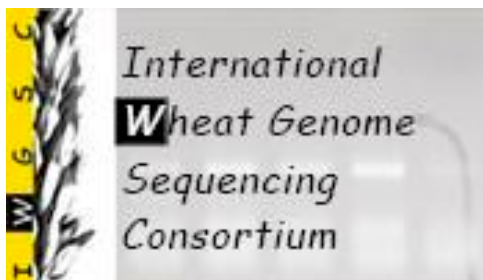


IWGSC: Wheat Genome Sequencing Project Update

Kellye Eversole

IWGSC Executive Director

**Research and Technology Committee
National Association of Wheat Growers
Washington, DC
5 February 2016**



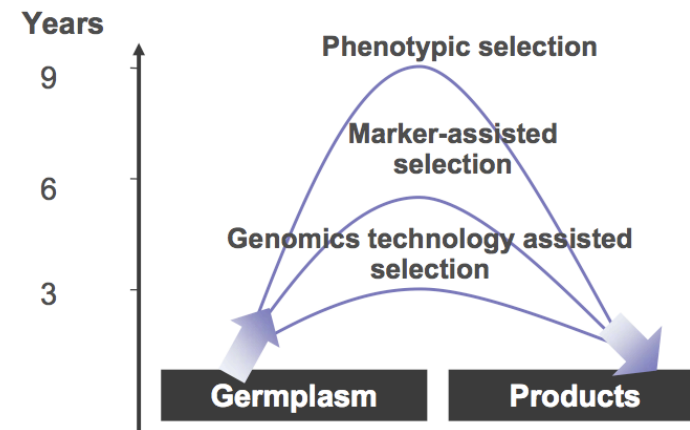
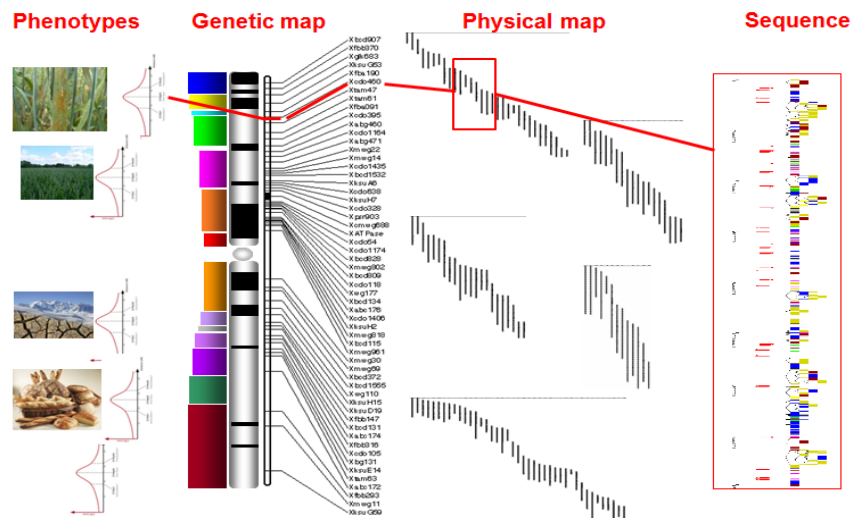
IWGSC Vision

Goal

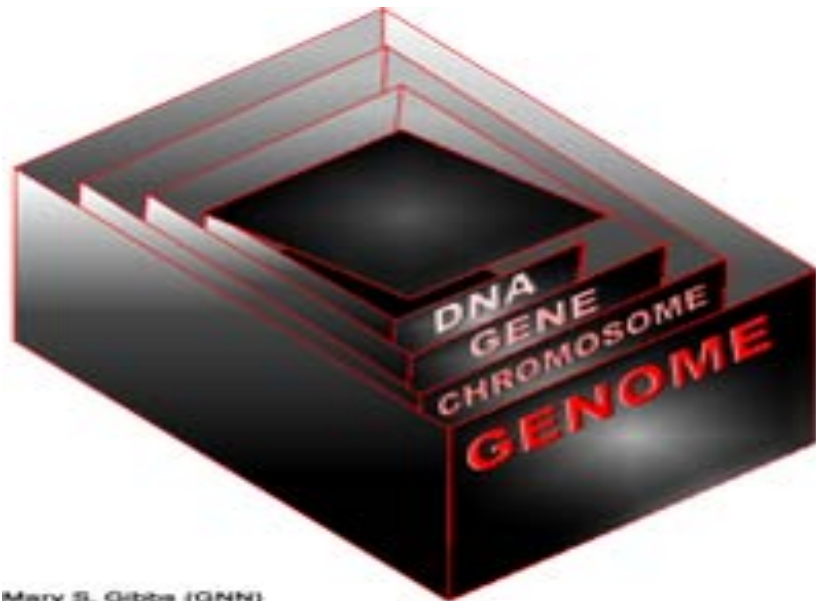
- Lay a foundation to accelerate wheat improvement
- Increase profitability throughout the industry

Vision

- High quality annotated genome sequence, comparable to rice genome sequence
- Physical map-based, integrated and ordered sequence



