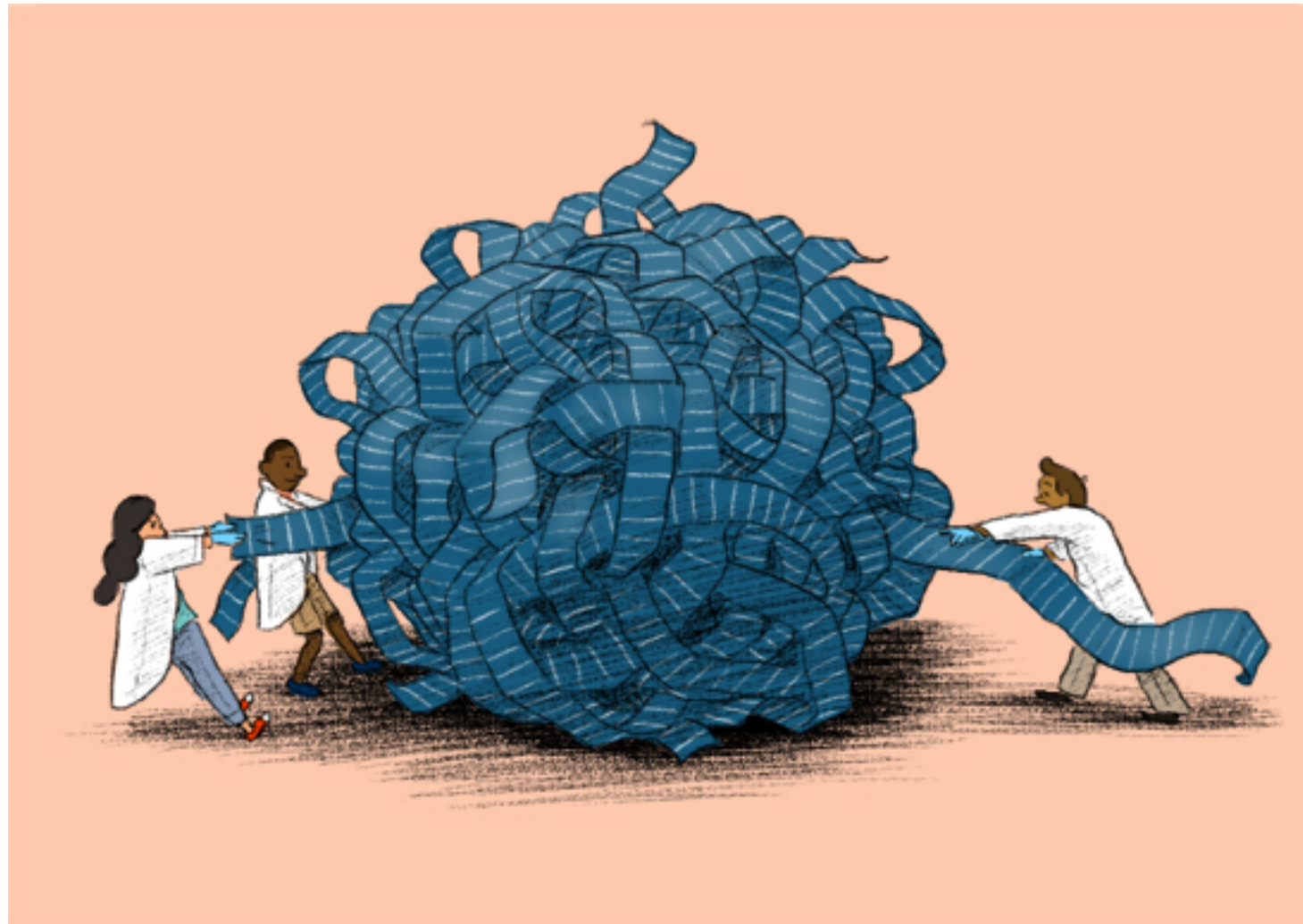
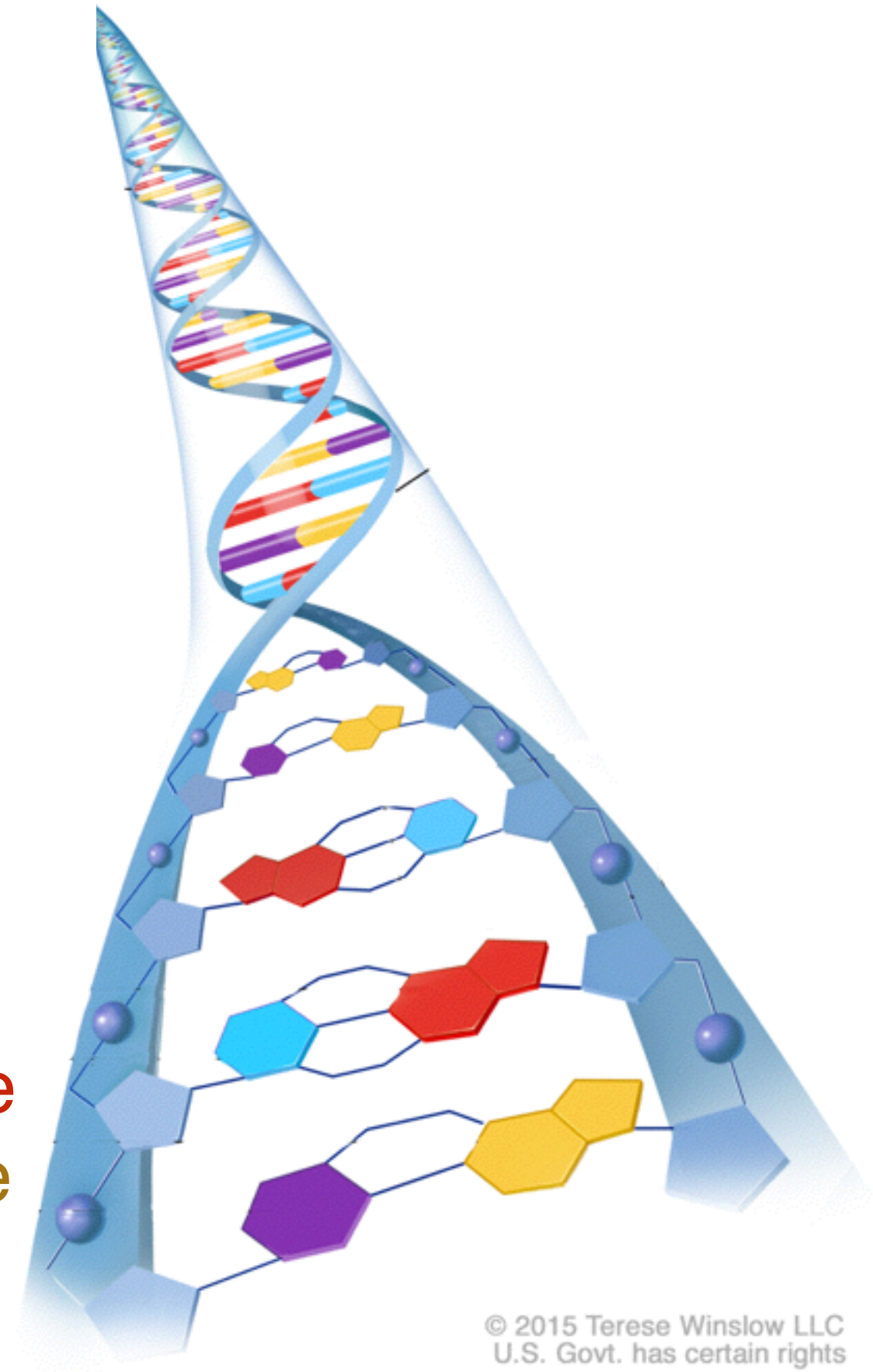
