Unit: Cell Structure and Function
Lesson: The Cell Cycle

Agriscience Instructor:

Student Objectives

- 1) Diagram and label the cell cycle and understand of each phase.
- 2) Identify cells in each stage of the cell cycle.
- 3) Understand how the cell controls cell division.

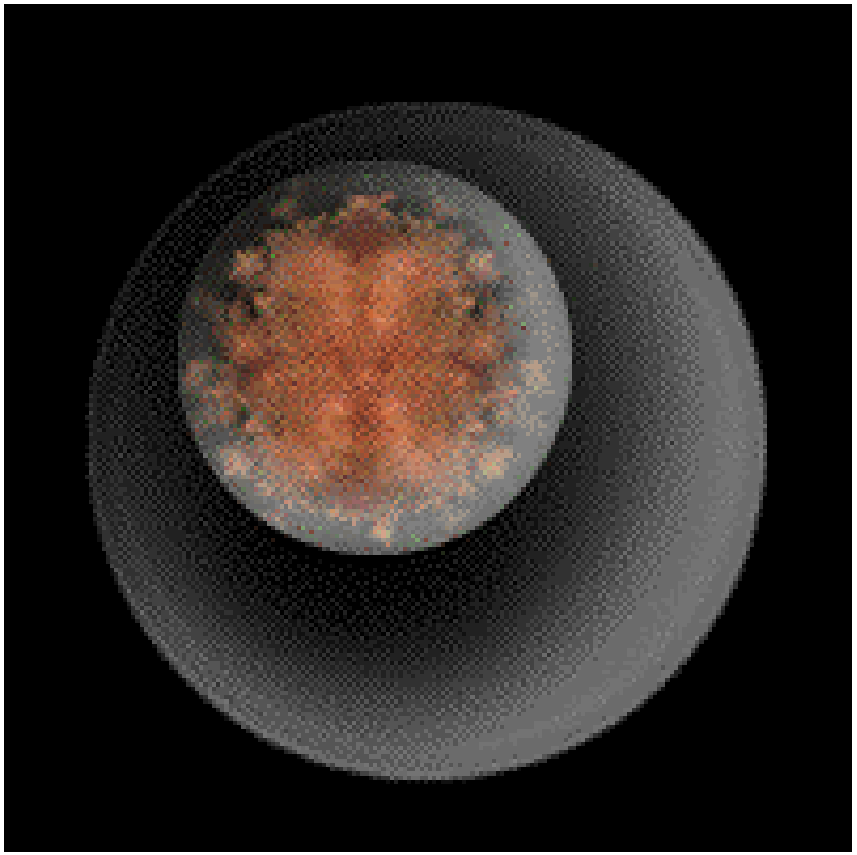
Understanding the Cell Cycle

- There are three major stages to the cell cycle – Interphase, Mitosis and Cytokinesis.

1. Interphase encompasses the phases of G1 (Growth 1), S (DNA Synthesis) and G2 (Growth 2) phase.
2. Mitosis encompasses the phases of prophase, metaphase, anaphase and telophase.
3. Cytokinesis (cytoplasm divides)

- Let's see what this look like!