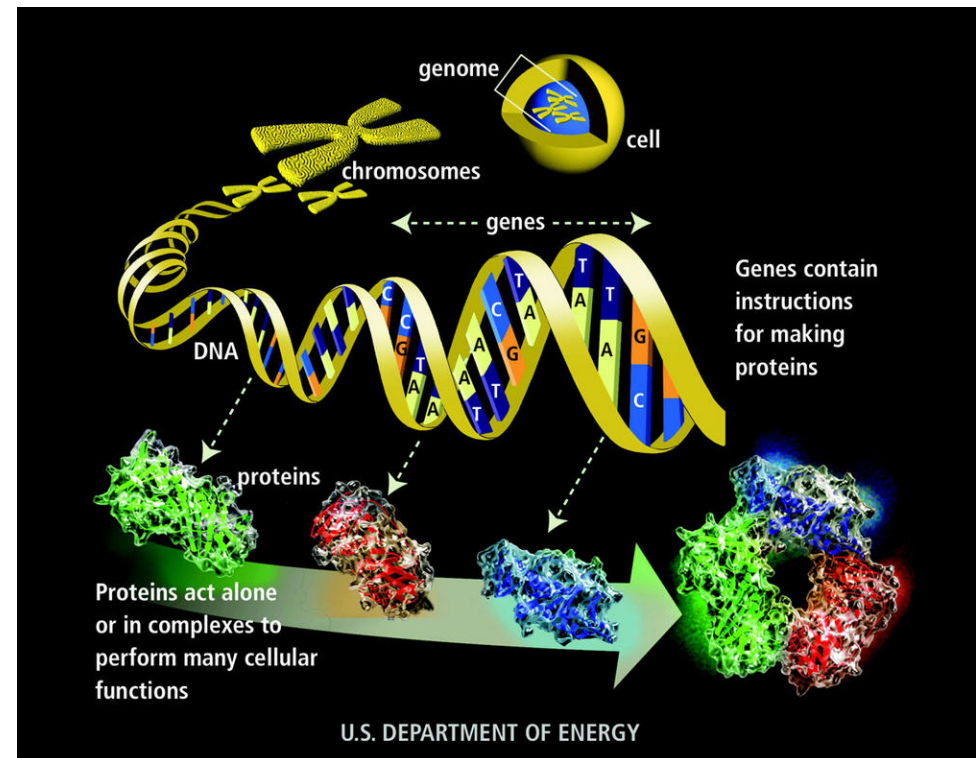
Definitions



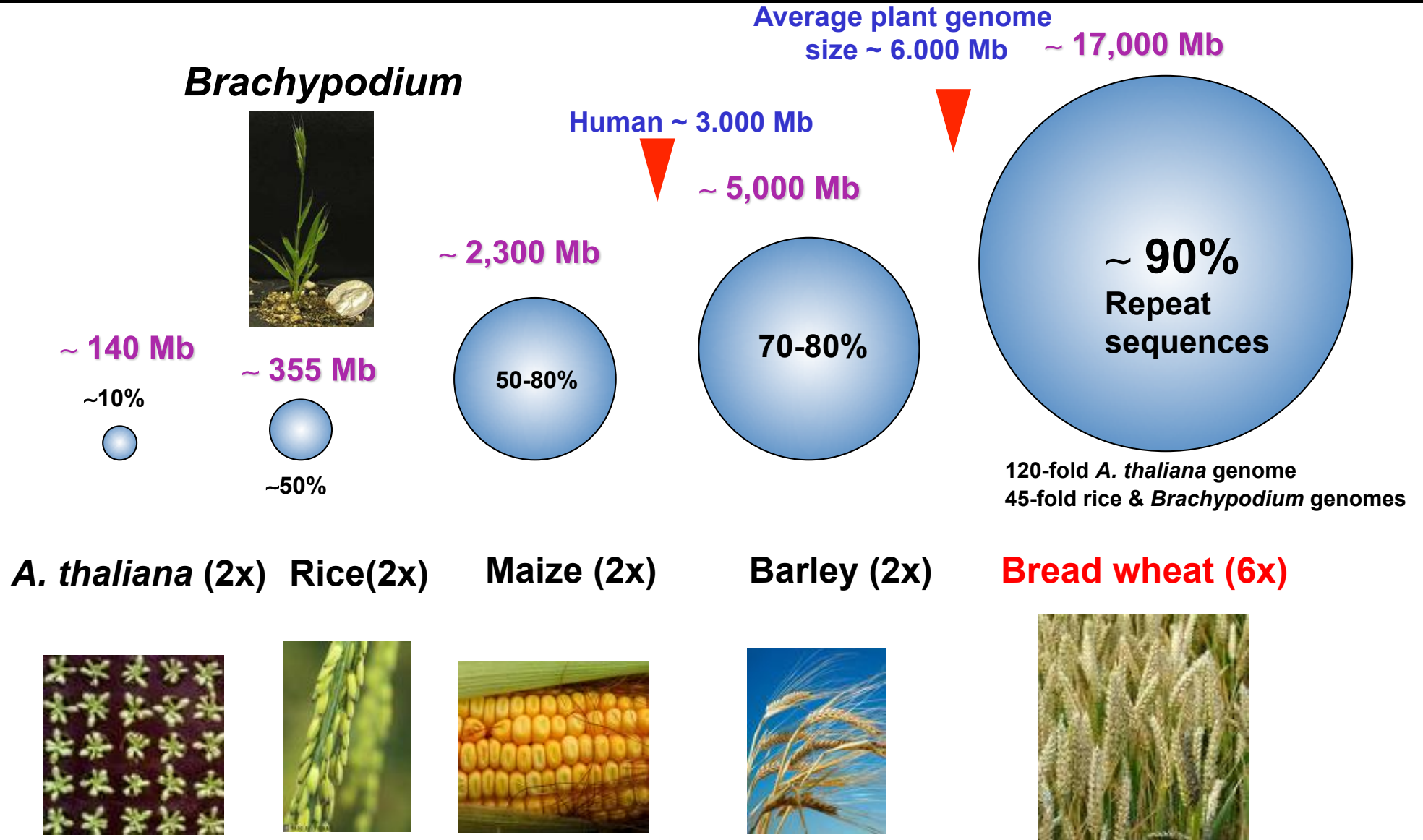
Mary S. Gibbs (GNN)

Genome = All of the genetic information, all of the hereditary material possessed by an organism.

**Each cell contains a genome
Its expression is cell specific**

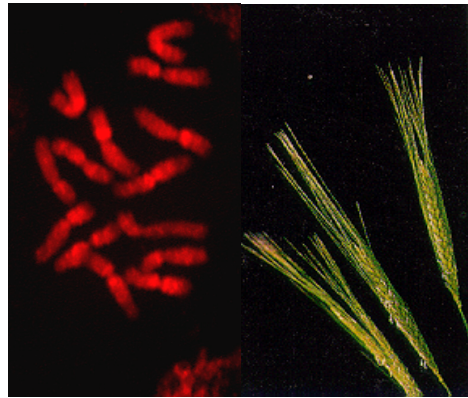


Challenging Bread Wheat Genome

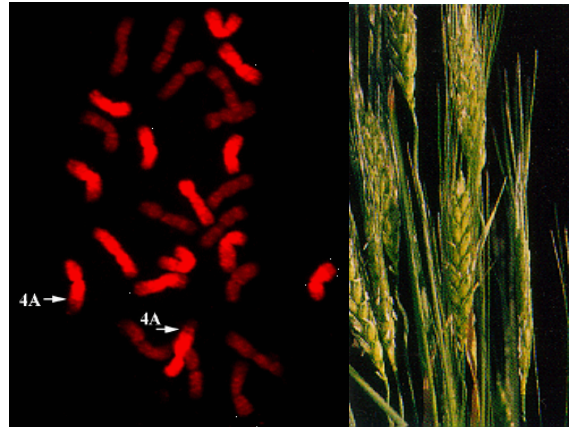


Wheat is a challenge for genomic studies & sequencing

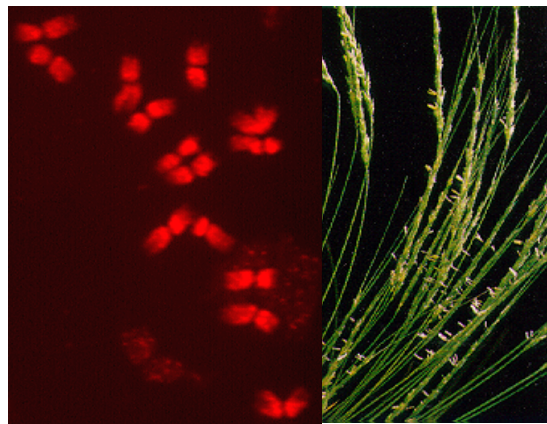
The Hexaploid Bread Wheat Genome



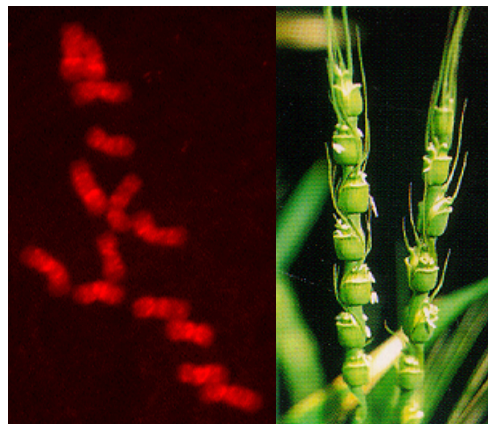
Triticum urartu
($2n=2x$, AA)



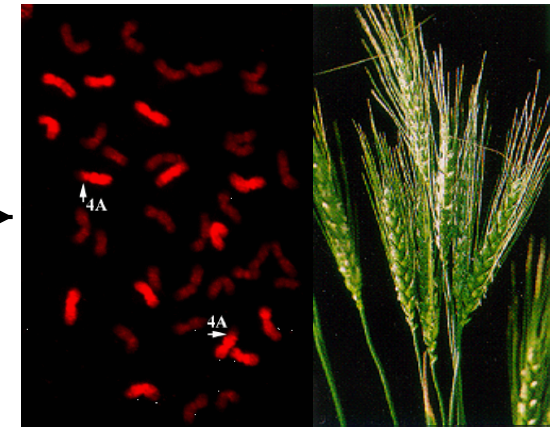
Triticum turgidum
($2n=4x$, AABB)



