myBaits® Wheat Exome Kit V1

SCOPE – PERFORMANCE – OUTLOOK

25 March 2020

Jacob Enk, PhD
R&D Manager, NGS

PRESENTED BY:

arbor biosciences

arbor biosciences

FOUNDED IN SCIENCE
Driven by Discovery

2006
Founded as
MYcroarray
Ann Arbor, MI

2017
Renamed
Arbor Bio

2019
Acquired by Chiral
Technologies

2020
- Hundreds of client publications
- Thousands of species studied

CORE TECH

Massively-parallelized DNA synthesis

CORE EXPERTISE

Non-model organism genomics

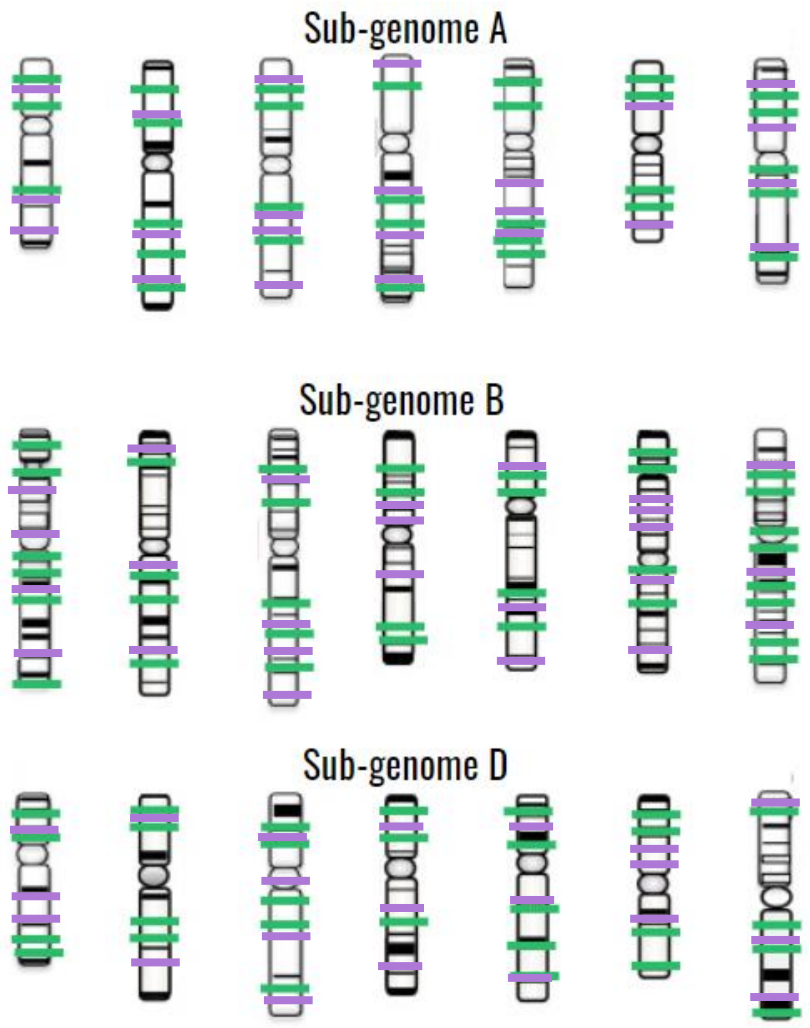
myBaits®	*NGS target enrichment panels*
myReads®	*Versatile NGS services*
myTags®	*Synthetic FISH probes*