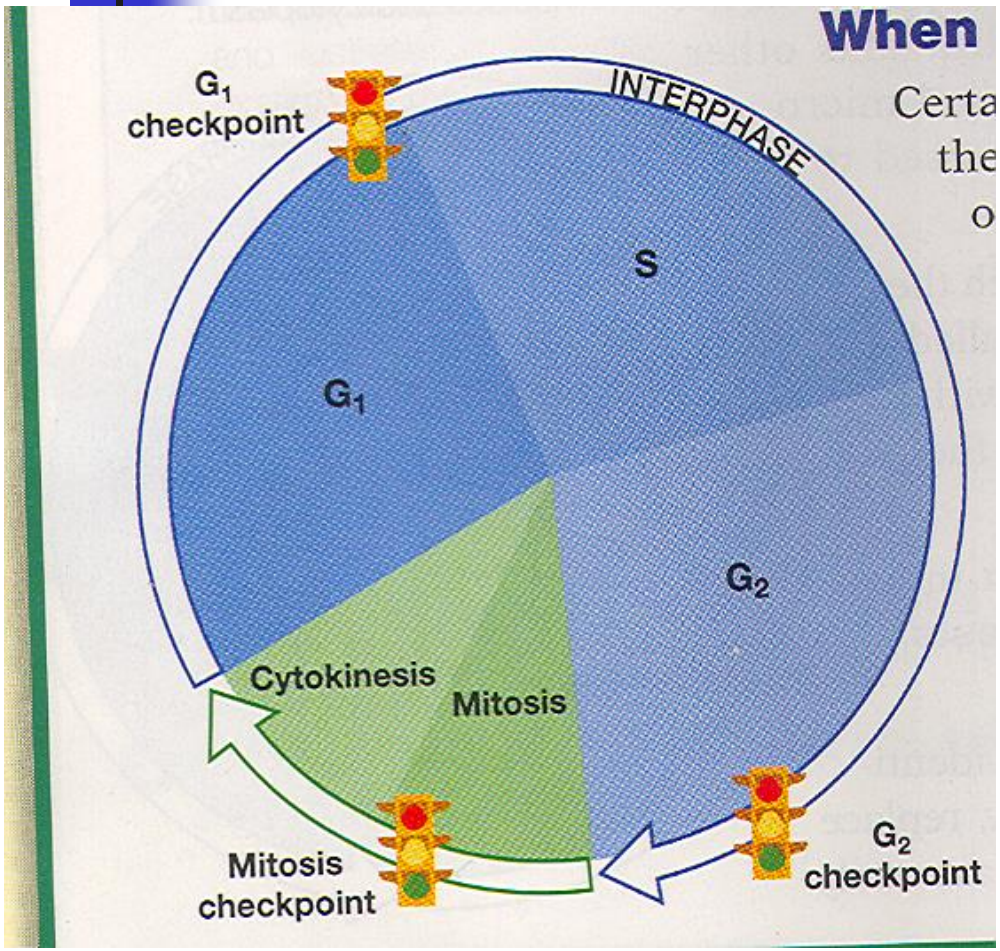
The Cell Cycle in Action!



Why do we care about cell division?

- A) Cell division is a process of reproducing cells. This occurs during growth, repair and development of tissues.

What is the cell cycle?



- Repeating sequence of cellular growth and division throughout the life of an organism

Interphase – an Overview

- 1st Growth Phase
- DNA Synthesis Phase
- 2nd Growth Phase

Phases of Interphase

- A) 1st Growth Phase = (G_1)
  - 1. Cell grows rapidly and carries out routine functions
  - 2. Phase takes most of the cell's life
  - 3. Muscle and nerve cells never divide, so they remain in G_1

Phases of Interphase (cont.)

- B) Synthesis Phase (S)
  - 1. Cell's DNA is copied
  - 2. At the end of the stage, each chromosome consists of 2 chromatids attached @ a centromere.

Phases of Interphase (cont.)

- C) Second Growth Phase (G_2)
  - 1. Hollow microtubules are assembled
  - 2. Microtubules are used to move chromosomes during mitosis

Second Phase of the Cell Cycle

D) Mitosis

1. Nucleus is divided into 2 nuclei
2. Each nucleus ends up with the same number of chromosomes as the original cell.
3. Includes prophase, metaphase, anaphase and telophase.