*"Aegilops
speltoides?"* ($2n=2x$, BB)



Aegilops tauschii
($2n=2x$, DD)

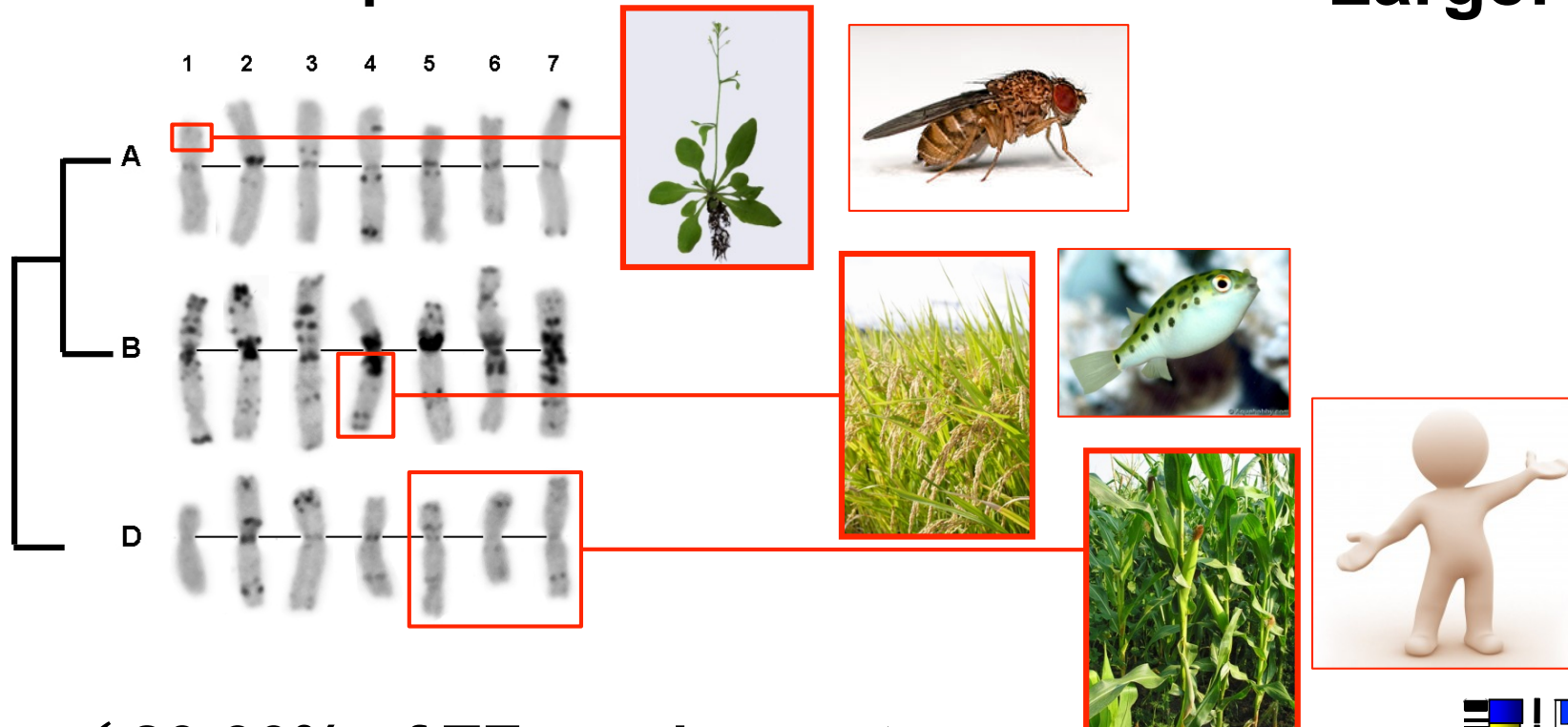


Triticum aestivum
($2n=6x$, AABBDD)

