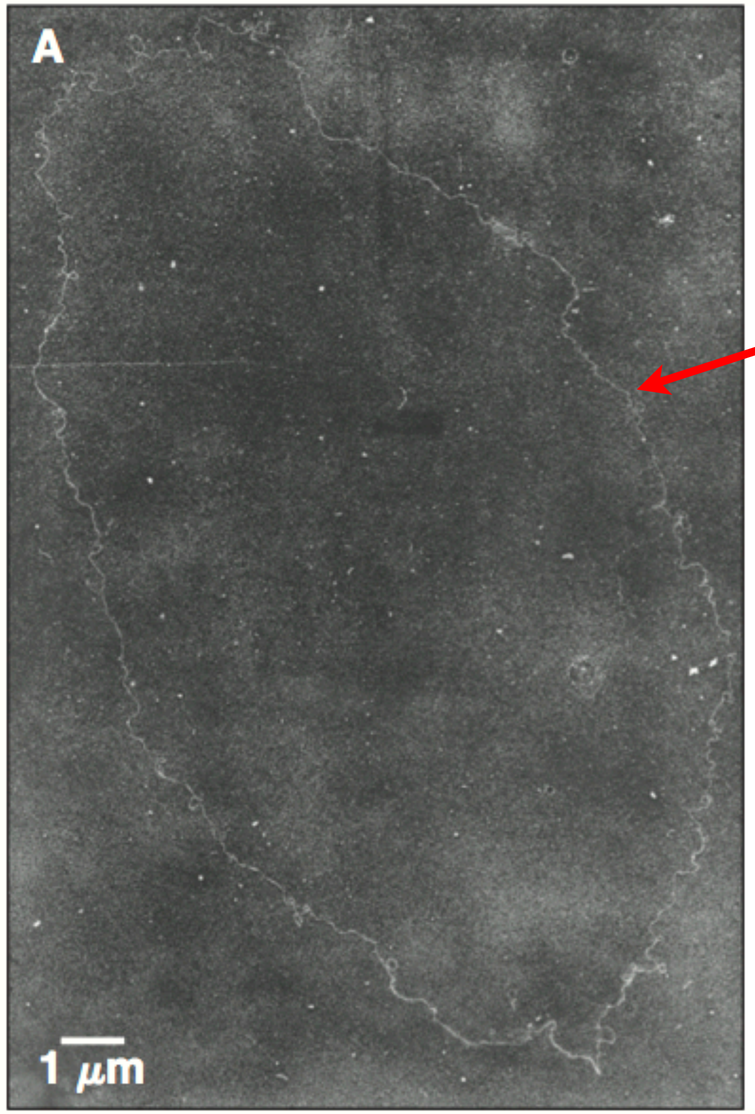

Adonis


Polyom…


Common


Brown

Typical Bacteria Have One Chromosome



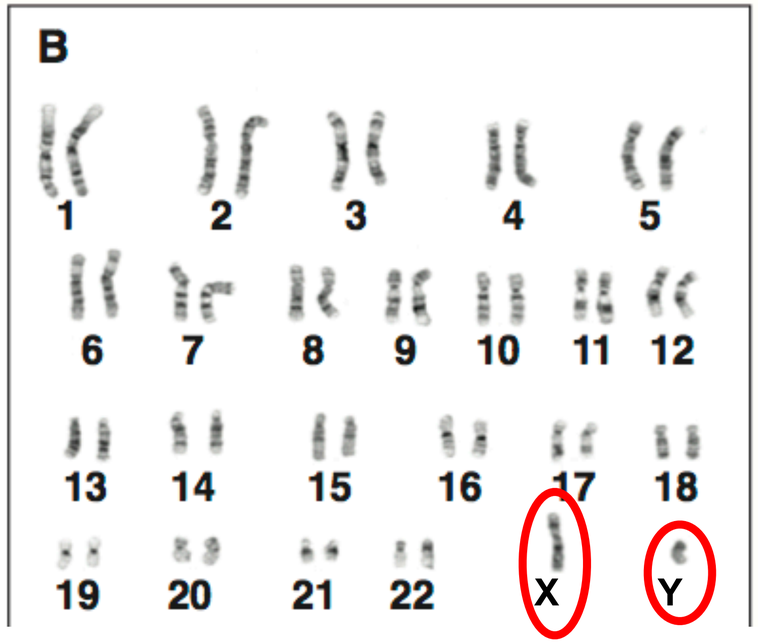
a bacterial genome

Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

Humans Have 46 Chromosomes

diploid human
male genome
46 chromosomes
22 pairs + X and Y

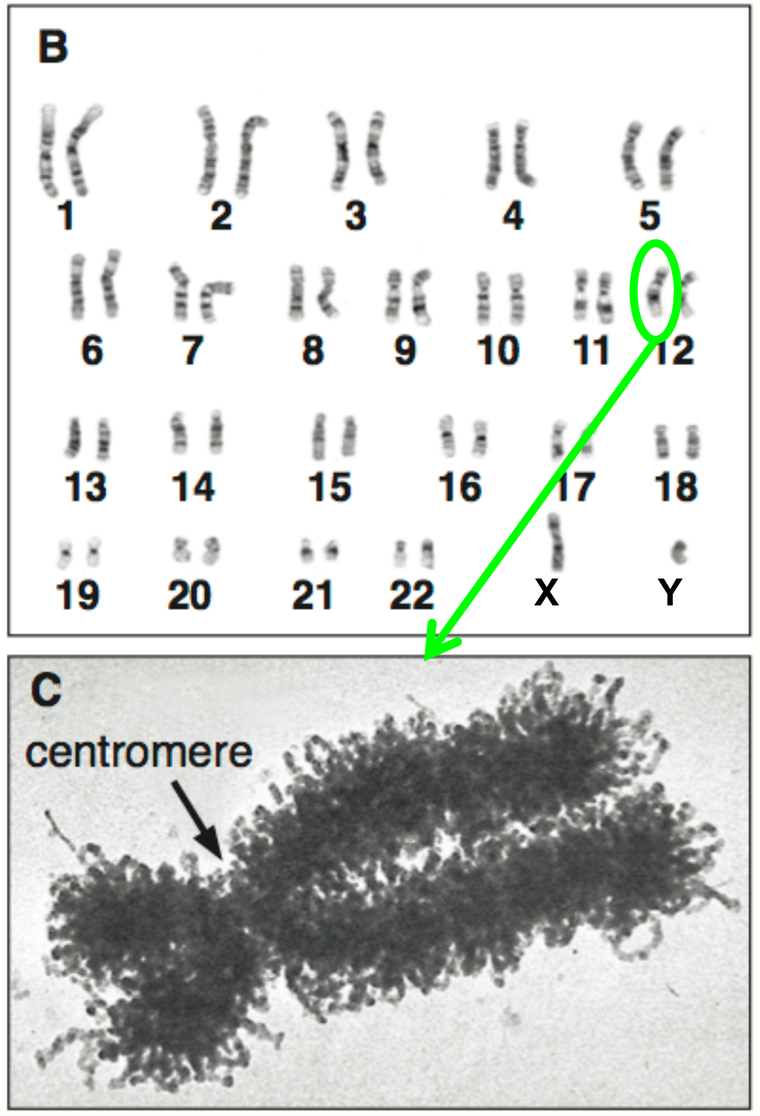


Why does NCBI say humans have more than 23 chromosomes?

Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

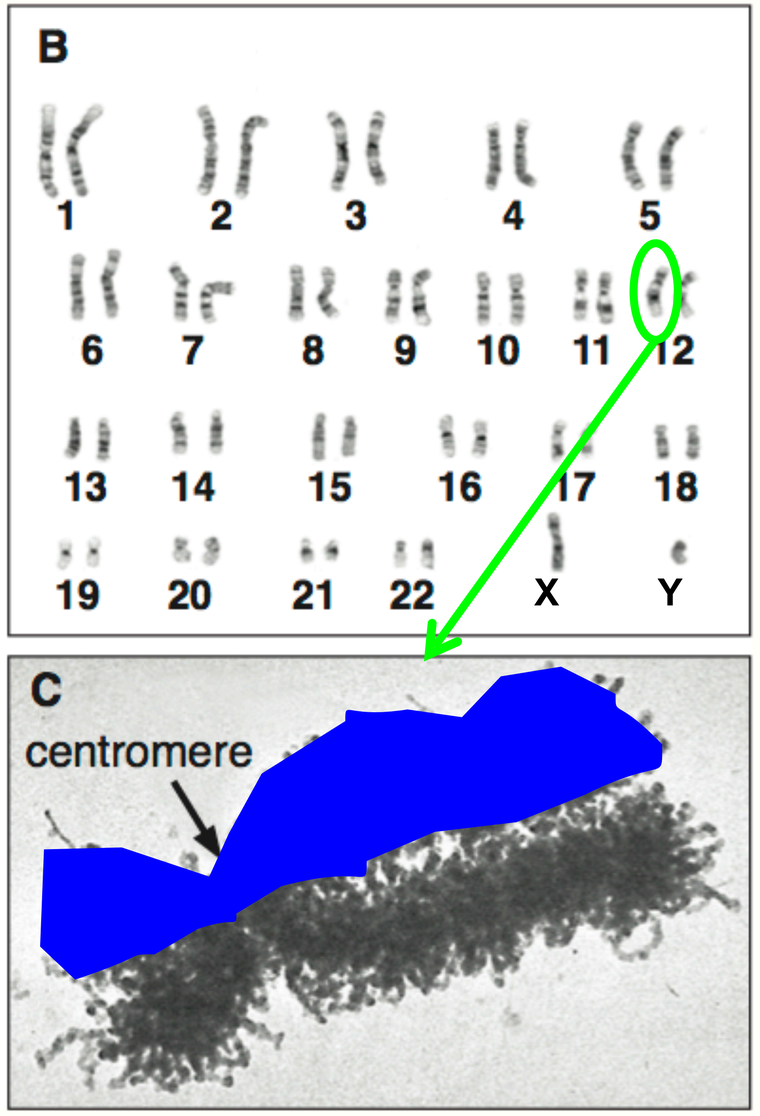
Chromosomes are Wound Up DNA



one chromosome #12

Fig. 3.19

Chromosomes are Wound Up DNA



one chromatid

Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

Chromosomes are Wound Up DNA

What would a chromosome look like prior to DNA replication?

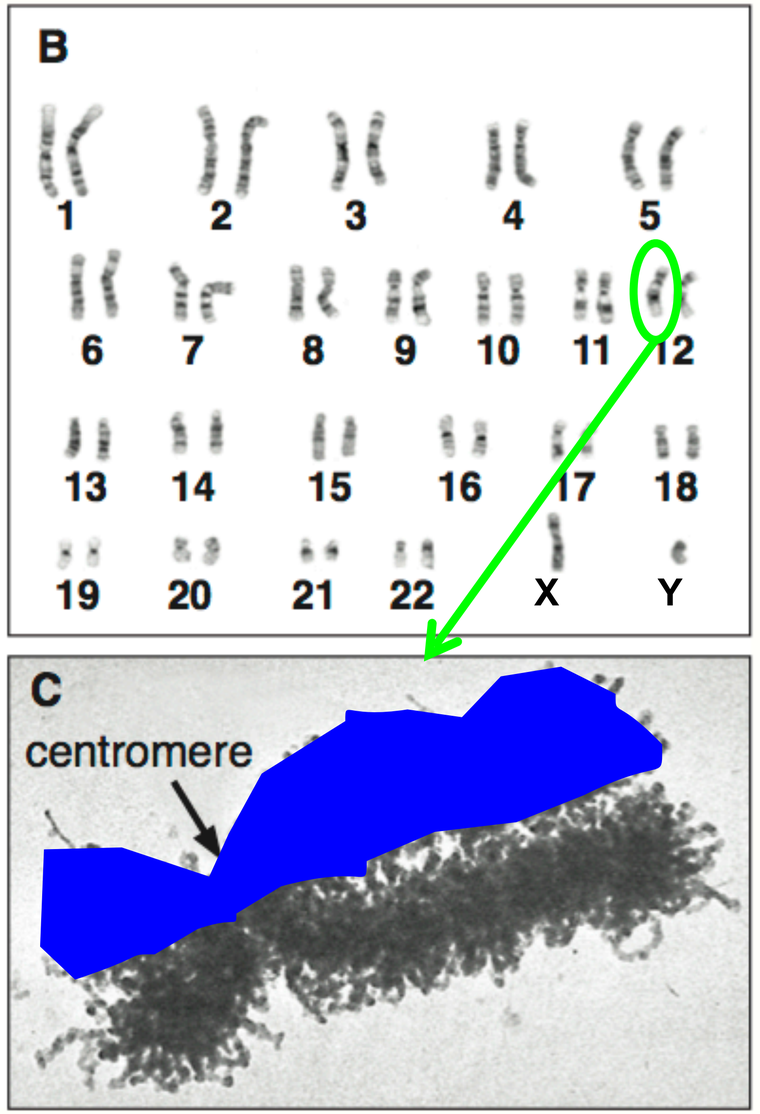


Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

Do both cells replicate the same way?

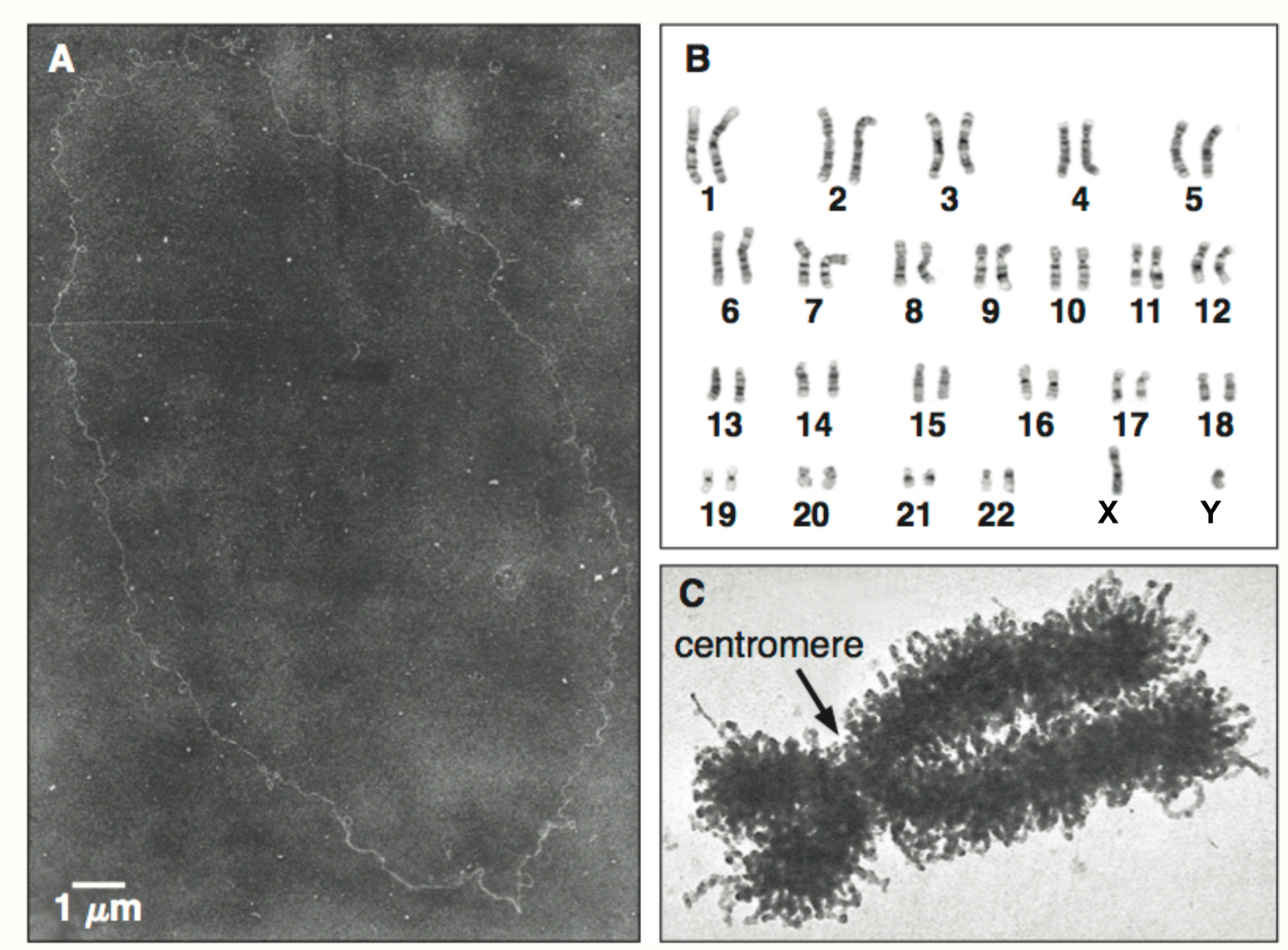
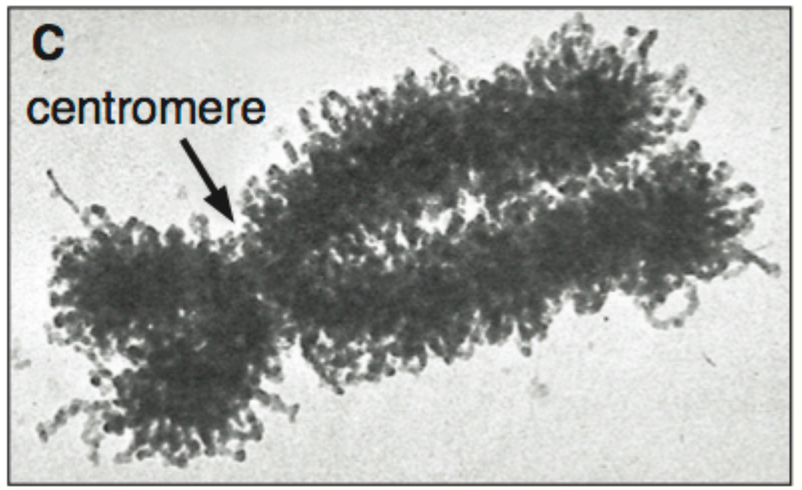