Final Stage of the Cell Cycle

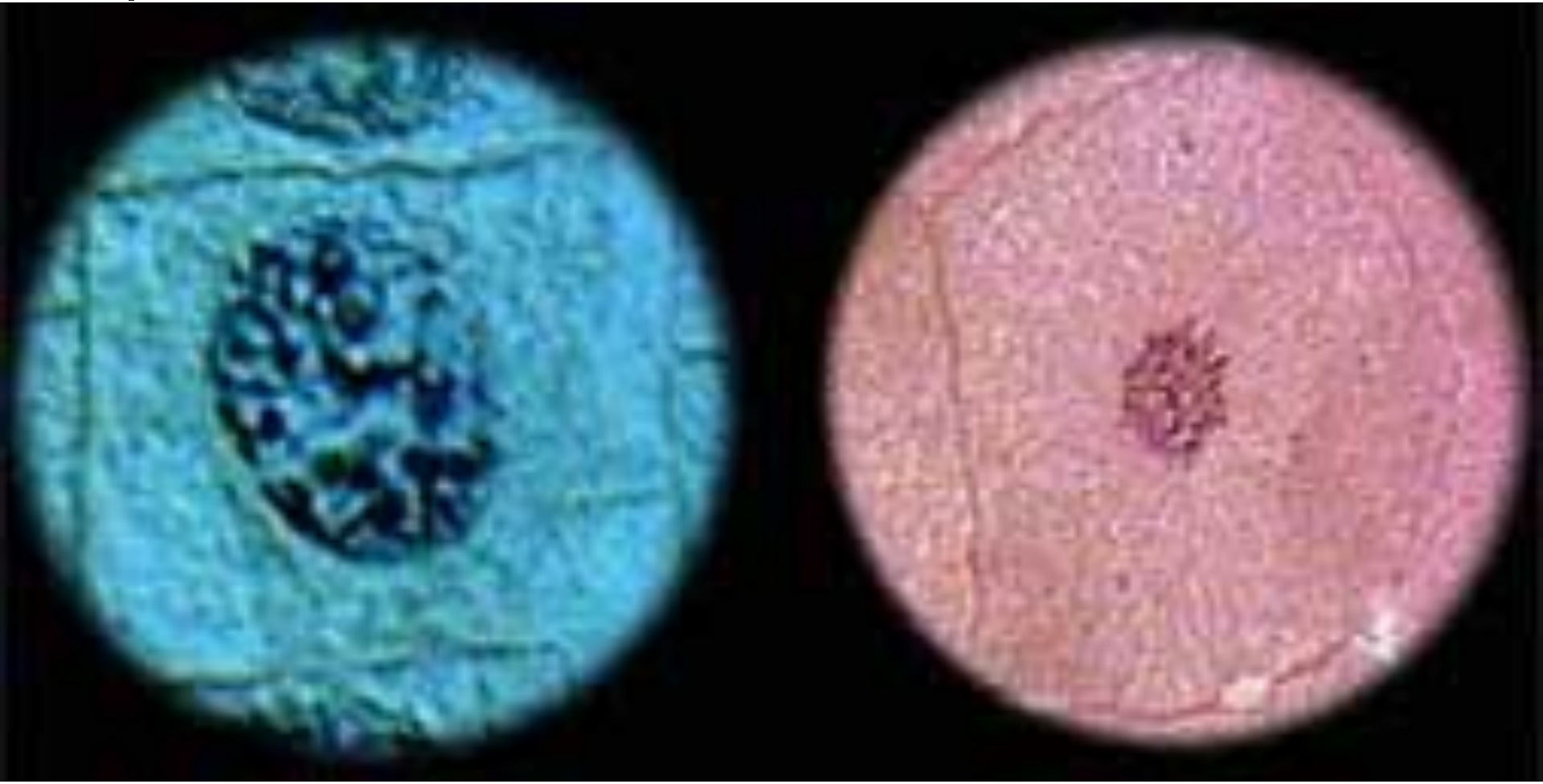
Cytokinesis

1. During this final stage, the cytoplasm divides.

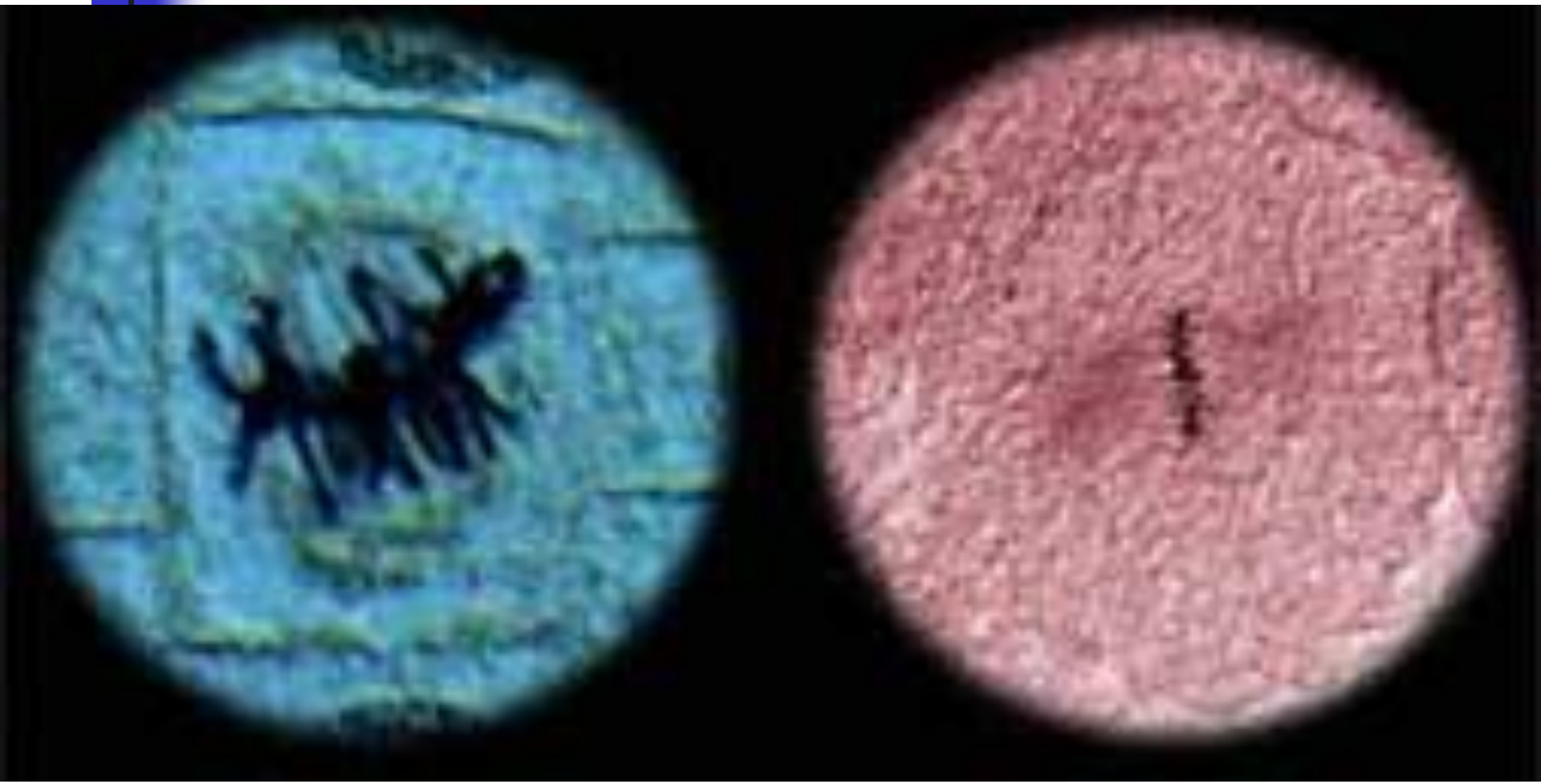
E – Moment

Crayon Moment

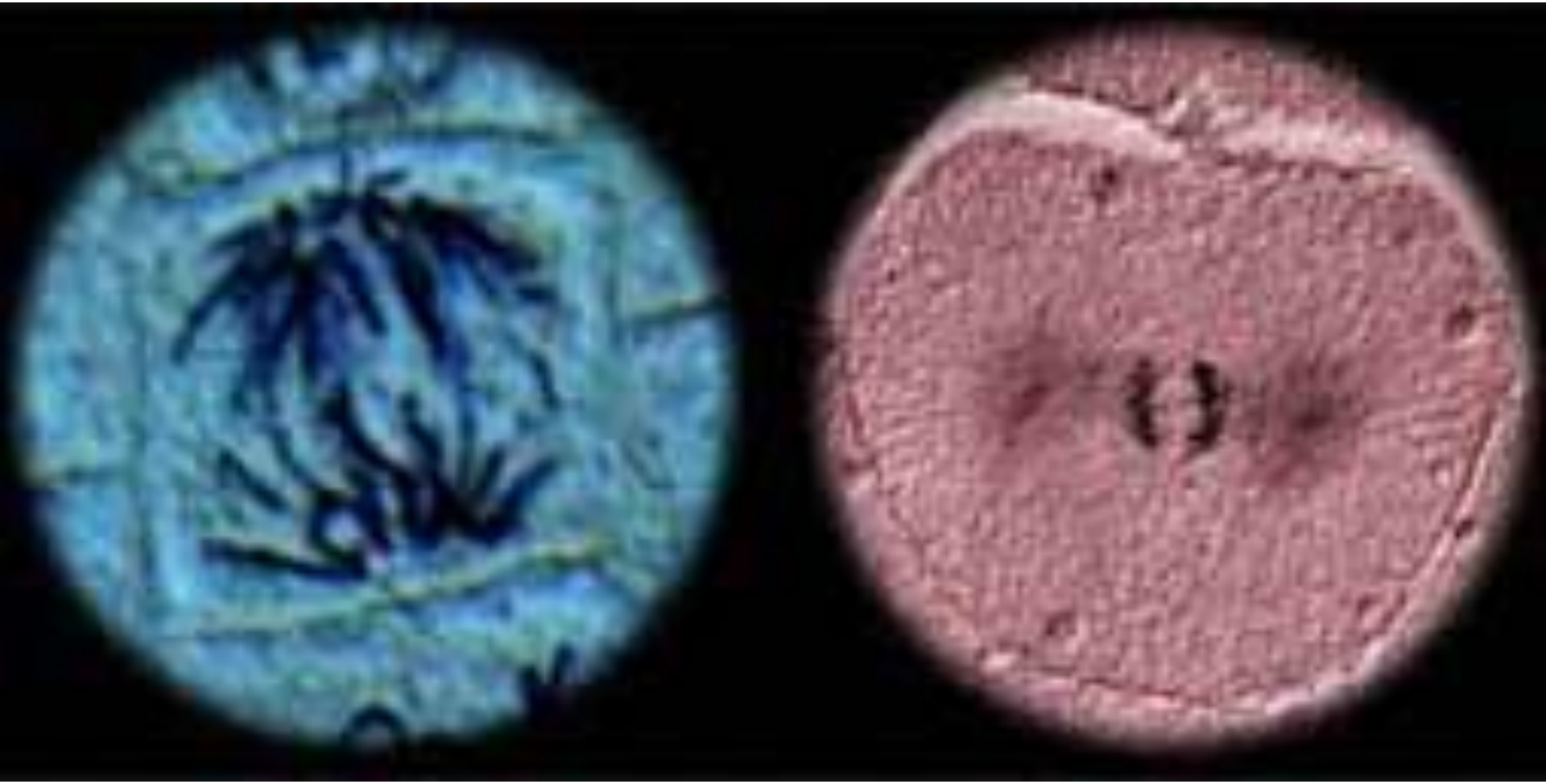