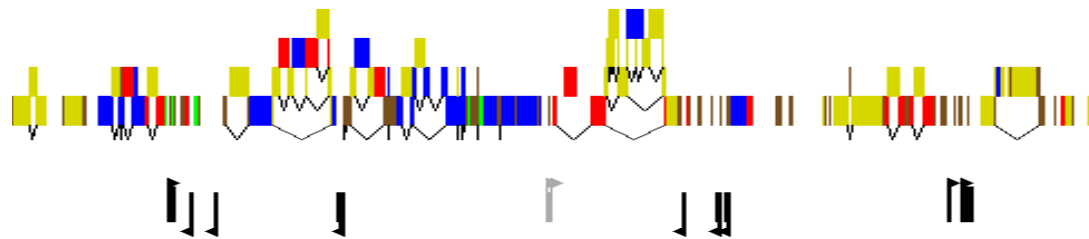
Bread Wheat Genome in Context

✓ **Allohexaploid**

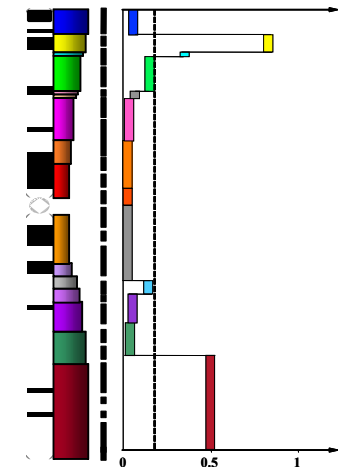
✓ **Large: 17 Gb**



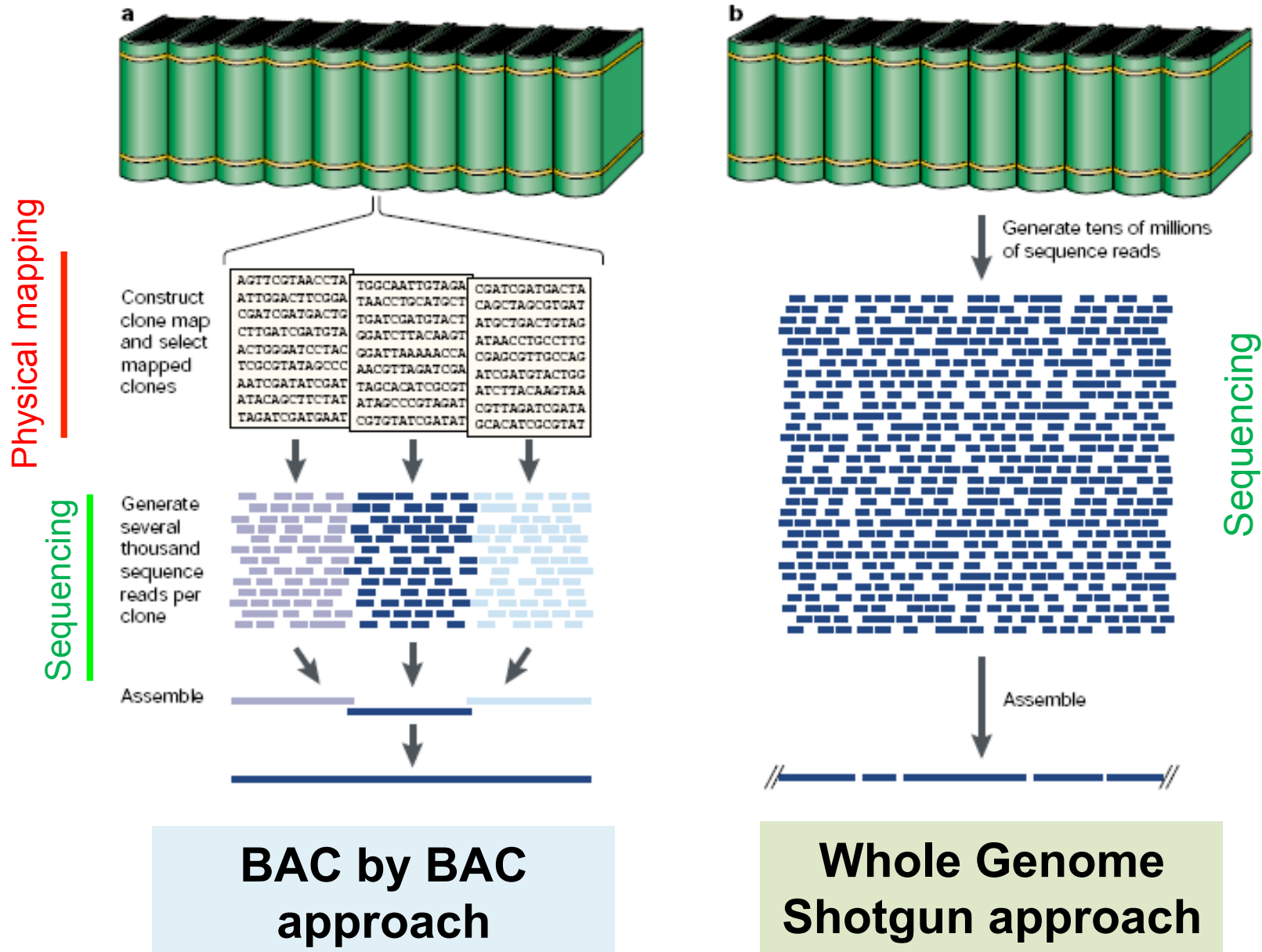
✓ **80-90% of TEs and repeats**