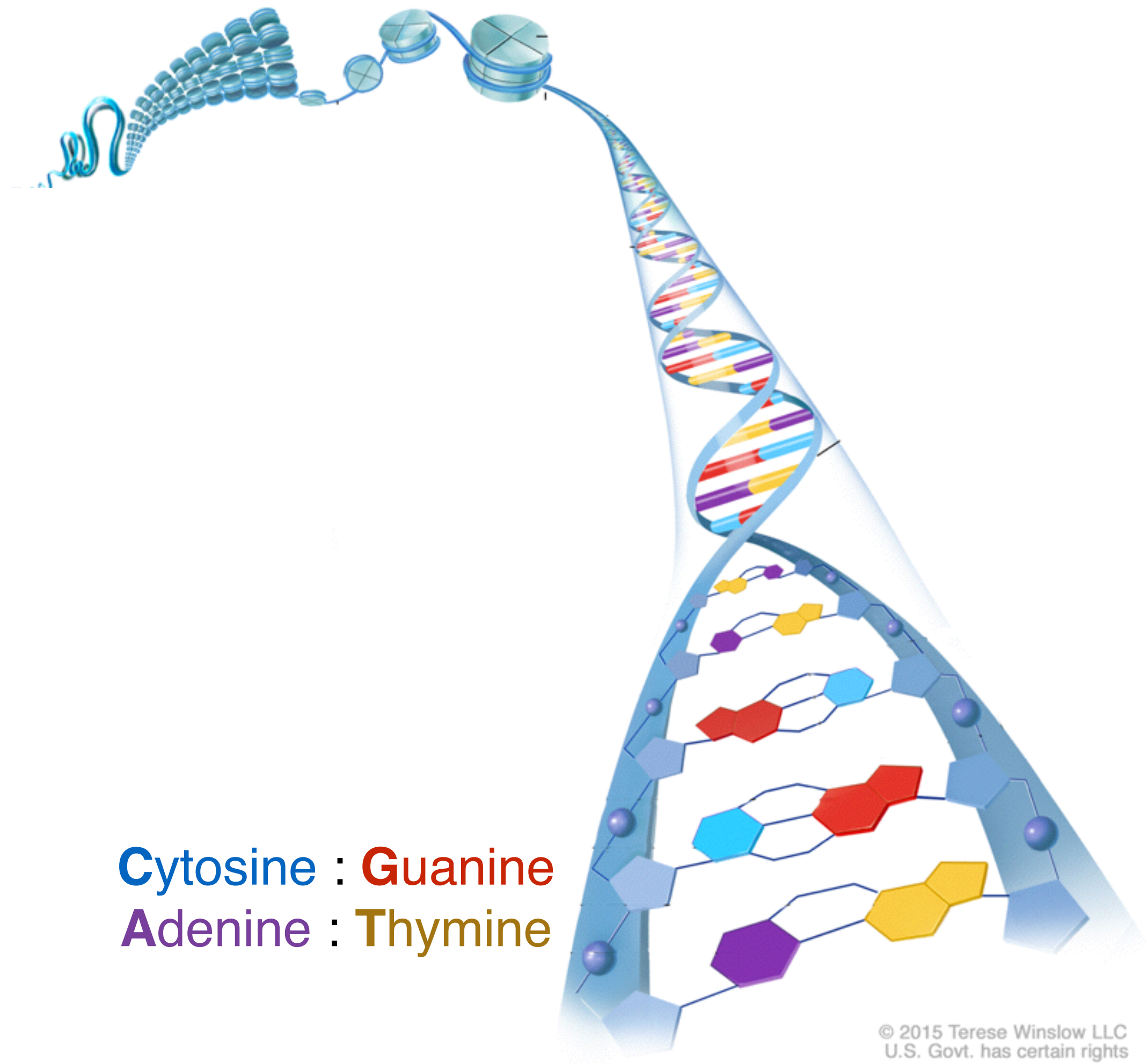