Fig. 3.19

A. from R. W. Leavitt, *et al.*, 1971; Cytogenetics/Wisconsin State Laboratory of Hygiene; C Devika Subramanian

This photo must have been taken during which stage of the cell cycle?

A. G1
B. S
C. G2
D. Mitosis



Explain?

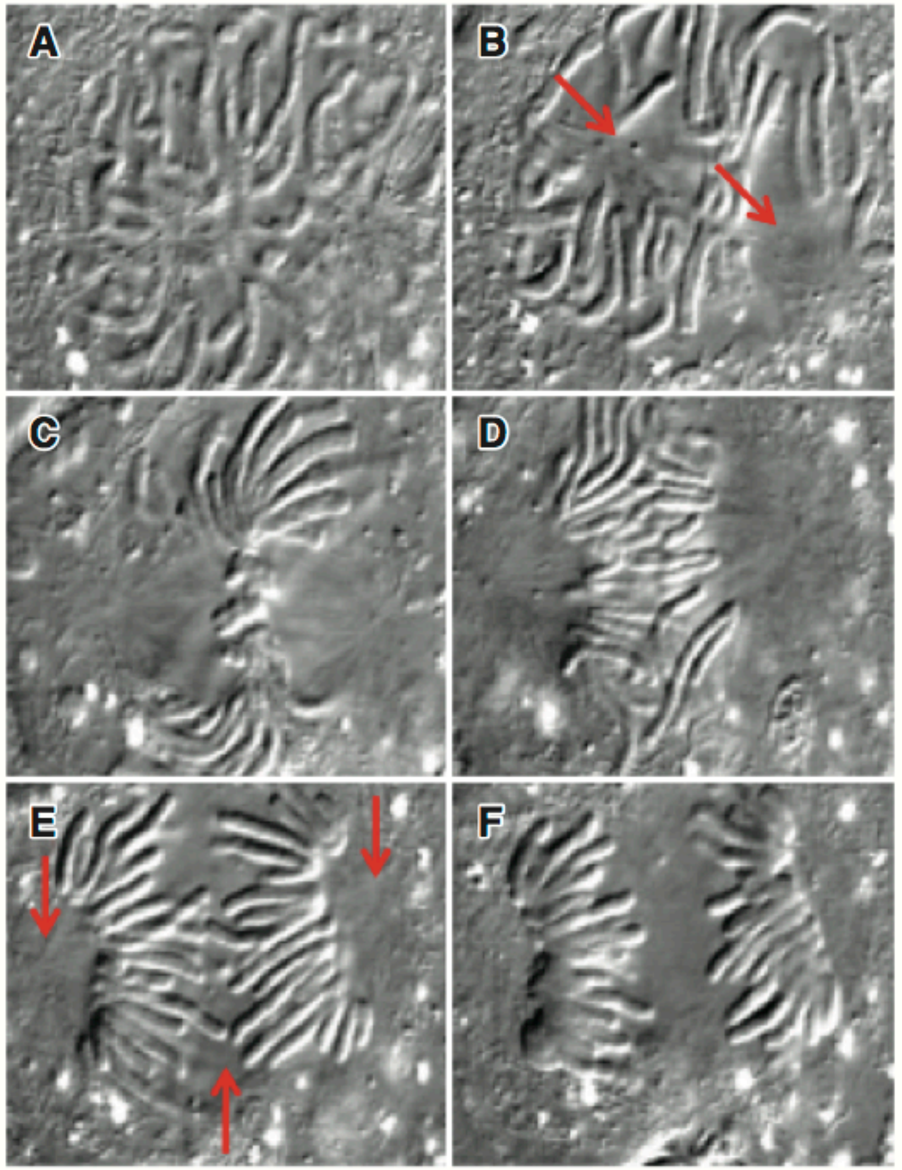


Fig. 3.20

modified from Rieder ,Cole and Waters

Integrating Questions

25. Speculate about possible advantages for chromosomes condensing before separating if they have to relax again later for genes to be transcribed.
26. When chromosomes are pulled toward the clear zones within a nucleus, which part of the chromosome leads the way? In other words, are they pulled from one end, both ends simultaneously, or somewhere near the middle? Watch the movie to answer this question.

Nuclear Division

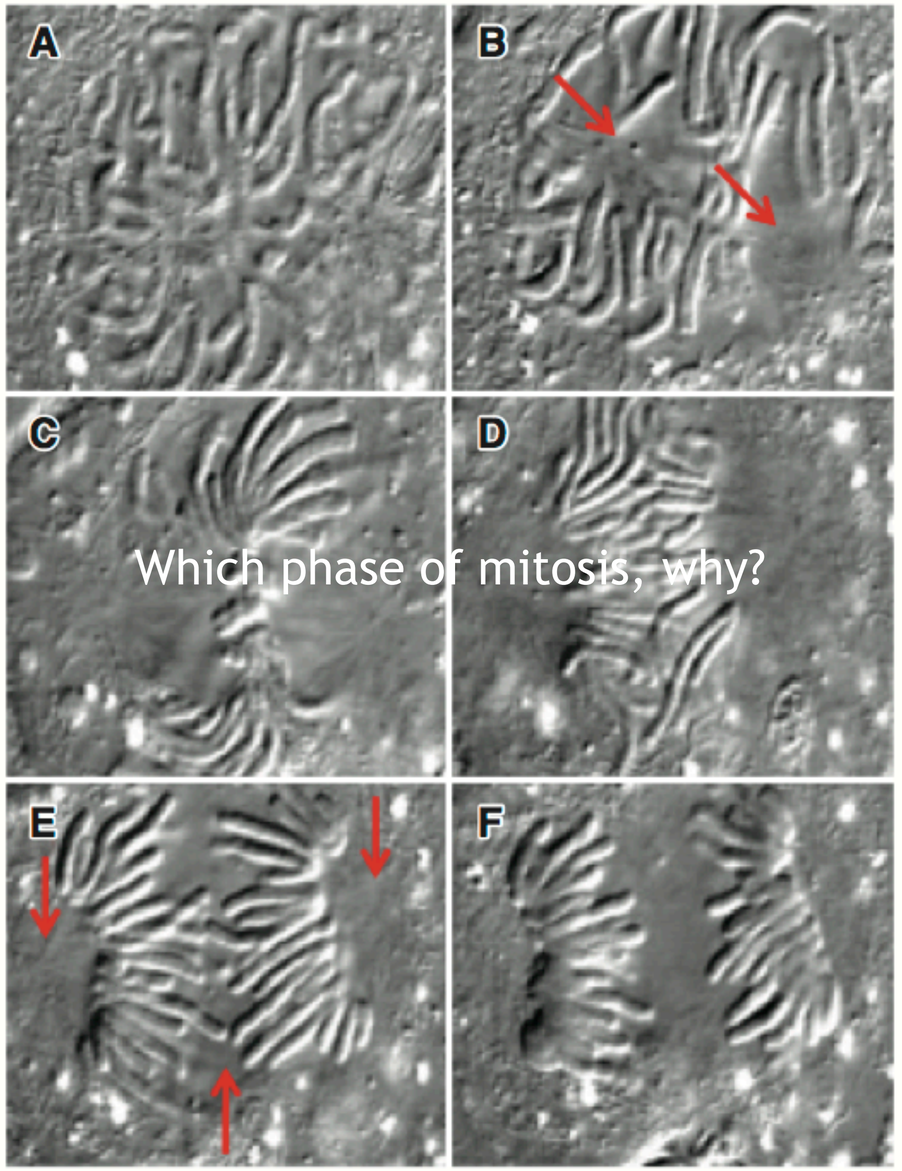
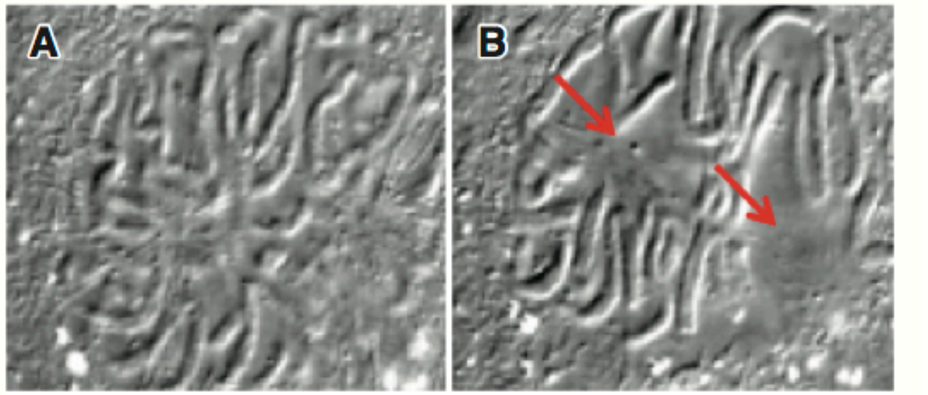