Plant and Animal Cells in Prophase



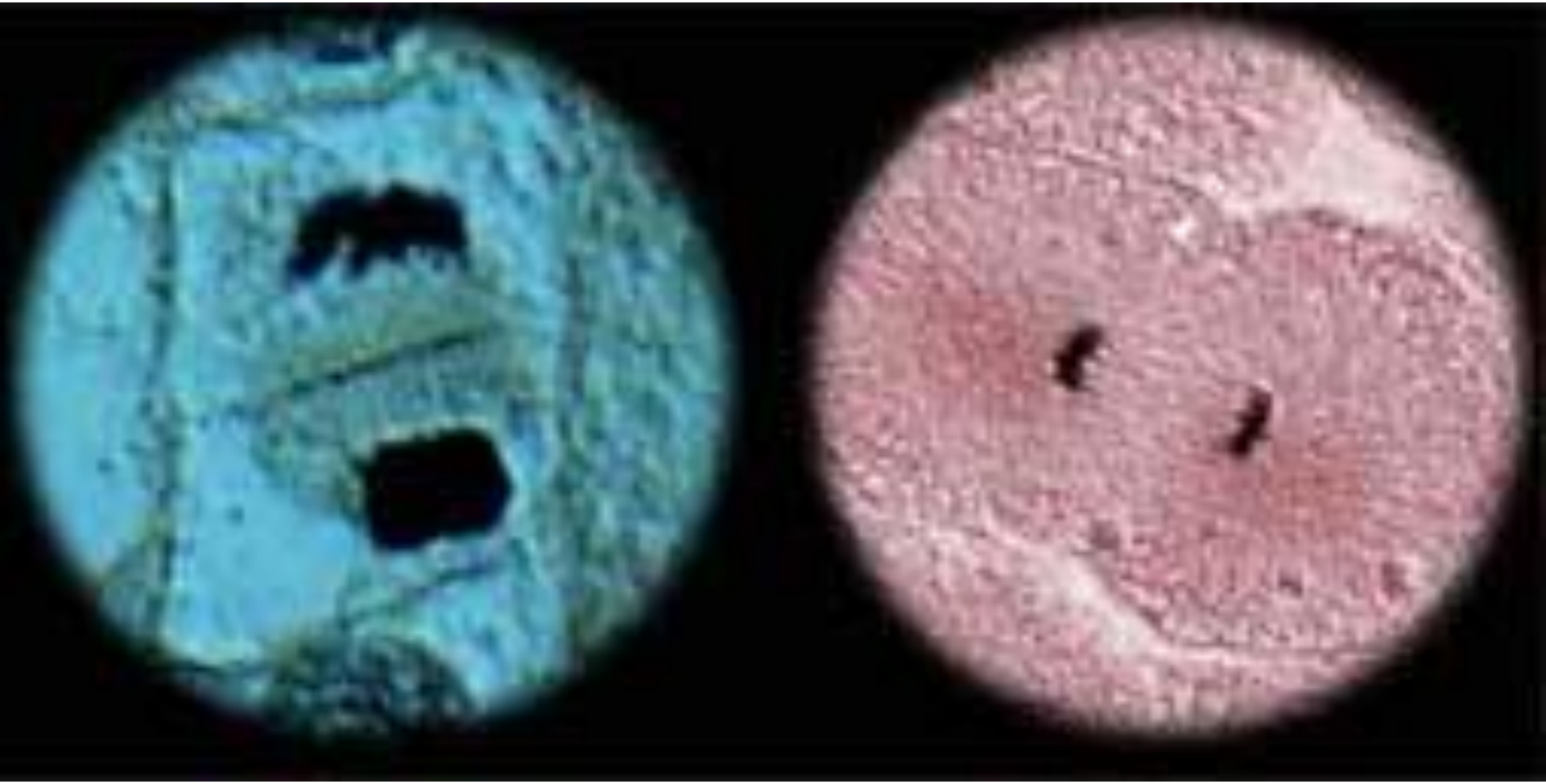
Plant and Animal Cells in Metaphase



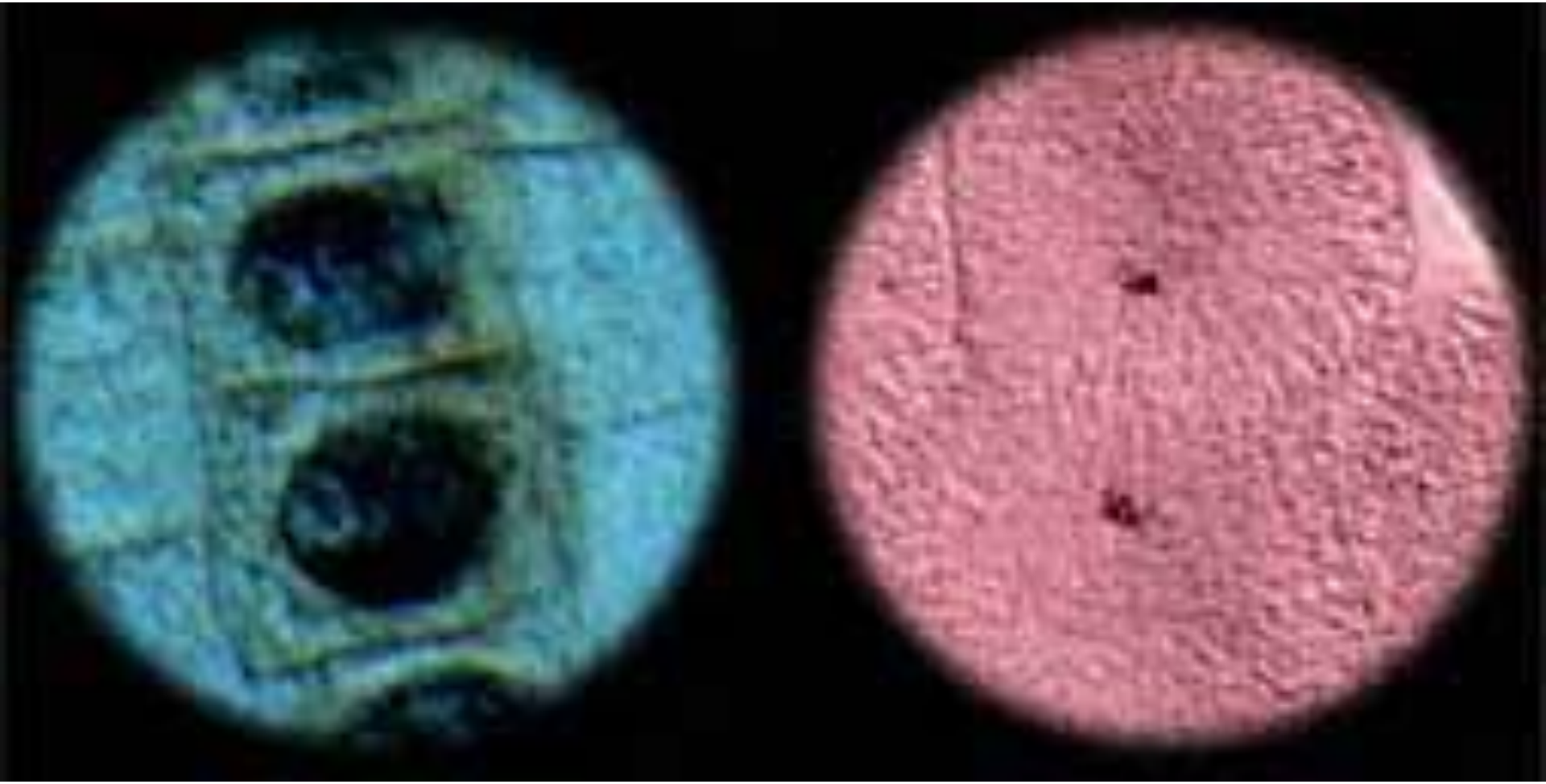
Plant and Animal Cells in Anaphase



Plant and Animal Cells in Telophase



Plant and Animal Cells in Cytokenisis



Control of Cell Cycle

There are three checkpoints:

1) G_1 Checkpoint

a. Decides when a cell can divide based on environmental conditions, health and cell size

b. Favorable conditions begin S phase

If not favorable, a resting period begins

Control of Cell Cycle

2) G_2 Checkpoint

a) DNA repairs enzymes and checks DNA replication

b) Once this checkpoint is passed, then mitosis begins

3)Mitosis Checkpoint

a) Signals end of mitosis and G_1 begins again

Control of Cell Cycle

What happens when checkpoints fail?

1. Cancer can occur

   Cancer is the uncontrolled growth of cells.

2. Mutation missed by checkpoint can cause overproduction of growth hormone

3. Damage done to a cell by environmental factors can cause cells to constantly repair