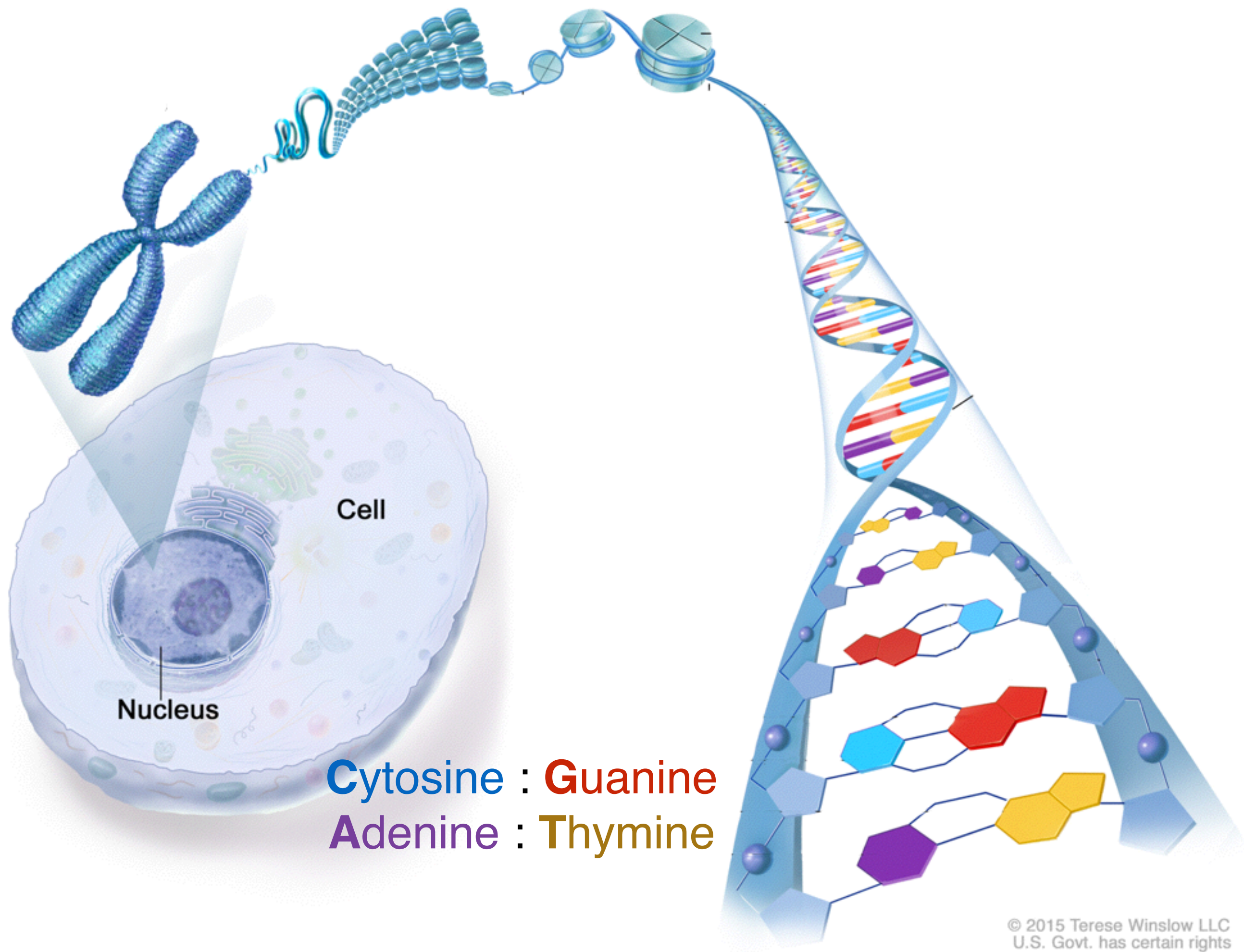
Assemble This

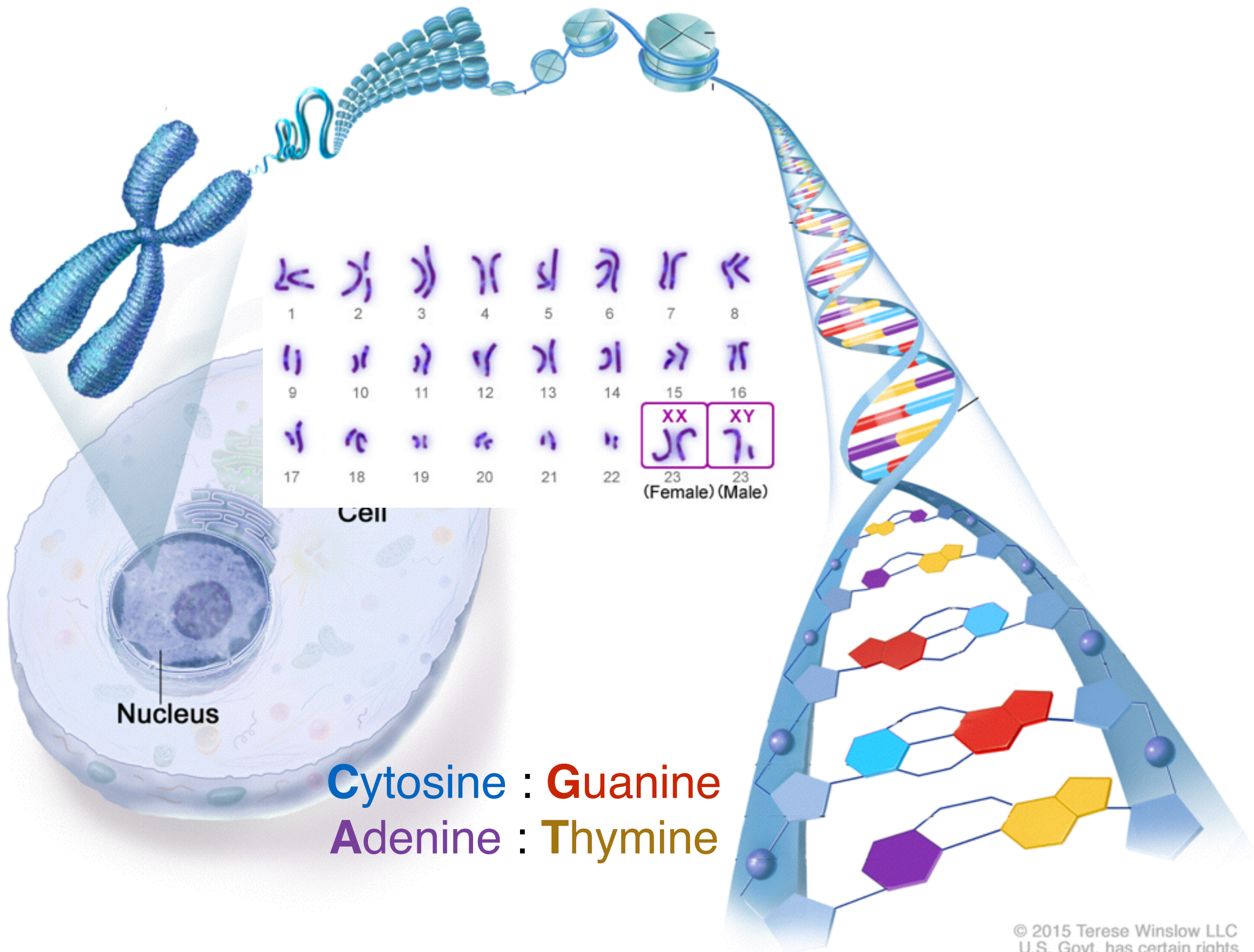


Cytosine : Guanine
Adenine : Thymine

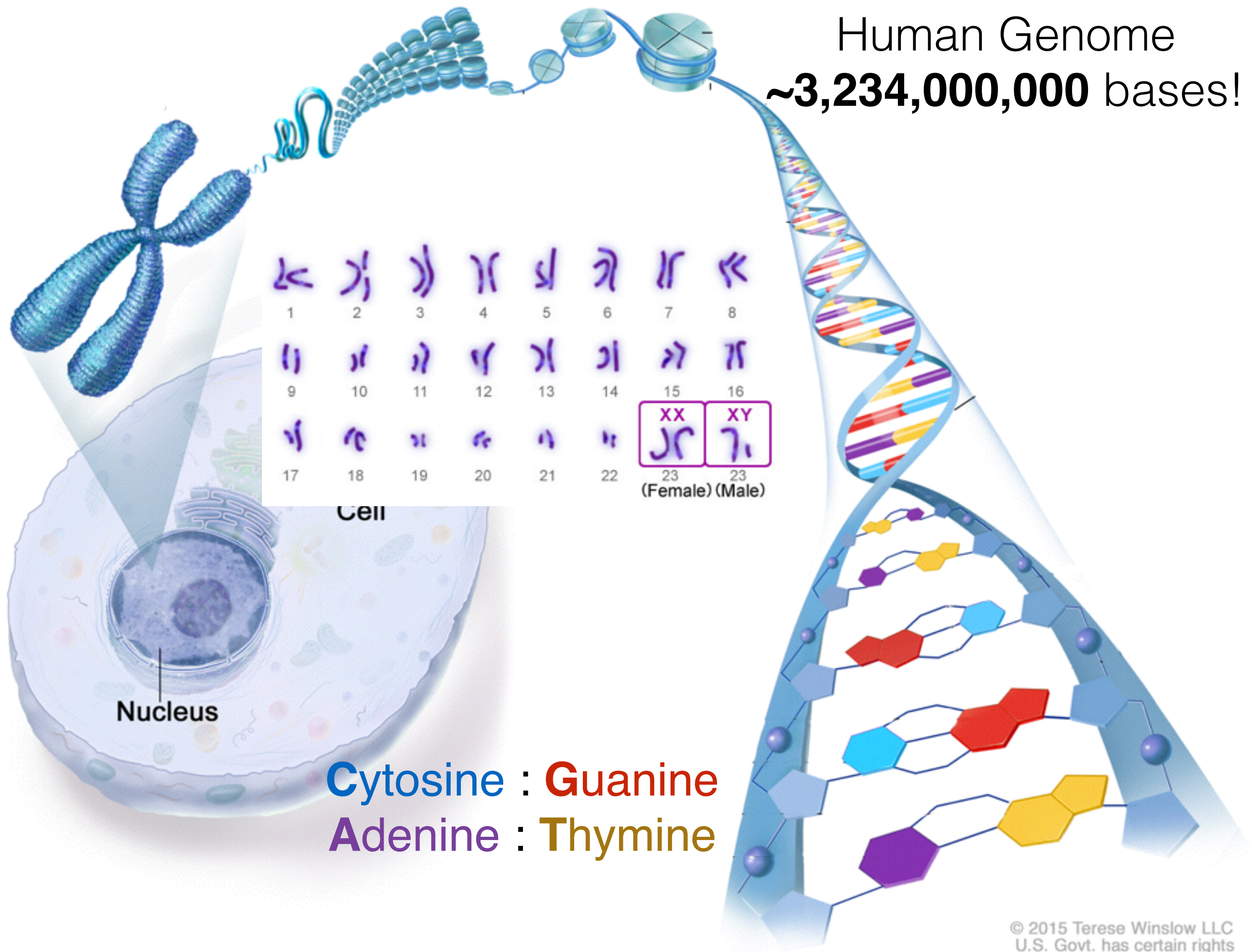








Human Genome
~**3,234,000,000** bases!



"All the News
That's Fit to Print"

The New York Times

Late Edition

New York: Today, afternoon thunderstorms, high 88. Tonight, showers end, low 67. Tomorrow, partly cloudy with showers late, high 81. Yesterday, high 88, low 74. Weather map, Page D8.

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NEW YORK, TUESDAY, JUNE 27, 2000

\$1 beyond the greater New York metropolitan area.

75 CENTS

Genetic Code of Human Life Is Cracked by Scientists

JUSTICES REAFFIRM MIRANDA RULE, 7-2; A PART OF 'CULTURE'

By LINDA GREENHOUSE

WASHINGTON, June 26 — The Supreme Court reaffirmed the Miranda decision today by a 7-to-2 vote that erased a shadow over one of the most famous rulings of modern times and acknowledged that the Miranda warnings "have become part of our national culture."

The court said in an opinion by Chief Justice William H. Rehnquist that because the 1966 Miranda decision "announced a constitutional rule," a statute by which Congress had sought to overrule the decision was itself unconstitutional.

Miranda had appeared to be in jeopardy, both because of that long-ignored but recently rediscovered law, by which Congress had tried to overrule Miranda 32 years ago, and because of the court's perceived hostility to the original decision.

The chief justice said, though, that the 1968 law, which replaced the Miranda warnings with a case-by-case test of whether a confession was voluntary, could be upheld only if the Supreme Court decided to overturn Miranda. But with Miranda having

Justices Antonin Scalia and Clarence Thomas cast the dissenting votes.

The decision overturned a ruling last year by the federal appeals court in Richmond, Va., which held that Congress was entitled to the last word because Miranda's presumption that a confession was not voluntary unless preceded by the warnings was not required by the Constitution.