✓ **> 50% of non recombinogenic regions**

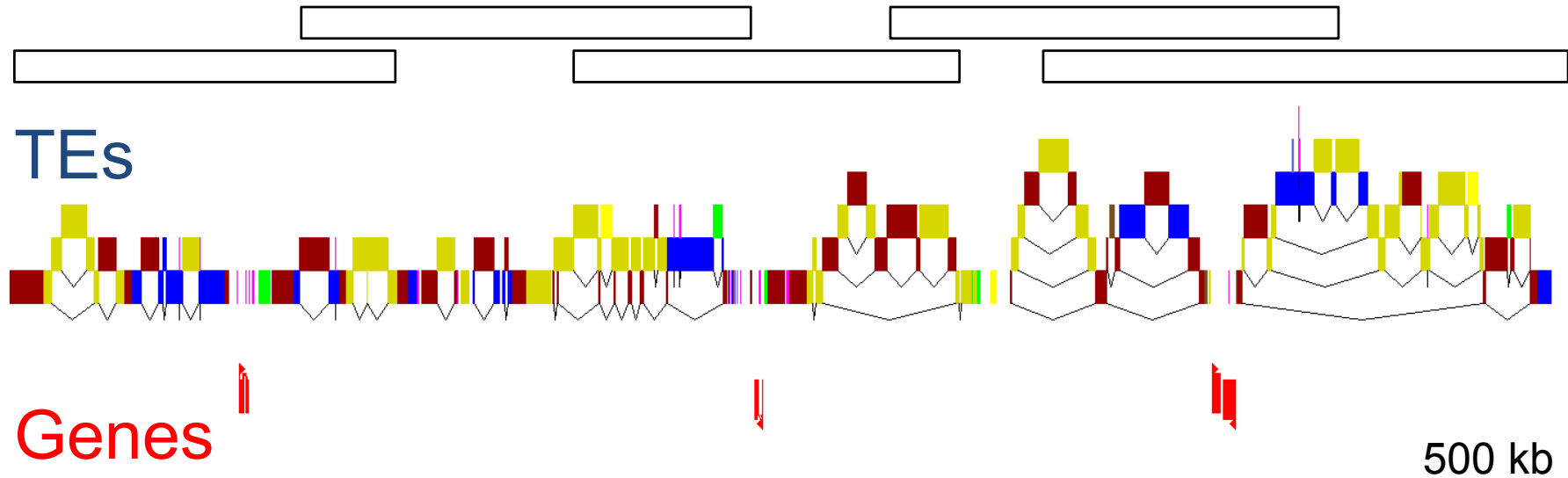


Sequencing Strategies

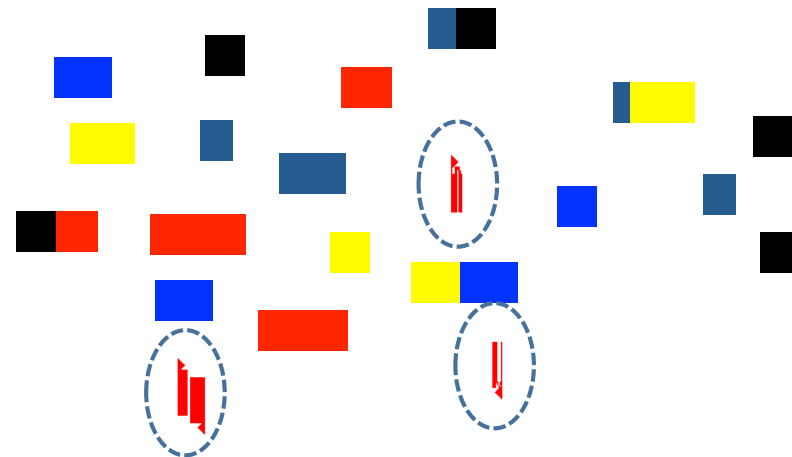


Genes in BAC by BAC vs Whole Genome Shotgun

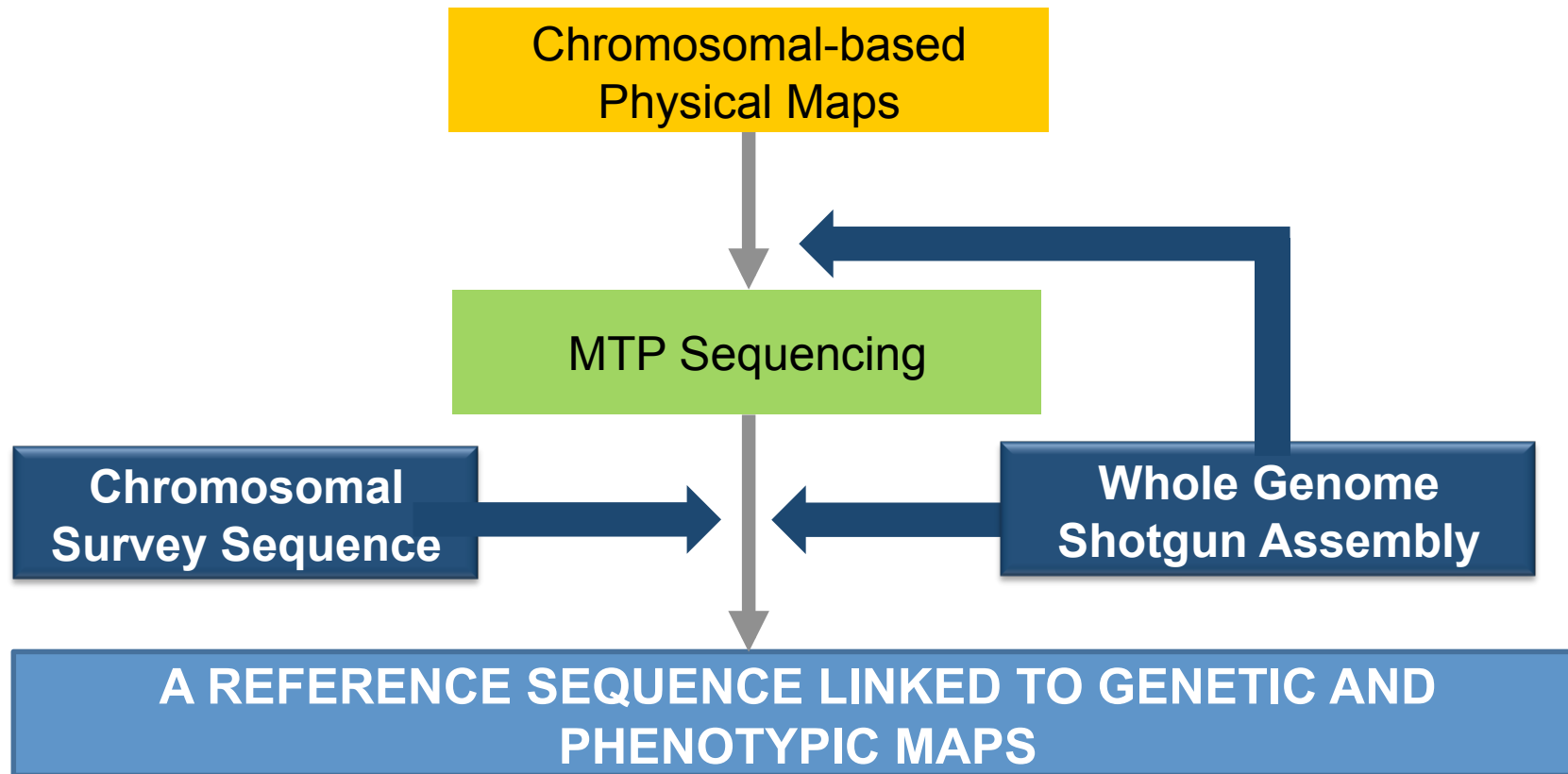
BAC by BAC (physical map)