Fig. 3.20

modified from Rieder ,Cole and Waters

Nuclear Division

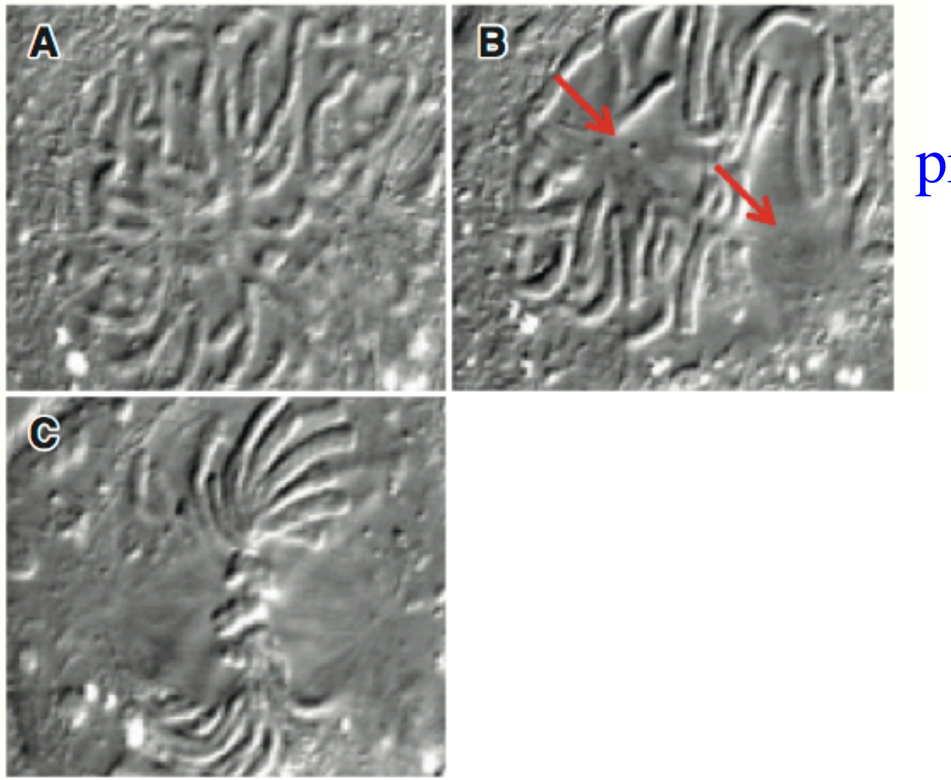


prophase

Fig. 3.20

modified from Rieder ,Cole and Waters

Nuclear Division



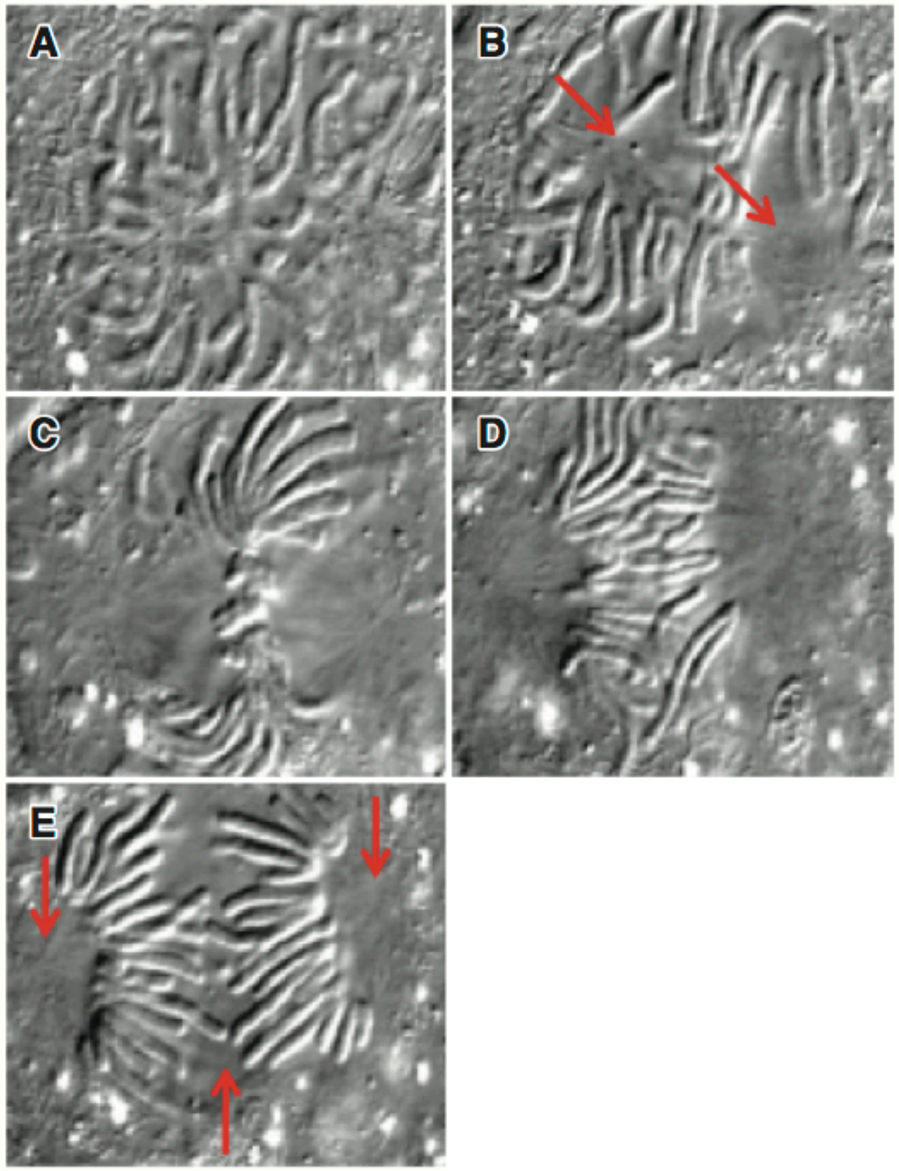
prophase

metaphase

Fig. 3.20

modified from Rieder ,Cole and Waters

Nuclear Division



prophase

metaphase