The decision today — only 14 pages long, in Chief Justice Rehnquist's typically spare style — brought an abrupt end to one of the odder episodes in the court's recent history, an intense and strangely delayed re-lighting of a previous generation's battle over the rights of criminal suspects. Miranda v. Arizona was a hallmark of the Warren Court, and Chief Justice Rehnquist, despite his record as an early and tenacious critic of the decision, evidently did not want its repudiation to be an imprint of his own tenure.

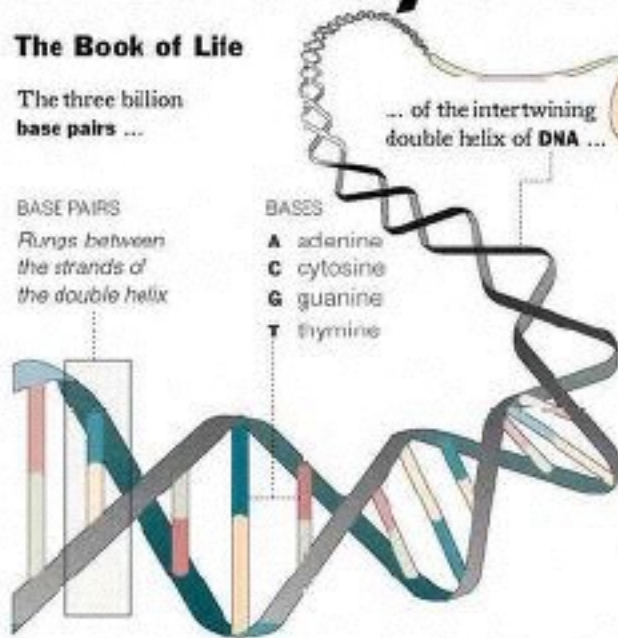
There was considerable drama in the courtroom today as the chief justice announced that he would de-

The Book of Life

The three billion base pairs ...

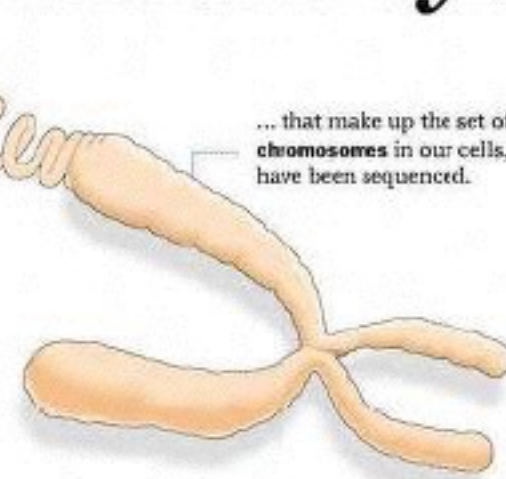
BASE PAIRS
Rungs between the strands of the double helix

BASES
A adenine
C cytosine
G guanine
T thymine



... of the intertwining double helix of DNA ...

... that make up the set of chromosomes in our cells, have been sequenced.



By ordering the base units, scientists hope to locate the genes and determine their functions.

The New York Times

Science Times A special issue

- Putting the genome to work.
- Some information has already paid research dividends.
- Two research methods, two results.
- From Mendel to helix to genome.
- More articles, charts and photos of the genome effort.

Section F

Francis S. Collins, head of the Human Genome Project, left, with J. Craig Venter, head of Celera Genomics, after the announcement yesterday that they had finished the first survey of the human genome.



Paul Heston/The New York Times

A SHARED SUCCESS

2 Rivals' Announcement Marks New Medical Era, Risks and All

By NICHOLAS WADE

WASHINGTON, June 26 — In an achievement that represents a pinnacle of human self-knowledge, two rival groups of scientists said today that they had deciphered the hereditary script that defines the human organism.

"Today we are learning the language in which God created life," President Clinton said at a White House ceremony attended by members of the two teams, Dr. James D. Watson, co-discoverer of the structure of DNA, and, via satellite, Prime Minister Tony Blair of Britain. [Excerpts, Page D8.]

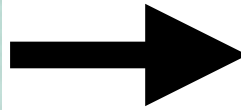
The teams' leaders, Dr. J. Craig Venter, president of Celera Genomics, and Dr. Francis S. Collins, director of the National Human Genome Research Institute, praised each other's contributions and signaled a spirit of cooperation from now on, even though the two efforts will remain firmly independent.

The human genome, the ancient script that has now been deciphered, consists of two sets of 23 giant DNA