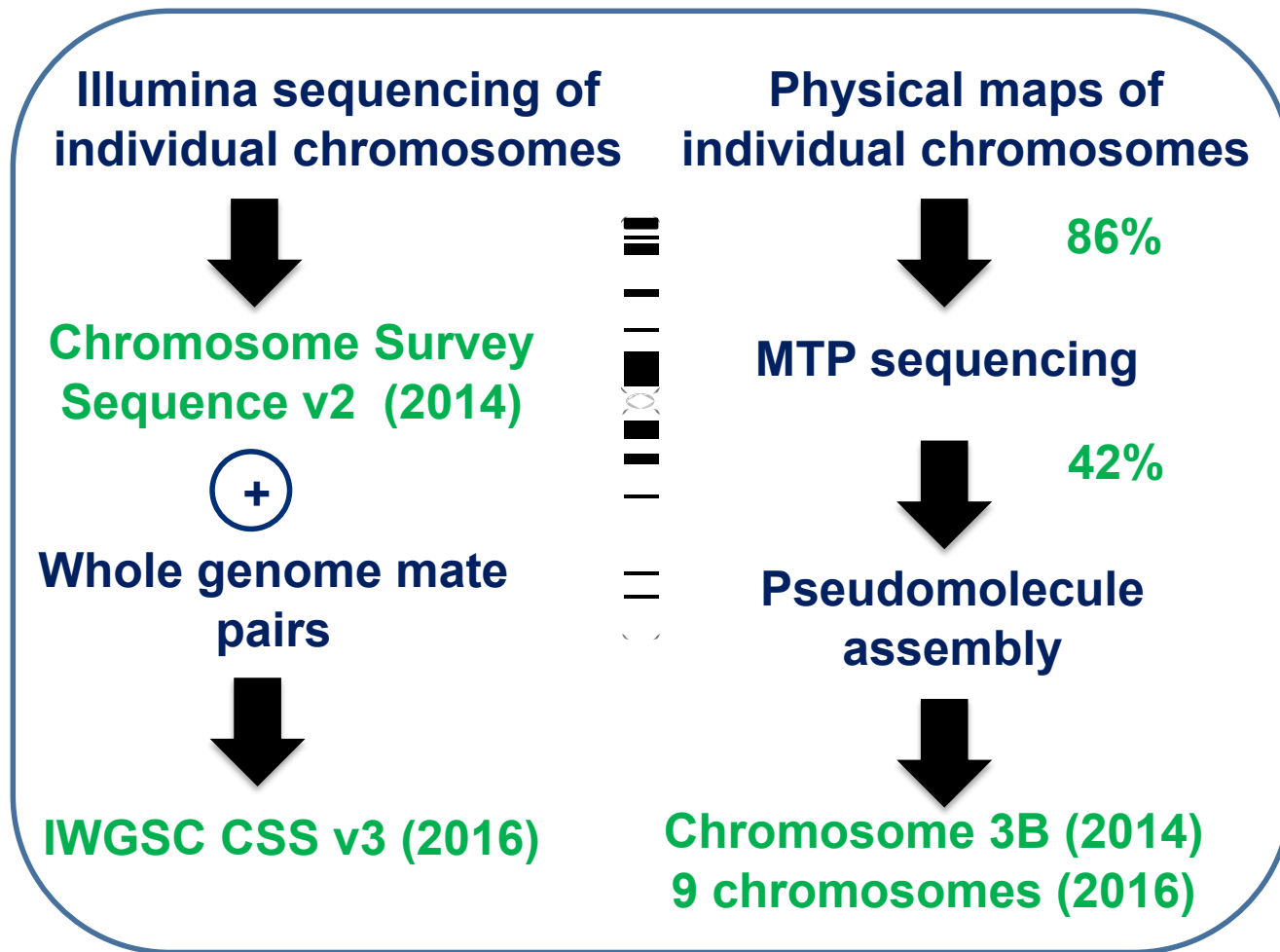
Whole genome shotgun



IWGSC Roadmap



Chromosome-based approaches - outcomes



BioNanoGenomics, optical, RH, HiC maps



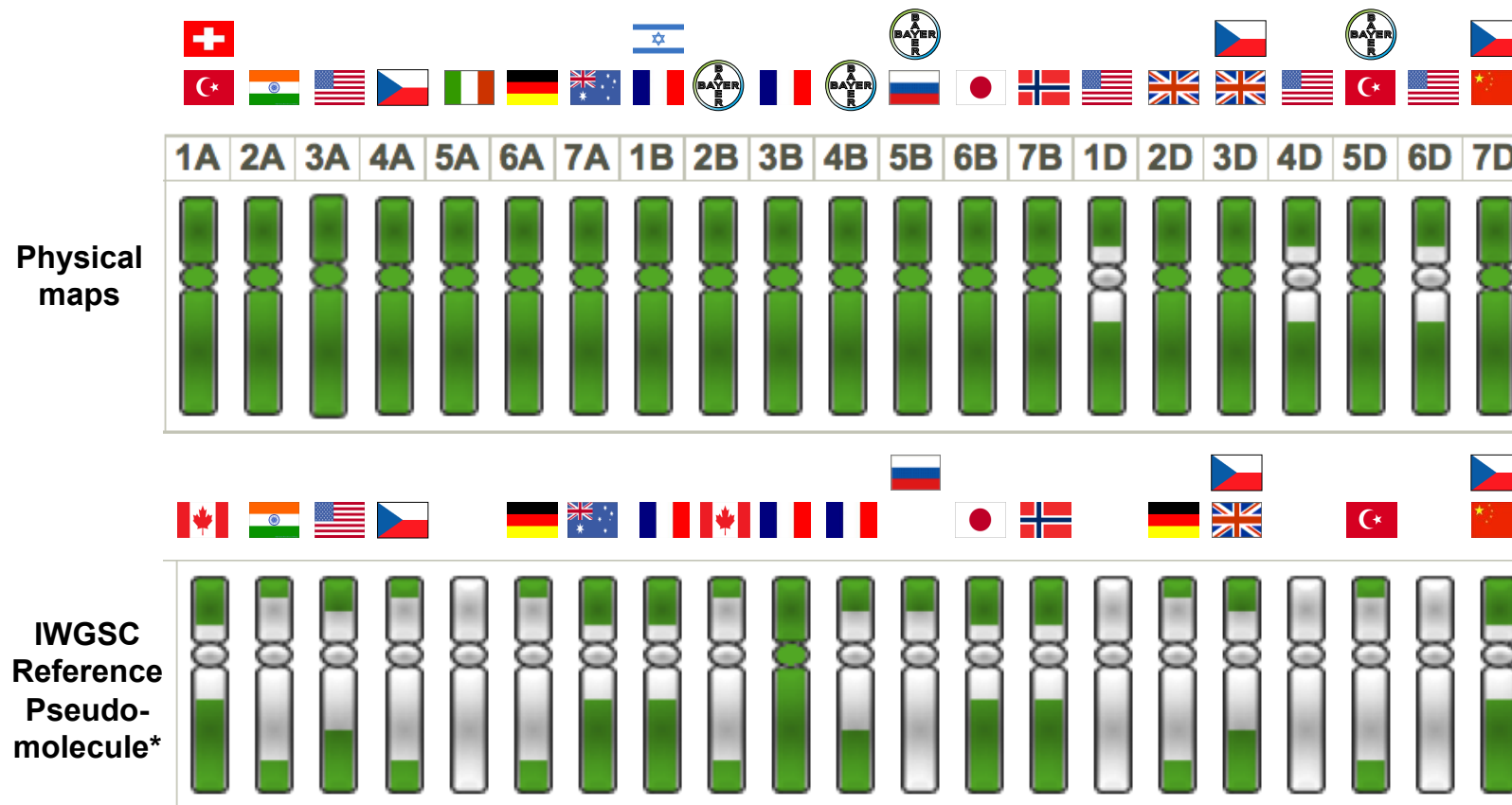
Genetic, LD maps
MTP sequence tags.....



Reference genome sequence (2019)



Progress towards completion of Bread Wheat Reference Genome Sequence



Physical maps available at IWGSC repository for all except 3AL

1 chromosome completed, 15.5 underway.

*Flags represent countries where work is underway with funding, as of January 2016