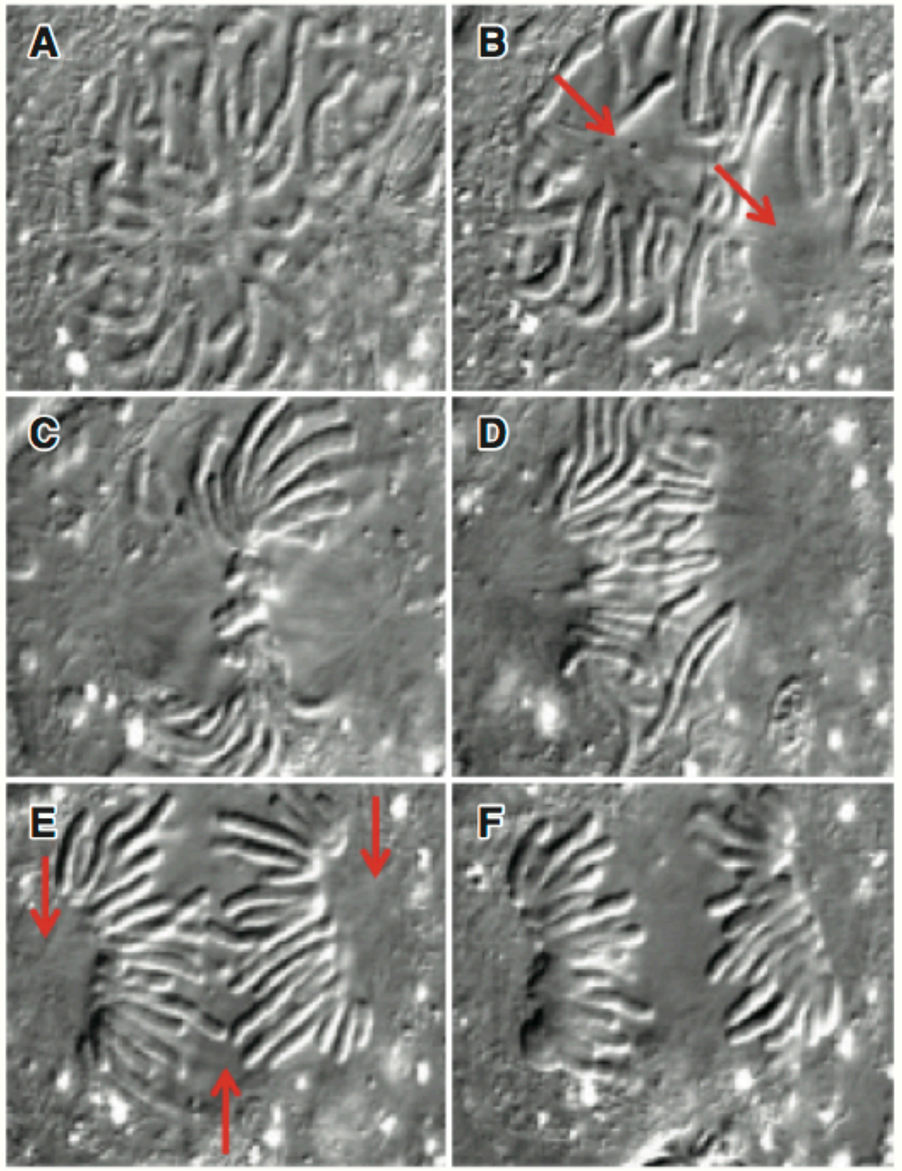
anaphase..

anaphase..

Fig. 3.20

modified from Rieder ,Cole and Waters

Nuclear Division



prophase

metaphase

anaphase..

anaphase..

..telophase

telophase

Fig. 3.20

modified from Rieder ,Cole and Waters

Nuclear Division

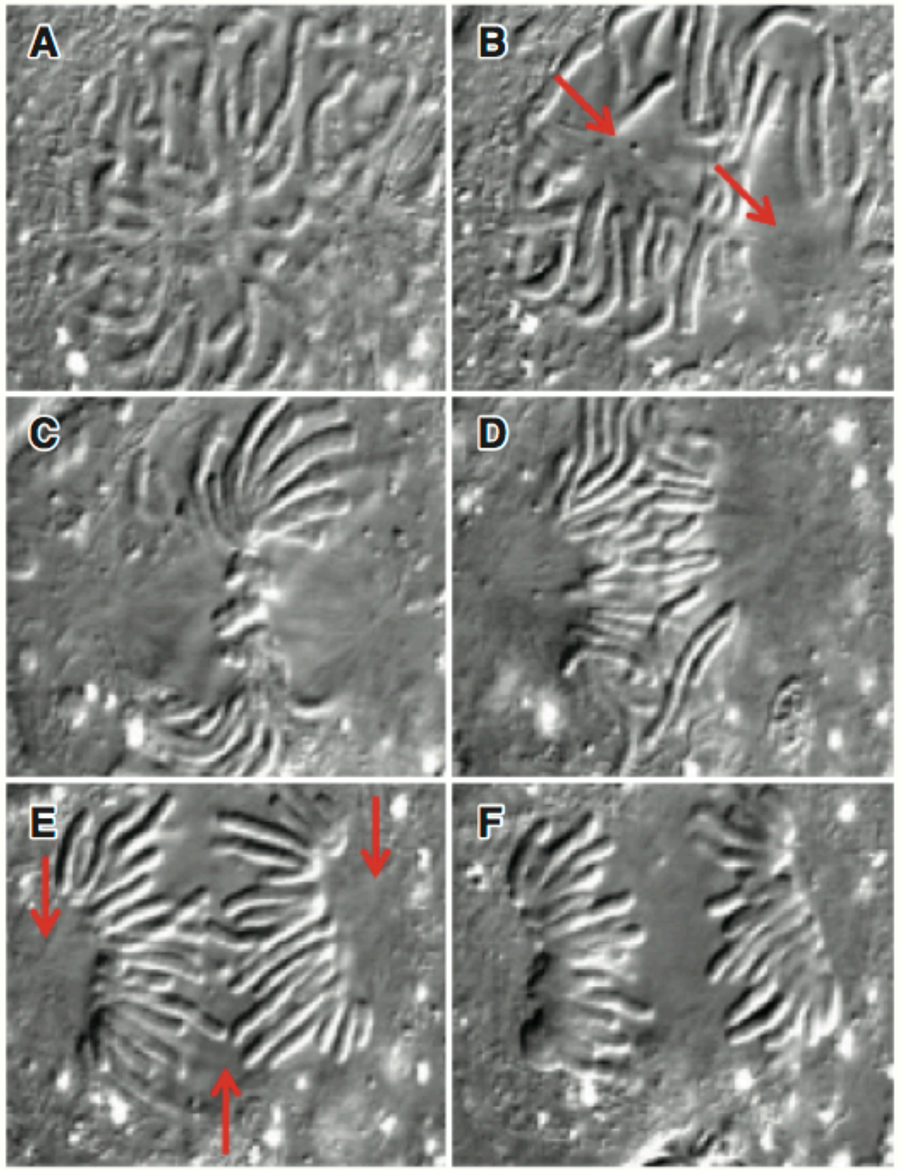
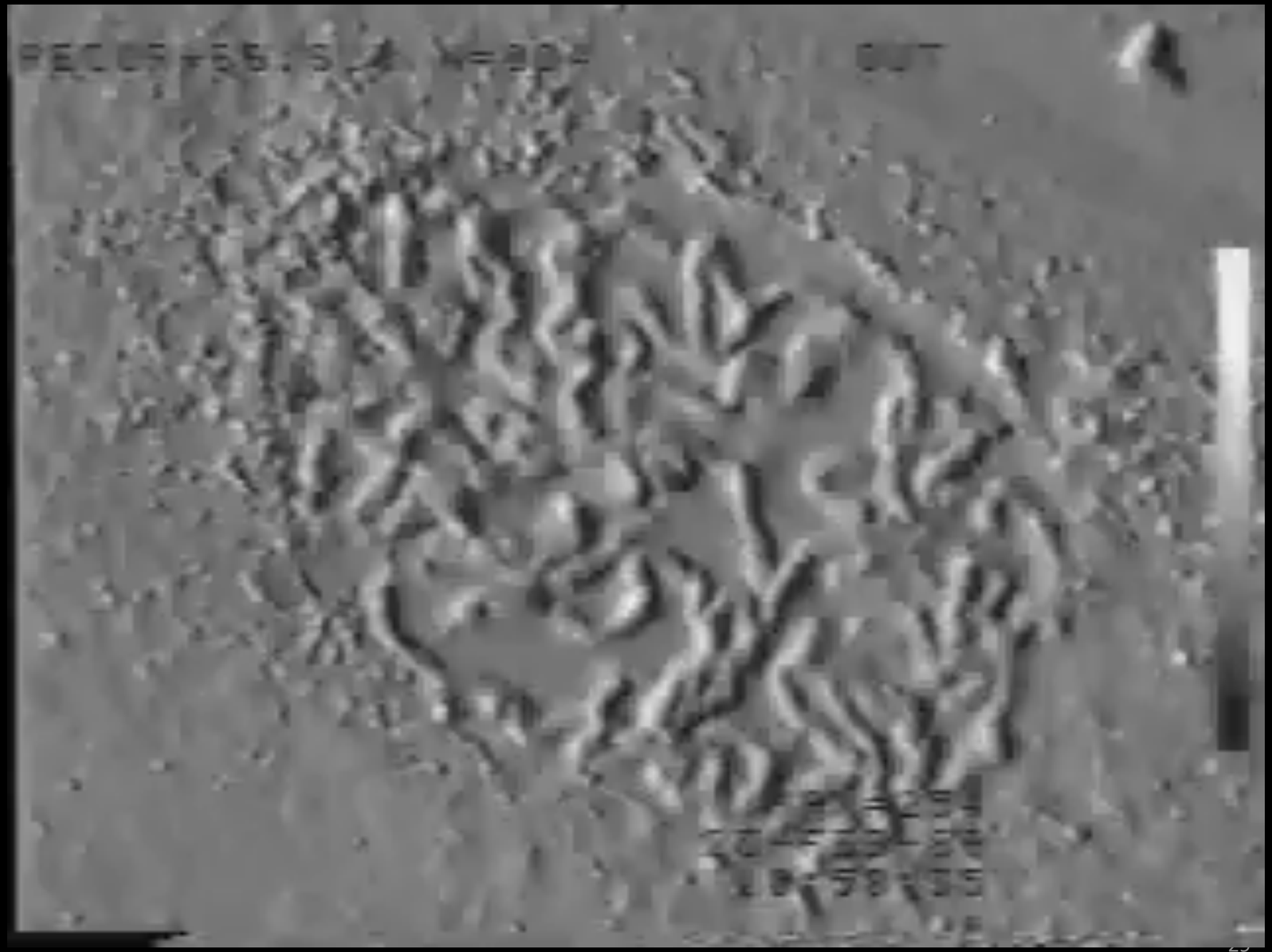