EXTRACT DNA



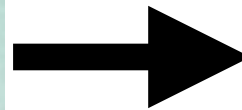
**EXTRACT
DNA**



CHOP UP



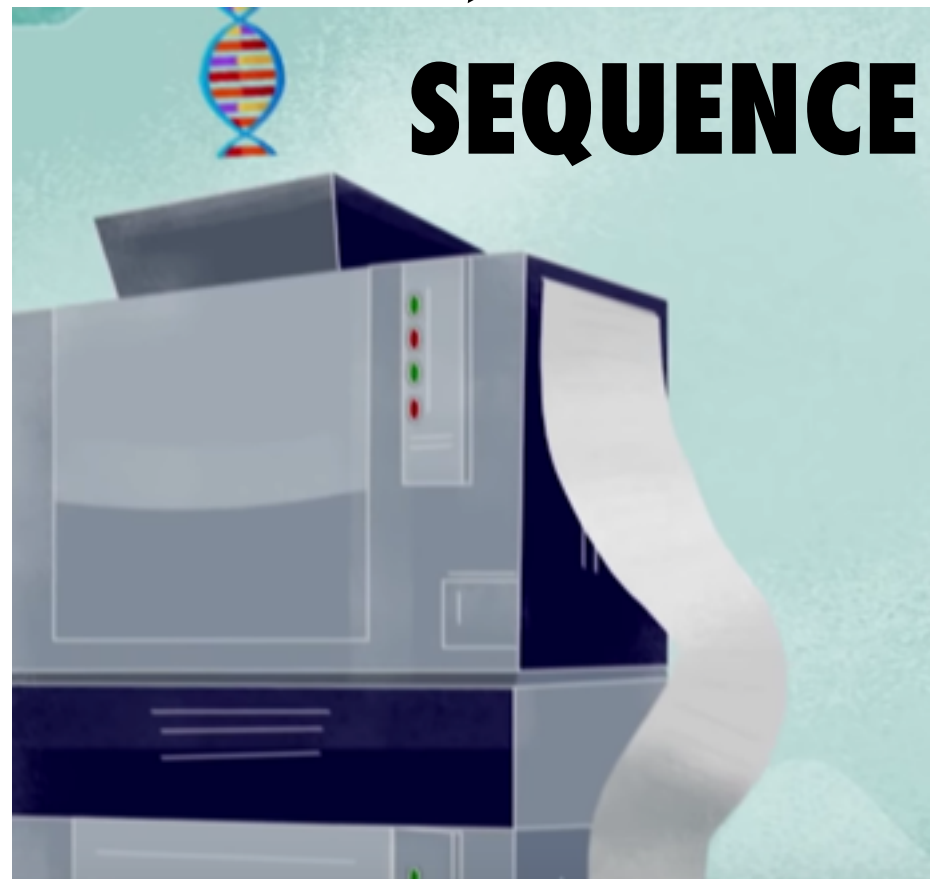
**EXTRACT
DNA**



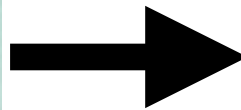
CHOP UP



SEQUENCE



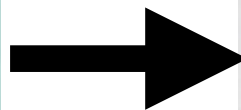
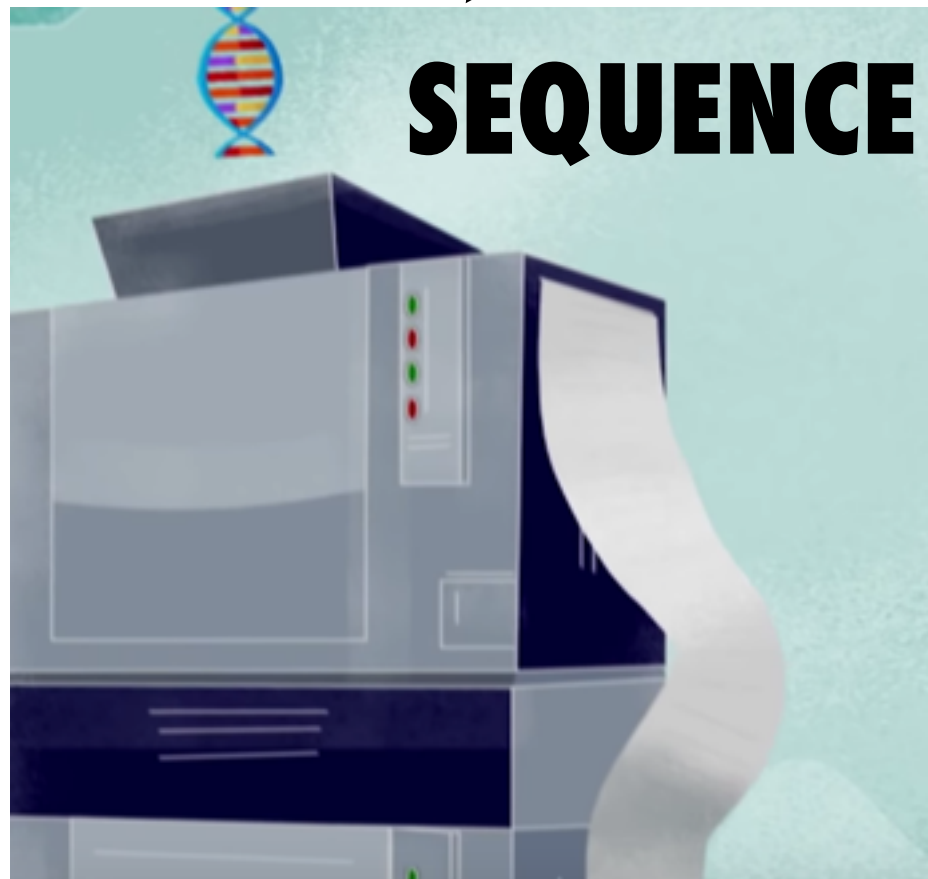
**EXTRACT
DNA**