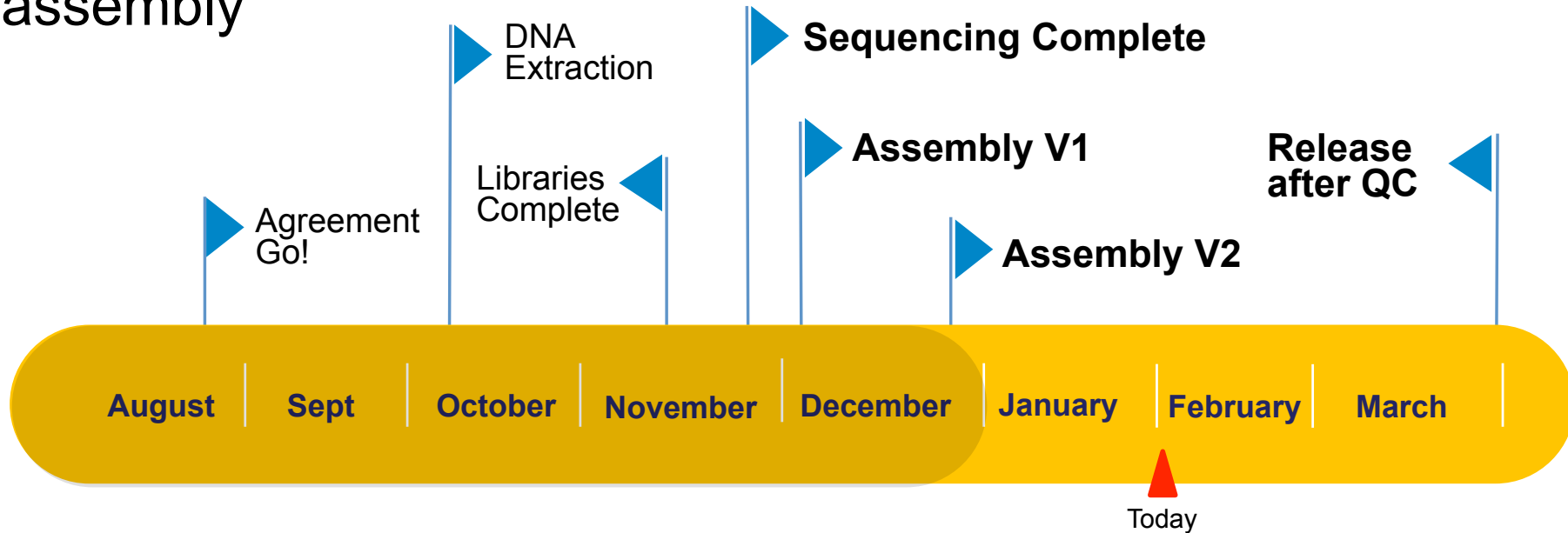


Whole Genome Shotgun- IWGSC WGA project

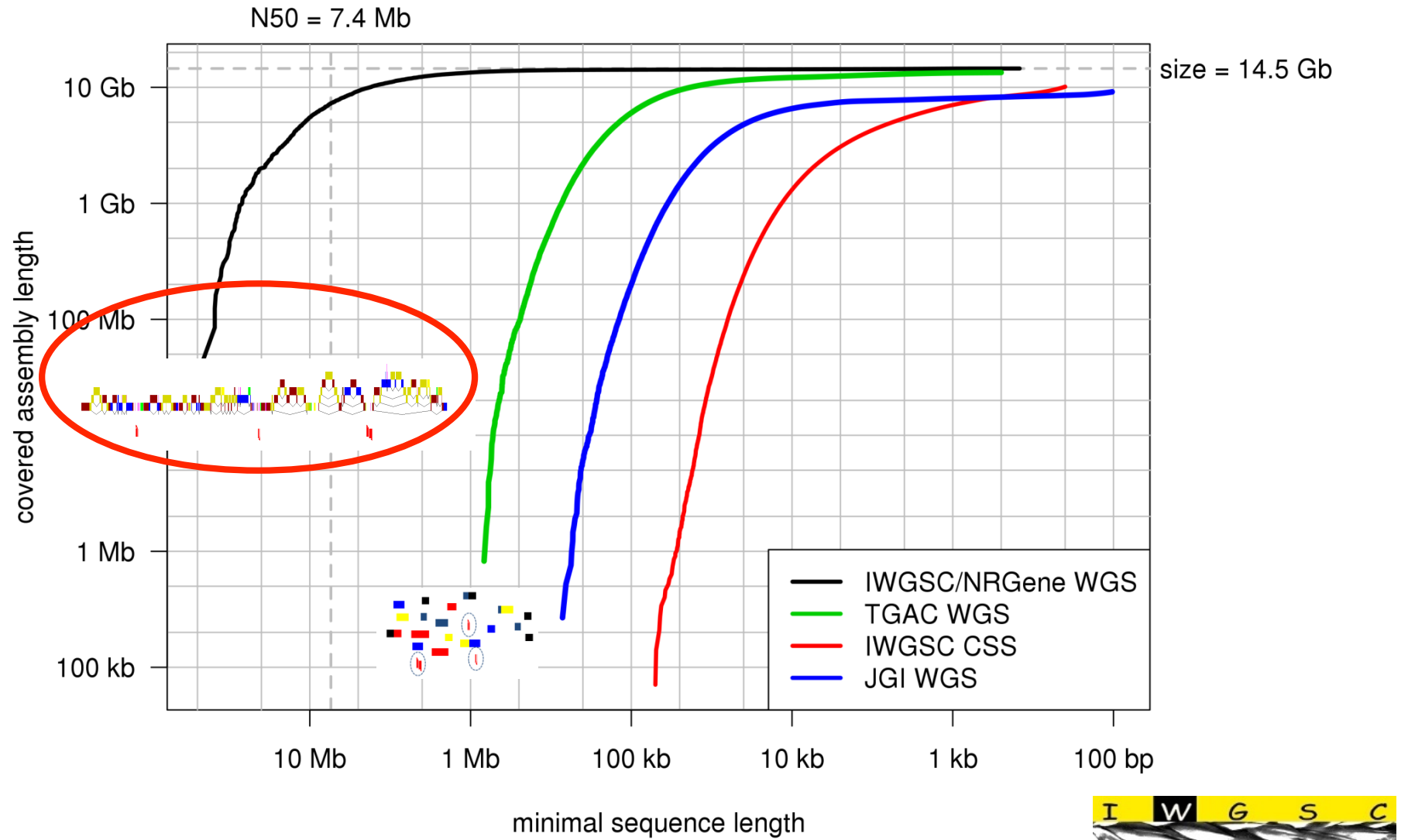


IWGSC coordinated - Led by Nils Stein, Curtis Pozniak, Jesse Poland with NRGene and Illumina

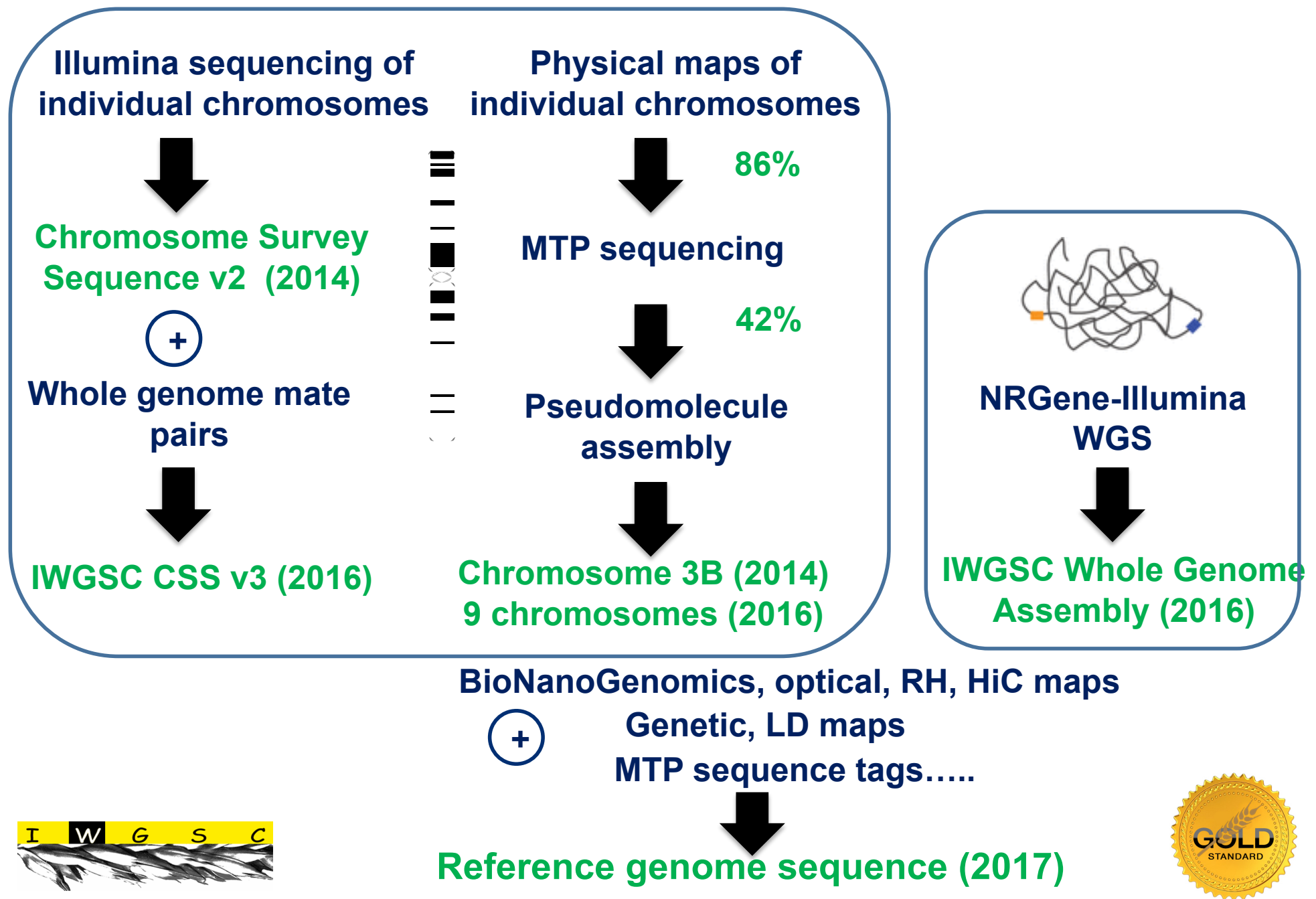
~2 months from data accumulation to completion of first assembly