Fig. 3.20

modified from Rieder ,Cole and Waters


Mitosis in tissue-cultured
lung cell of a newt,
Traicha granulosa, recorded
with the new Pol-Scope.


OUT

Mitosis Mechanism

Explain?

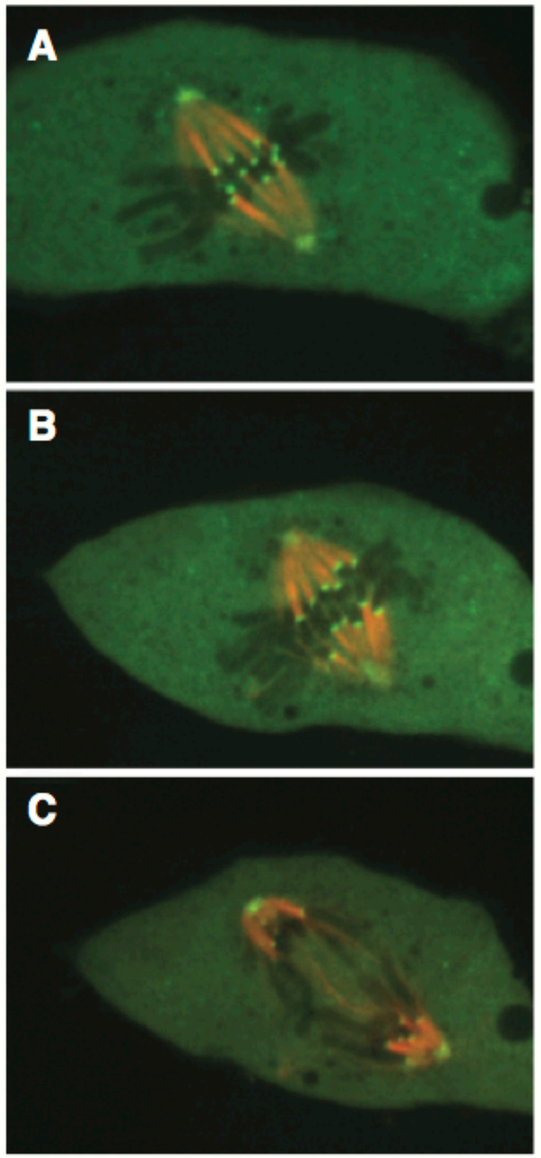


Fig. 3.21

modified from Cimini *et al.*, 2006b

Integrating Questions

27. Locate the two ends of one microtubule in Figure 3.21. To what is each end attached?
28. Use Table 3.5 and the images in Figure 3.19 through Figure 3.21 to summarize what happens inside a parental cell in order to produce two equivalent new cells. Start your summary immediately after the previous cell division. You should be able to draw this process as well as outline it in writing.