CHOP UP



SEQUENCE

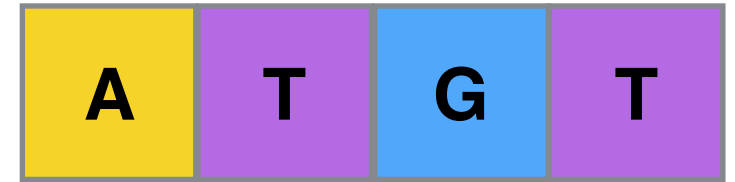


THE COMPLETE DNA



REASSEMBLE

Fragments



Fragments

G A A C

G T C T

C T G A

A A C C

A T G T

A T G T

Fragments

C T G A

G T C T

A T G T

A T G T

A A C C

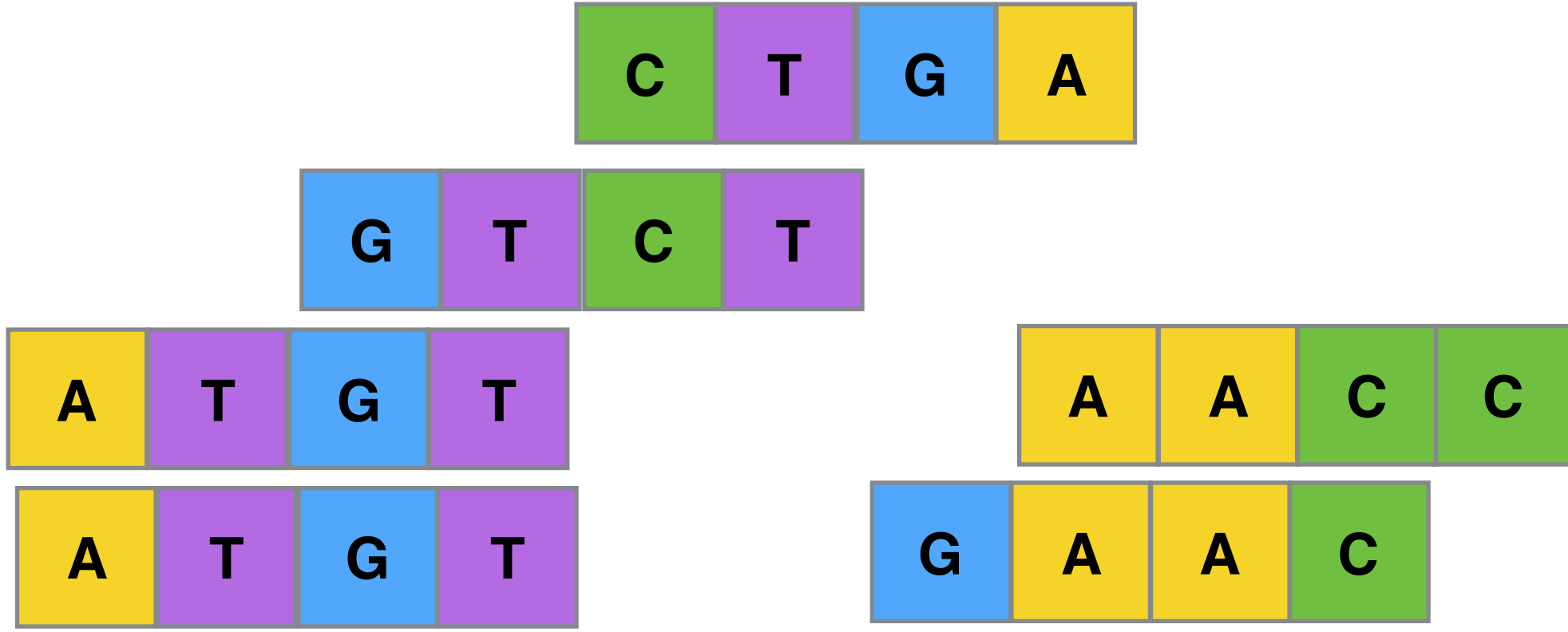
G A A C

Align

ment

Fragment

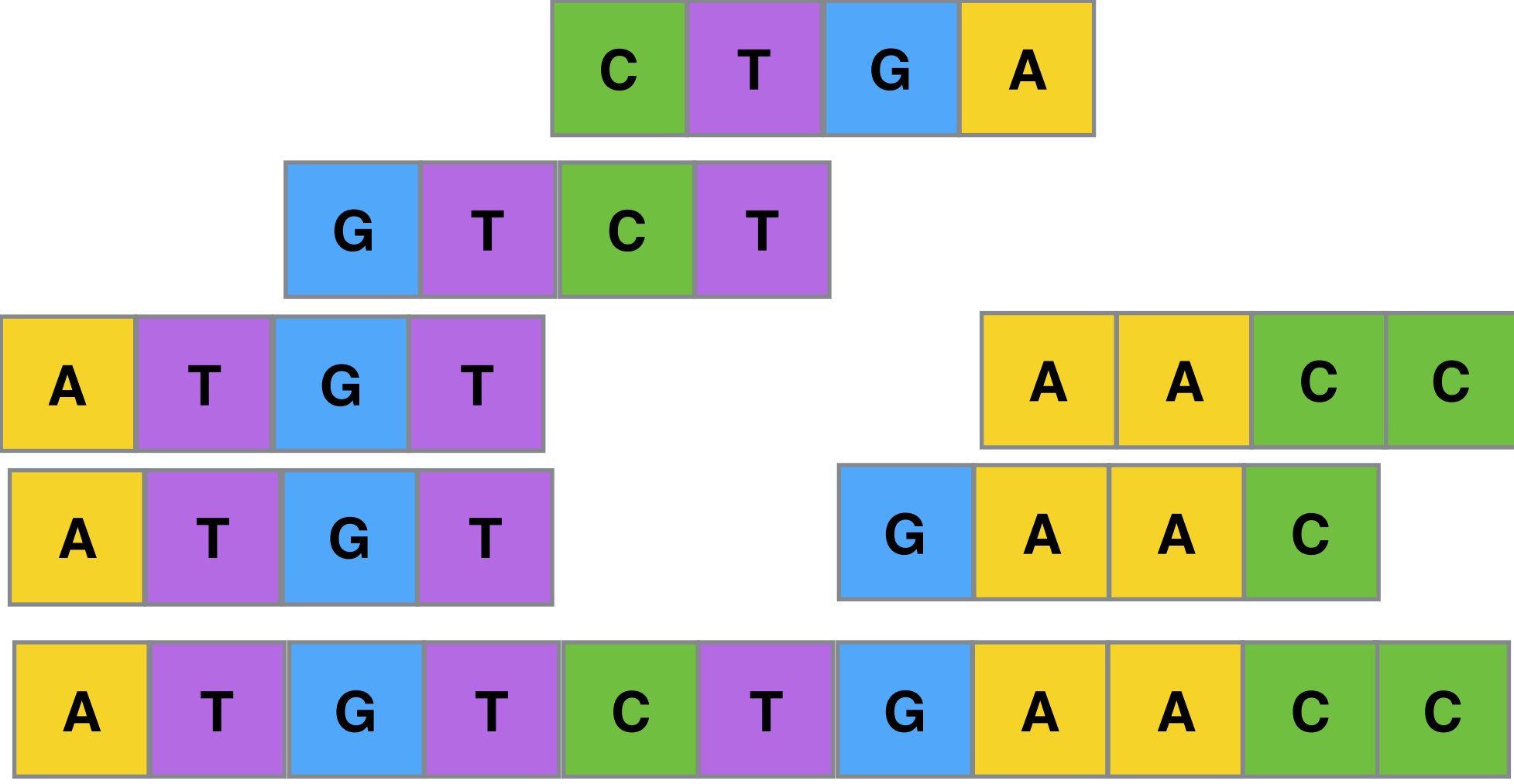
s



Sequence

Alignment

Fragments



Assemble This RULES

1. *Never* take apart fragments

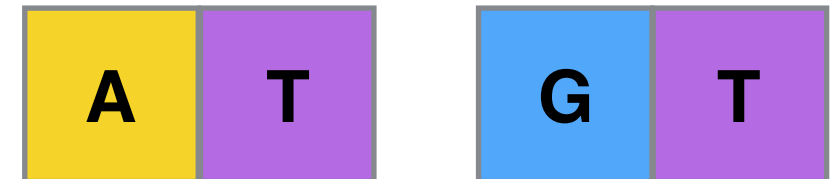


Assemble This RULES

1. ***Never*** take apart fragments



2. ***Never*** stick fragments together

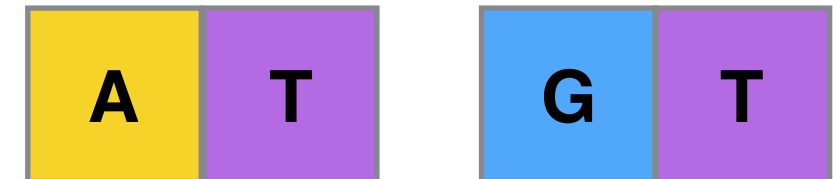


Assemble This RULES

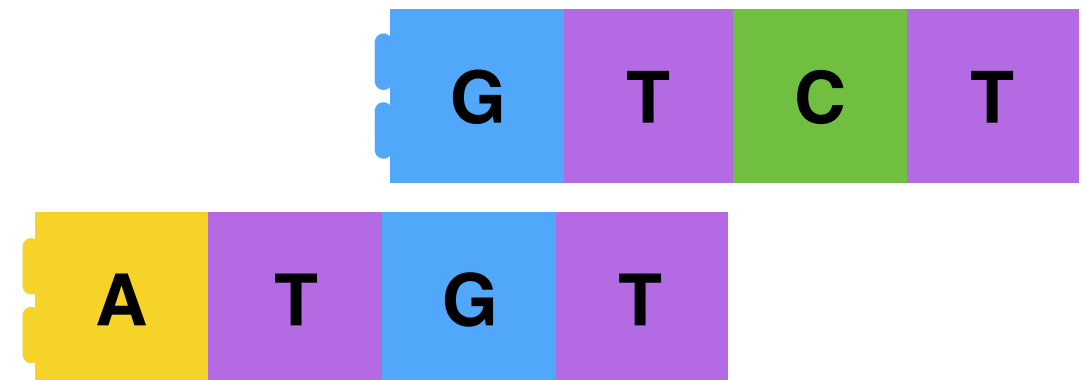
1. **Never** take apart fragments



2. **Never** stick fragments together



3. Fragments all face the same direction



Sequence 1: 14 bases long