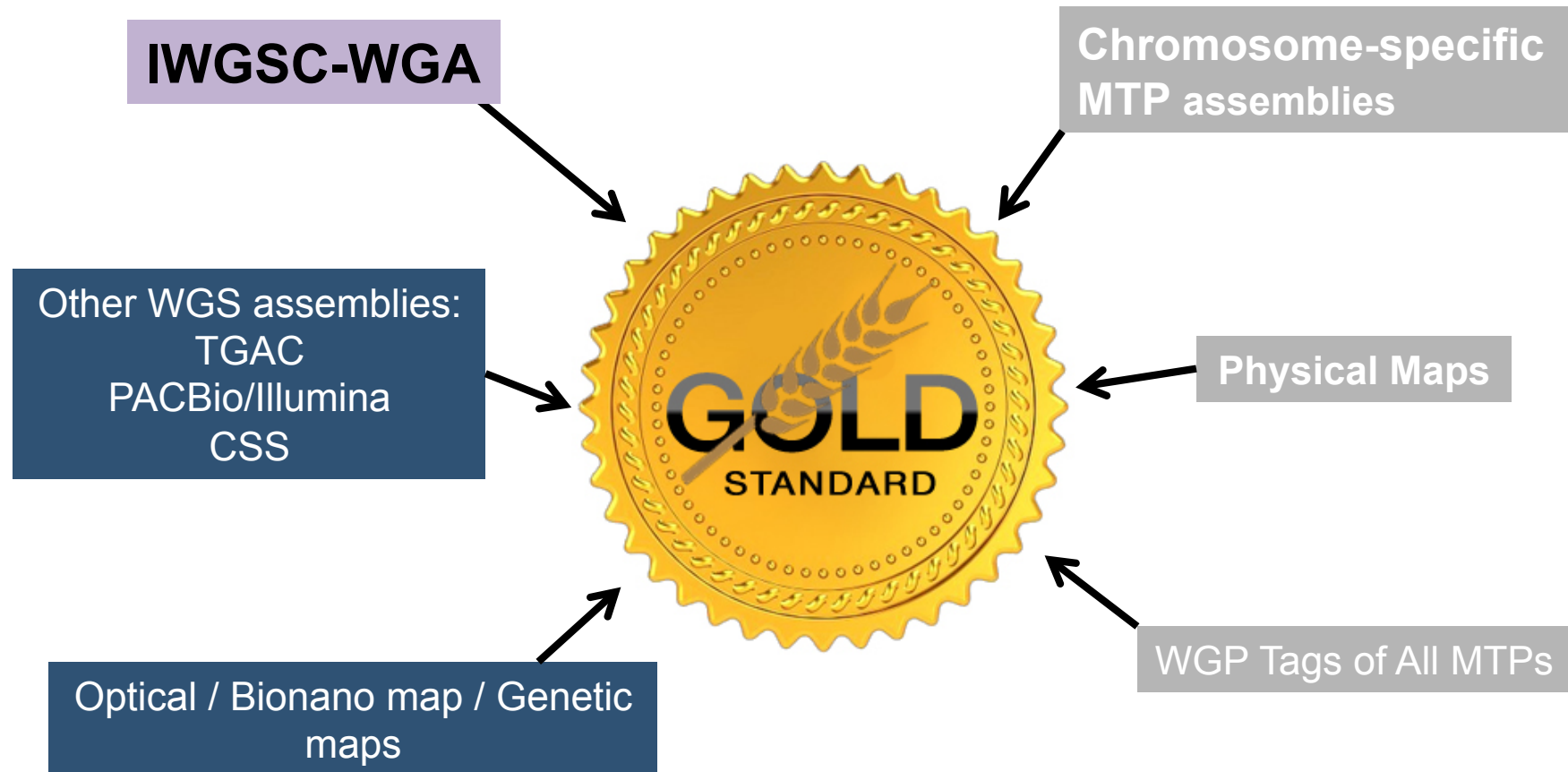
Assembly Comparisons



Roadmap to the Wheat Genome Sequence

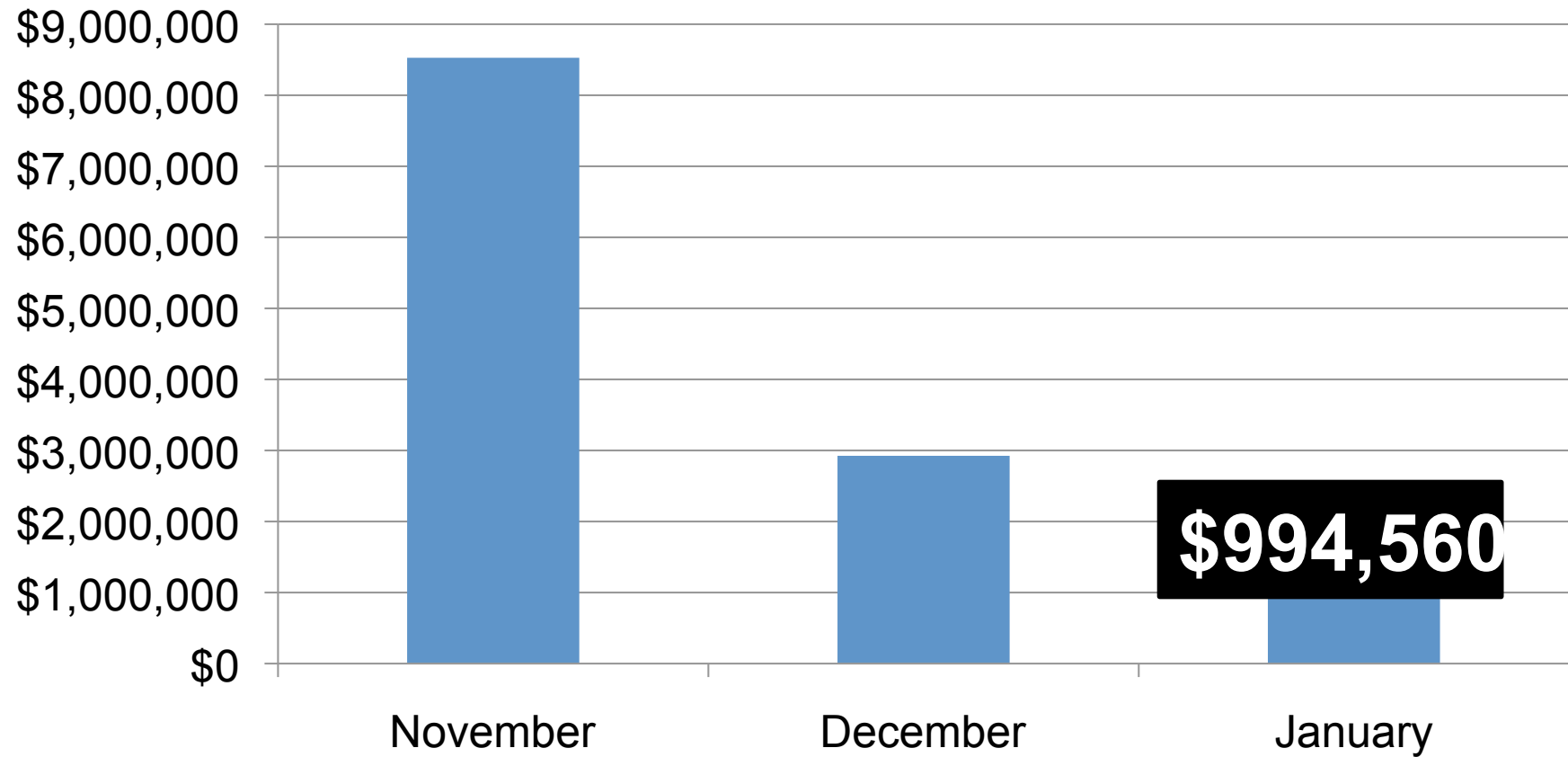


Goal -- Achieving Reference release IWGSC v1 by 2016, Gold Standard by 2017



Breakthrough = Rapidly Declining Cost

Estimated Cost in USD



Planning for Post Reference

- Industry sponsors request continuation of coordinating development of competitive and pre-competitive genomic resources
- Coordinate sequencing with breakthrough technology 4-5 commercial varieties (total cost of ~\$2.5 million)
 - Select haplotypes that represent breadth of diversity
 - Funding will help determine varietal selections
 - Funding likely for Canadian, German, French, Australian varieties. US?



Request for Funding Support

- Two-year budget for completing the gold standard reference sequence (\$994,560)
 - Sponsorship of IWGSC activities, workshops, and exchange visits for rapid completion of gold standard for each chromosome
- Fund IWGSC sequencing of US variety (~\$700,000)

IWGSC Sponsors



MONSANTO



I W G S C



Thank you!