Mitosis Mechanism

match the term
with the image

anaphase

metaphase

telophase

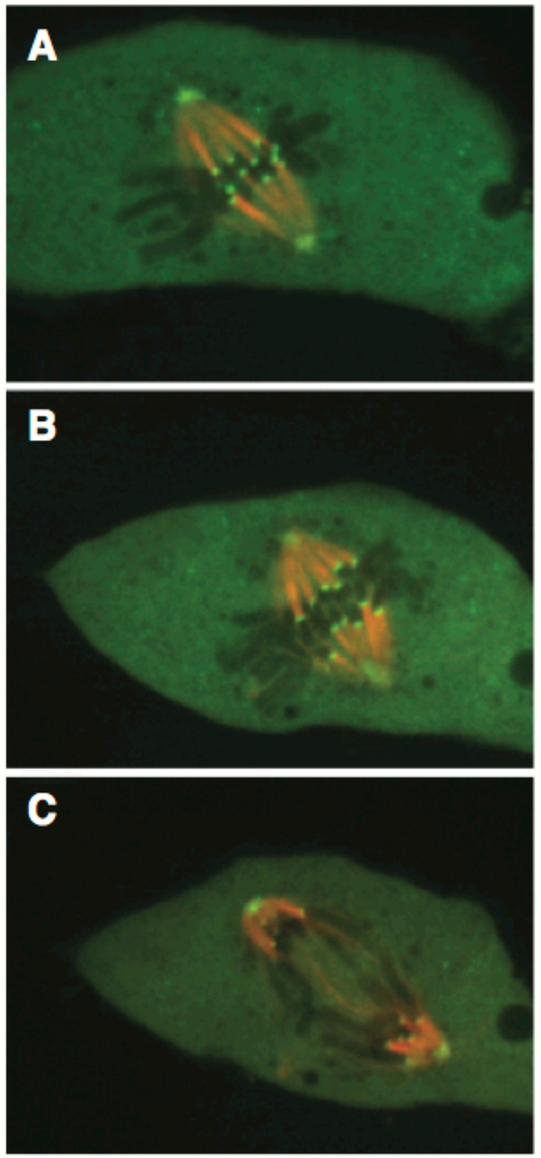


Fig. 3.21

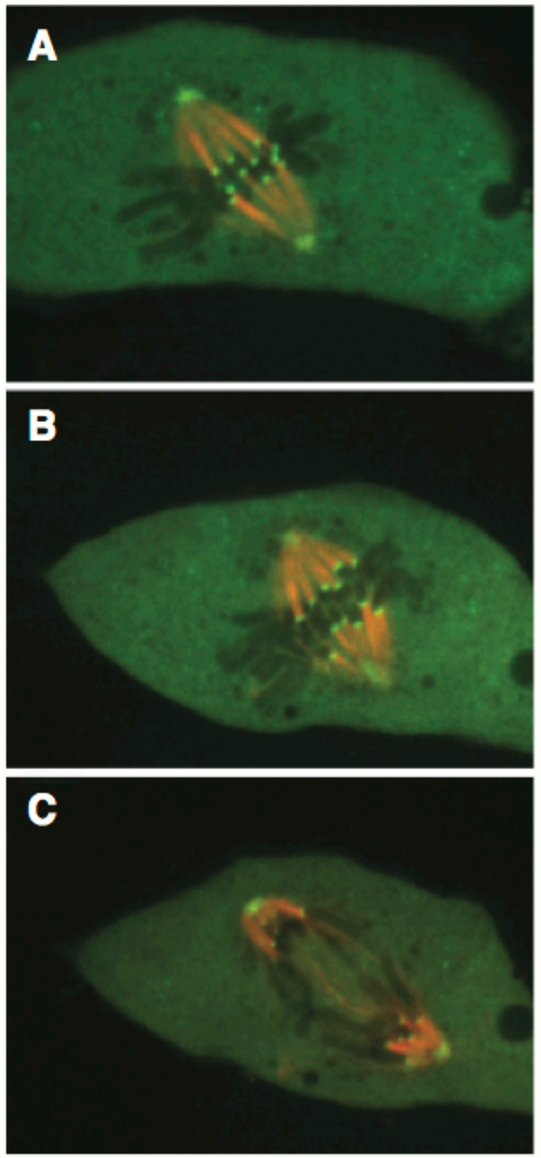
modified from Cimini *et al.*, 2006b

Mitosis Mechanism

match the term
with the image

metaphase

telophase



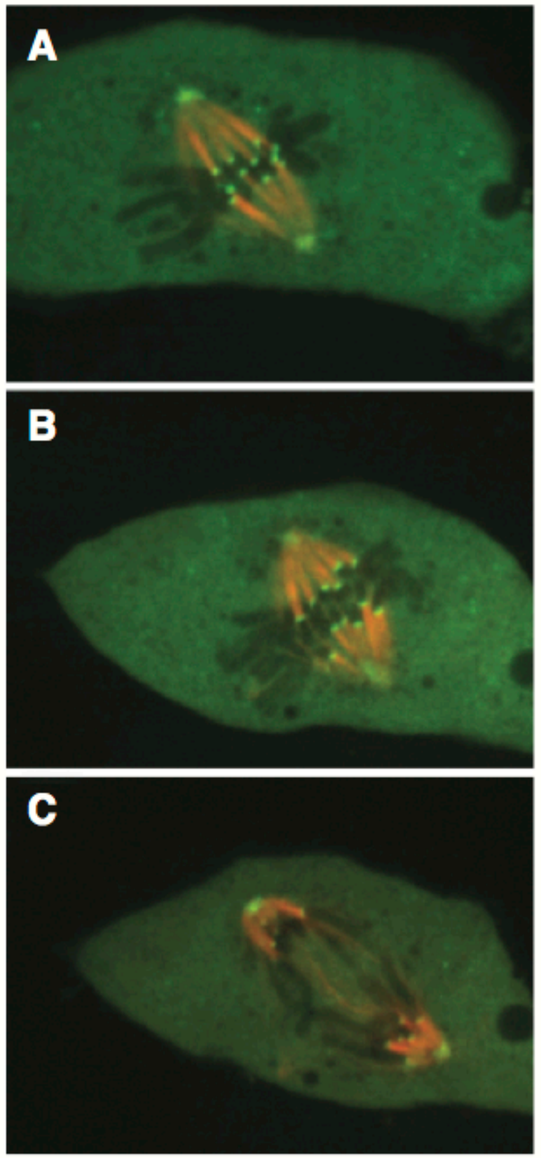
anaphase

Fig. 3.21

modified from Cimini *et al.*, 2006b

Mitosis Mechanism

match the term
with the image



metaphase

anaphase

telophase

Fig. 3.21

modified from Cimini *et al.*, 2006b

Mitosis Mechanism

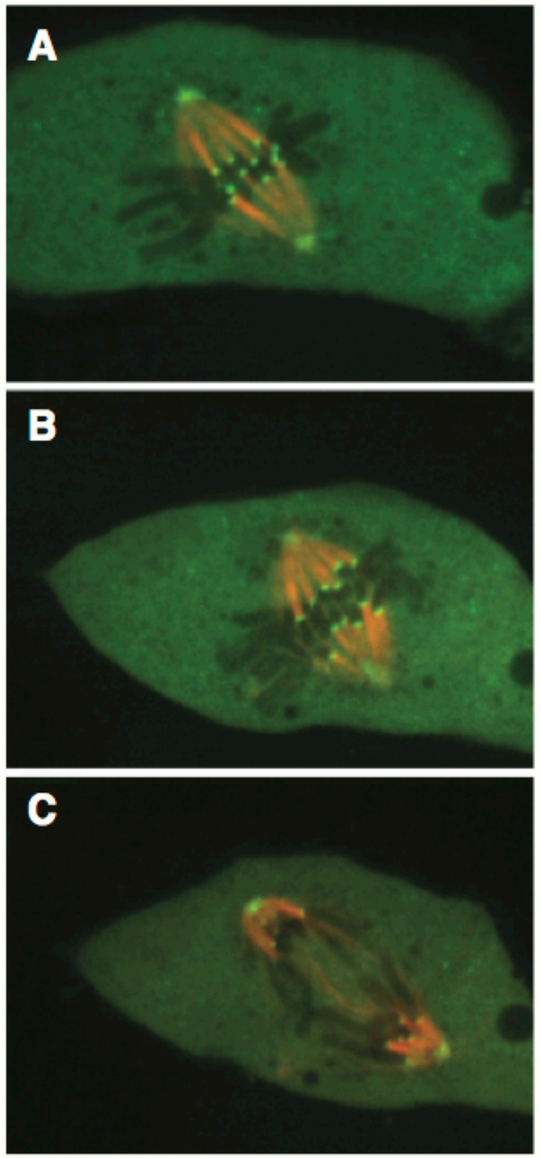
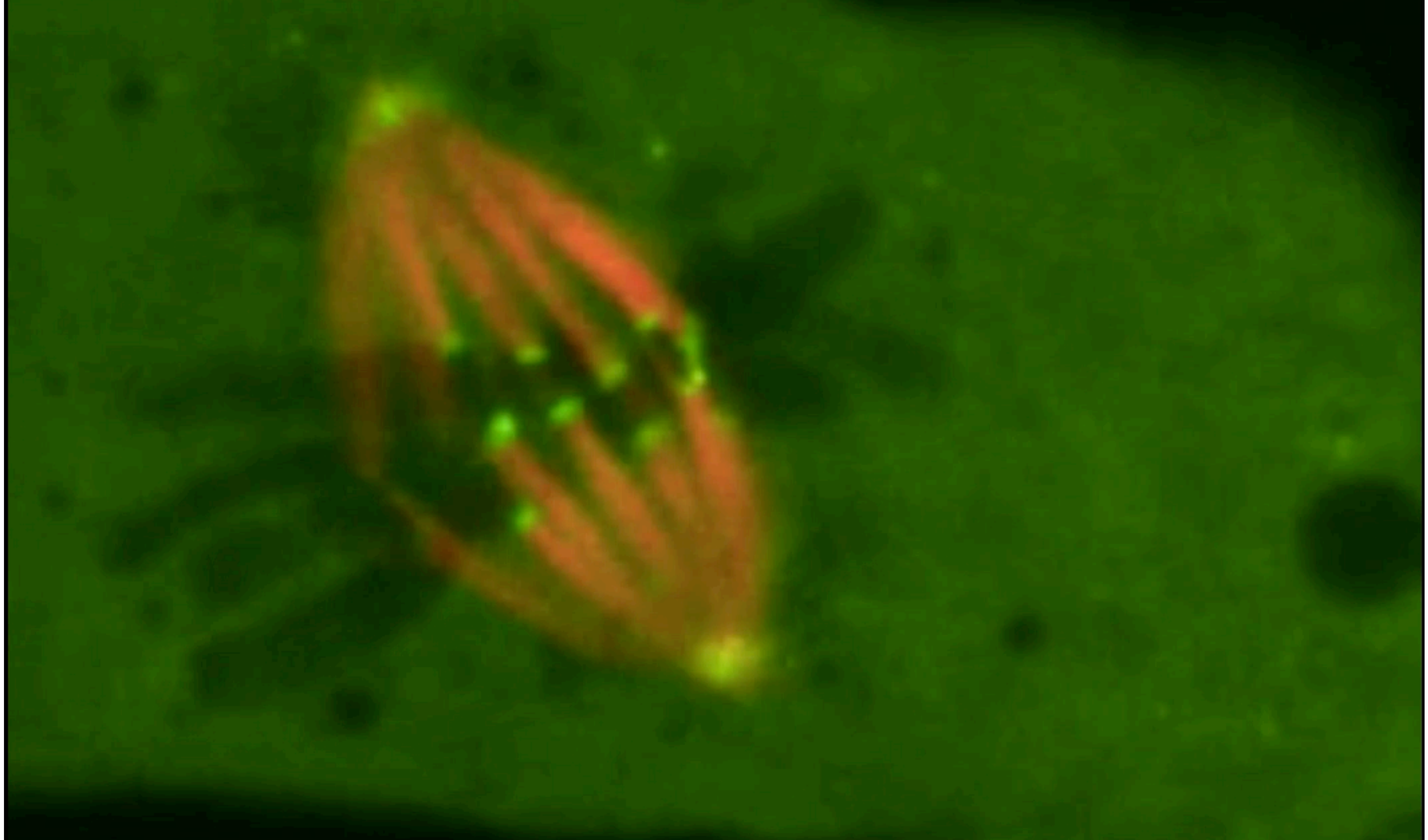
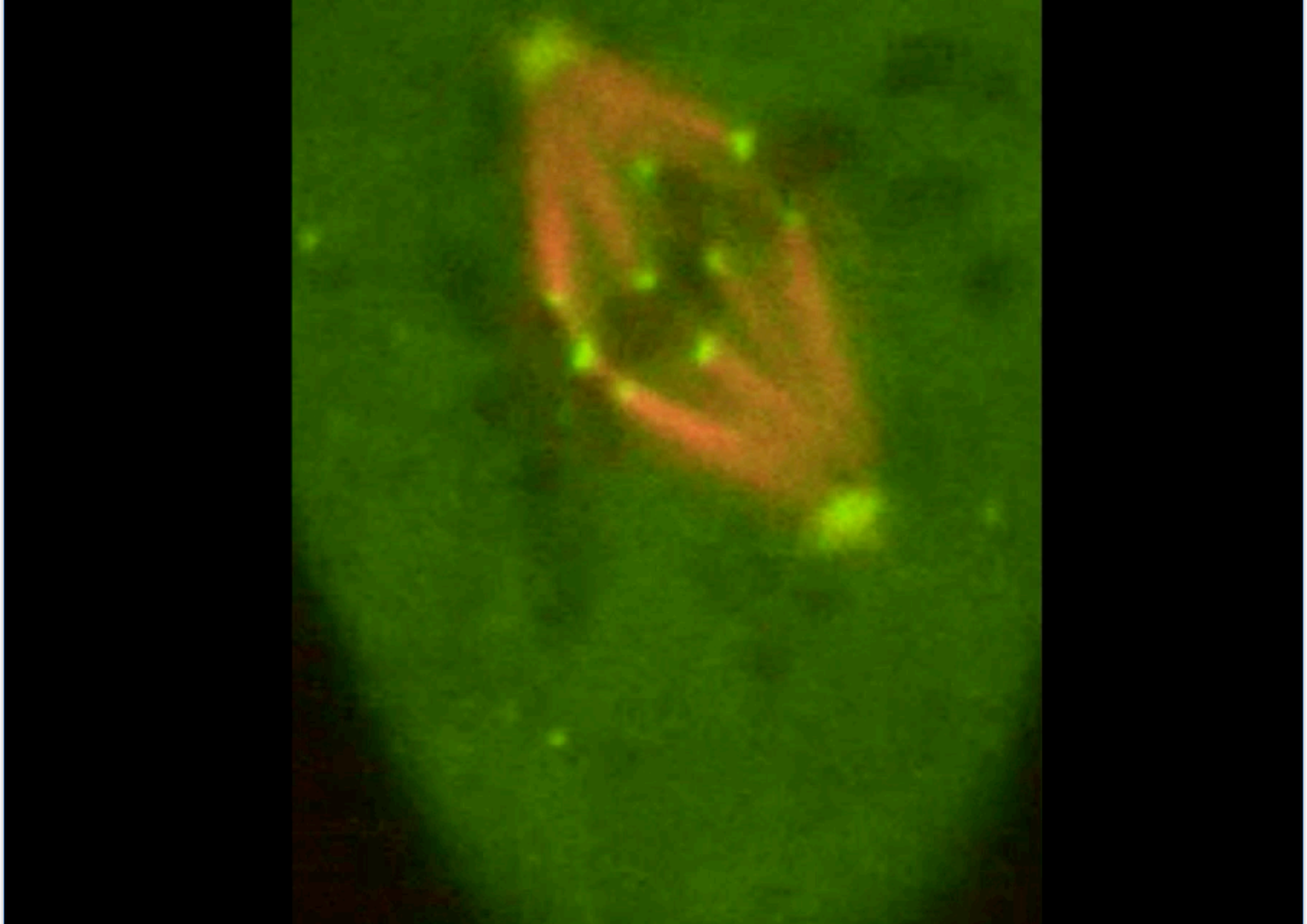