Sequence 1: 14 bases long



Sequence 1: 14 bases long



Sequence 2: 16 bases long

Sequence 1: 14 bases long



Sequence 2: 16 bases long



Sequence 3: 16 bases long

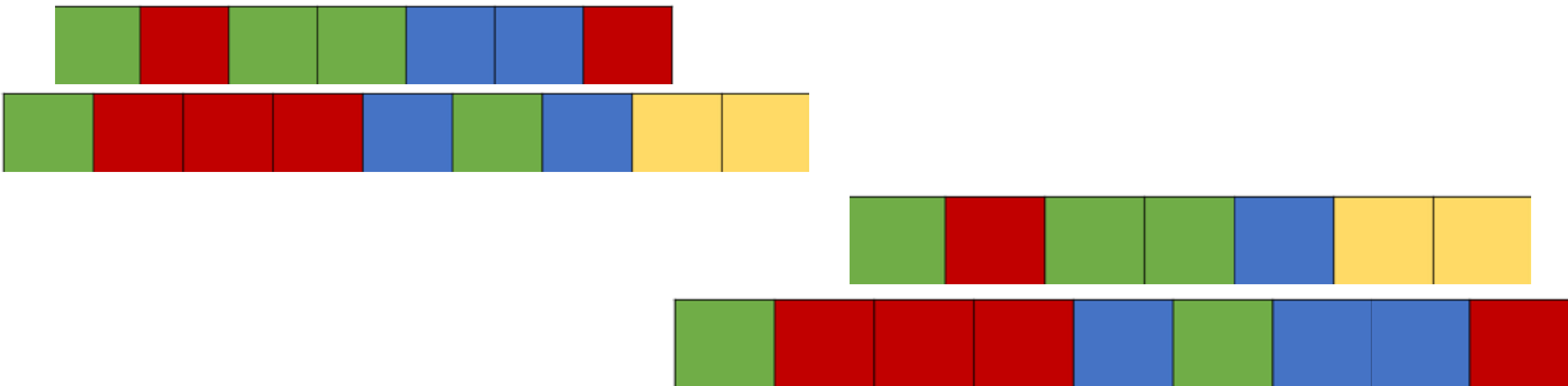
Sequence 3: 16 bases long

Can get 2 sequences... but can't fit them together...



Sequence 3: 16 bases long

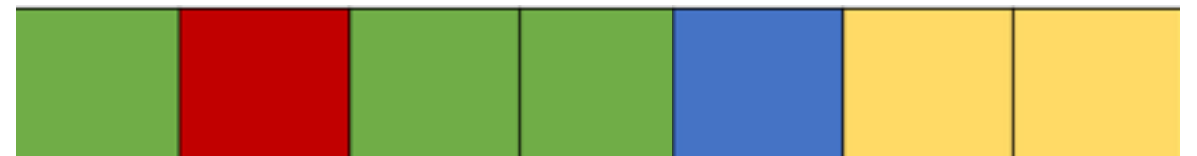
Can get 2 sequences... but can't fit them together...



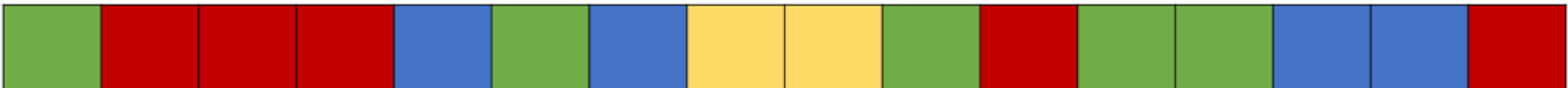
Solution? More sequencing!!!

Sequence 3: 16 bases long

Can get 2 sequences... but can't fit them together...



Solution? More sequencing!!!



Sequence 4: ?? bases long

Sequence 4: ?? bases long

Solution? Longer fragments!!!

Sequence 4: ?? bases long

17 bases long!!!

Solution? Longer fragments!!!

Sequence 4: ?? bases long

17 bases long!!!

Solution? Longer fragments!!!