Fig. 3.21

modified from Cimini *et al.*, 2006b





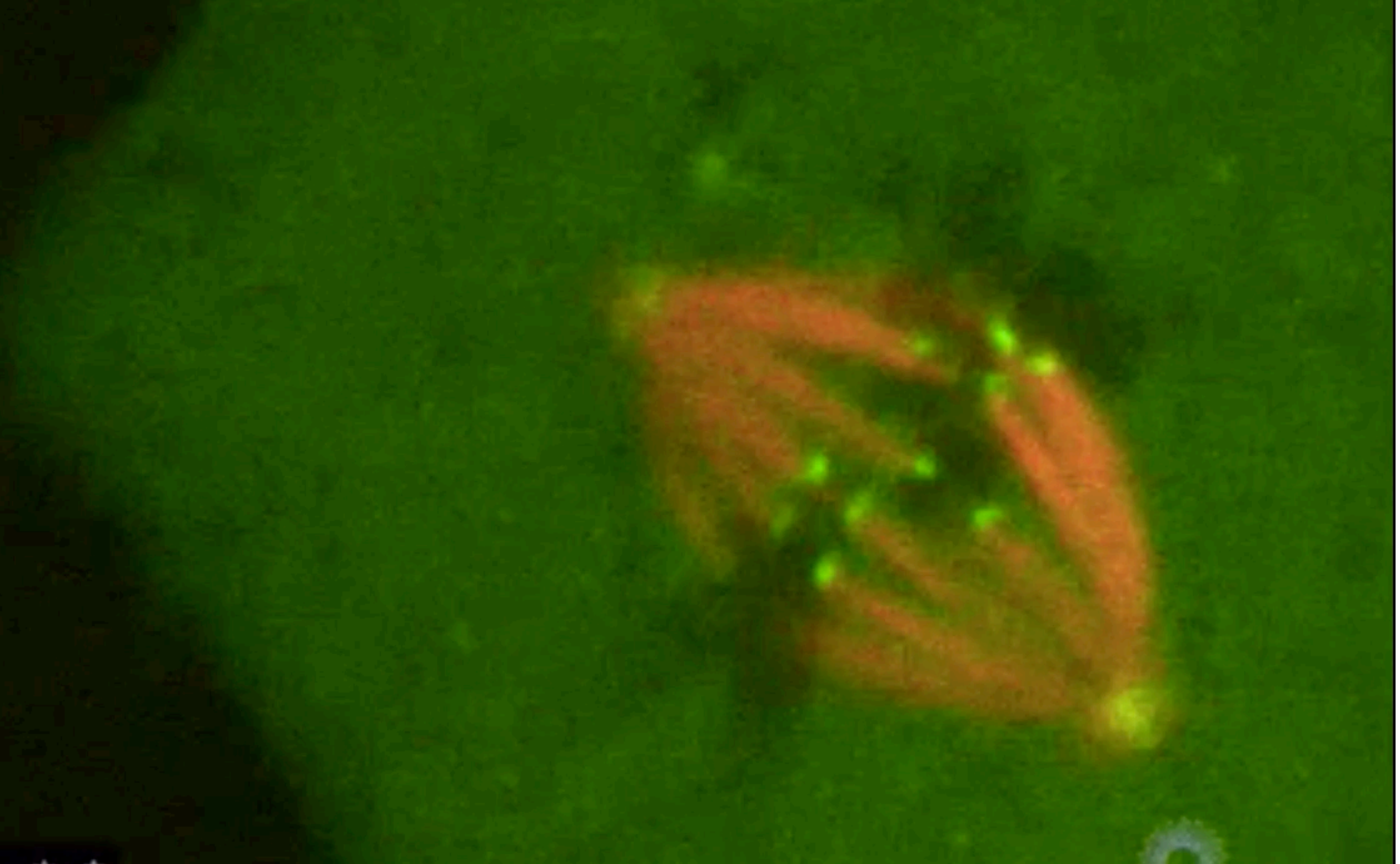


Table 3.5

Explain? name the stages and describe what happens

Table 3.5 Steps in typical eukaryotic cell cycle.

name	description	duration (hours)
G_1		
S		
G_2		
mitosis		

Table 3.5

Table 3.5

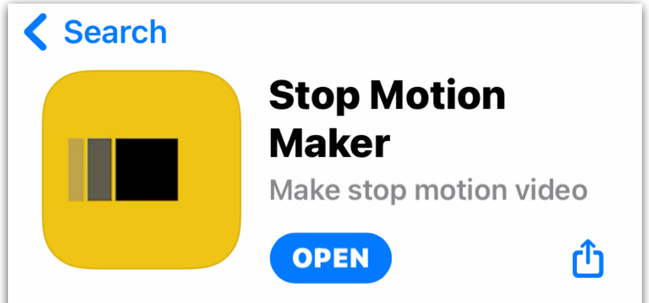
Table 3.5 Steps in typical eukaryotic cell cycle.

name	description	duration (hours)
G_1	growth and normal cellular functions	10
S	synthesis of DNA	8
G_2	growth and normal cellular functions	4
mitosis	separation of chromosomes	2

Shoot a series of photos to create a flip-book of all your group's shoes performing MITOSIS.

Then *Show & Tell* on screen

Little more advanced ->



LB144-Pandemic *2022*