Wheat Exome Kit V1

SCOPE OF DESIGN

IWGSC RefSeq 1.0 14.54 Gbp

First chromosome-scale *T. aestivum* reference assembly and annotations



High-Confidence annotations v 1.1

139,893 Gene IDs

HC exons **171 Mbp**

“Promoter space” **227 Mbp**

Low-Confidence annotations v 1.1

165,016 Gene IDs

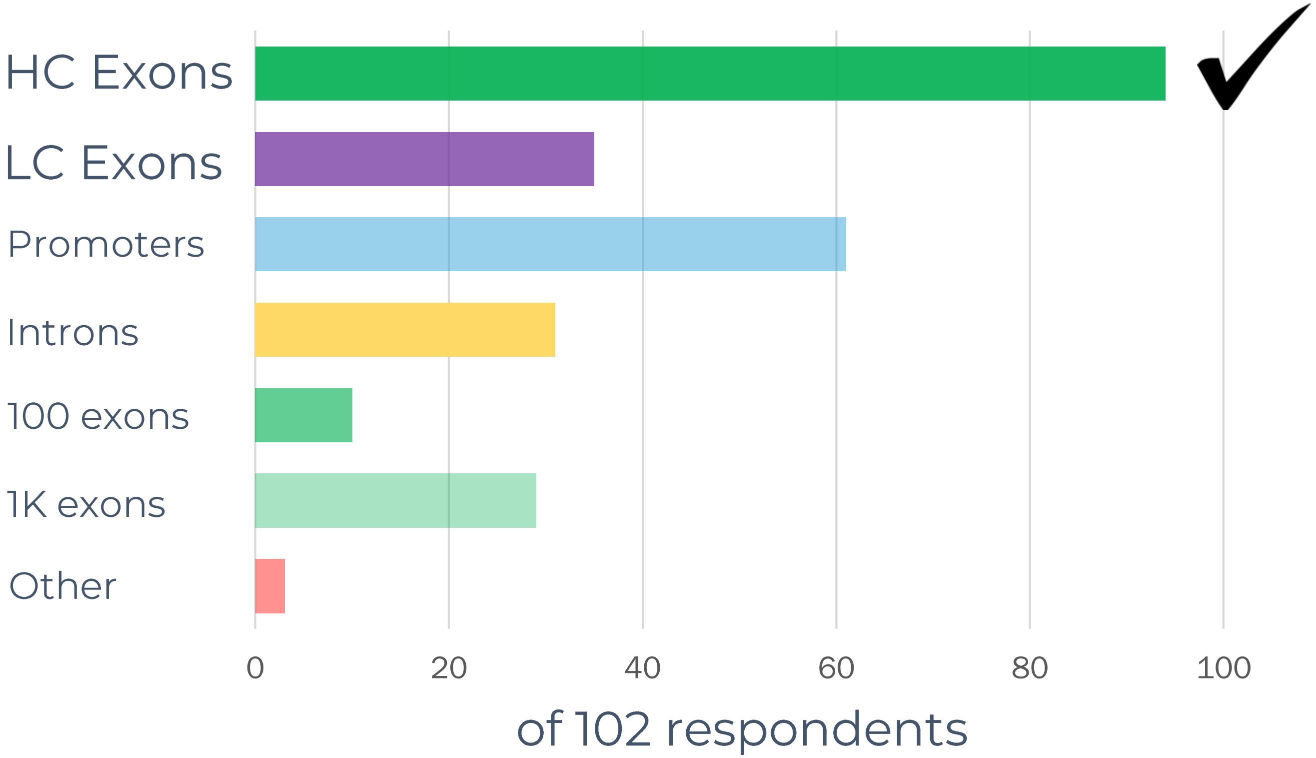
LC exons **108 Mbp**

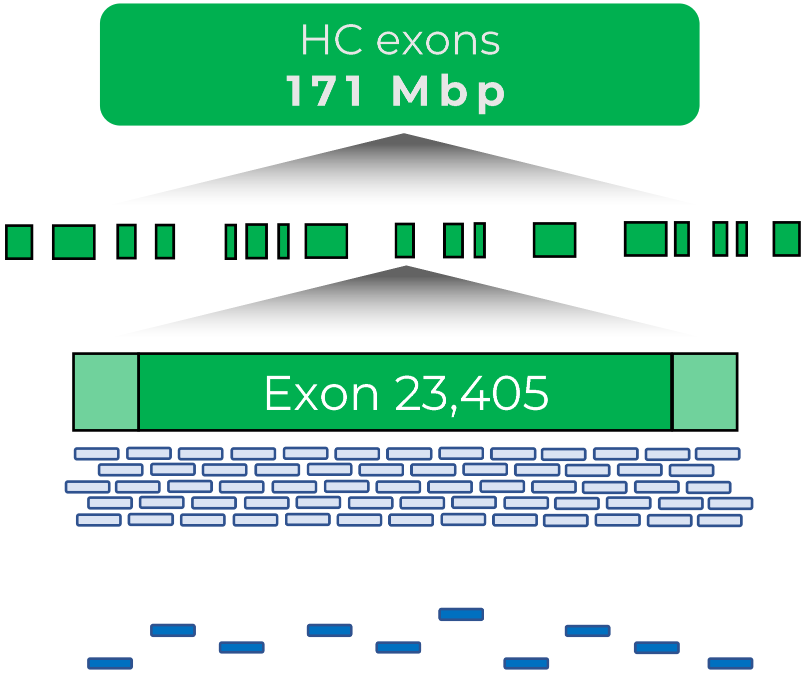
“Promoter space” **263 Mbp**

Kit composition

Guided by IWGSC community survey

Q: What would be useful to your research?

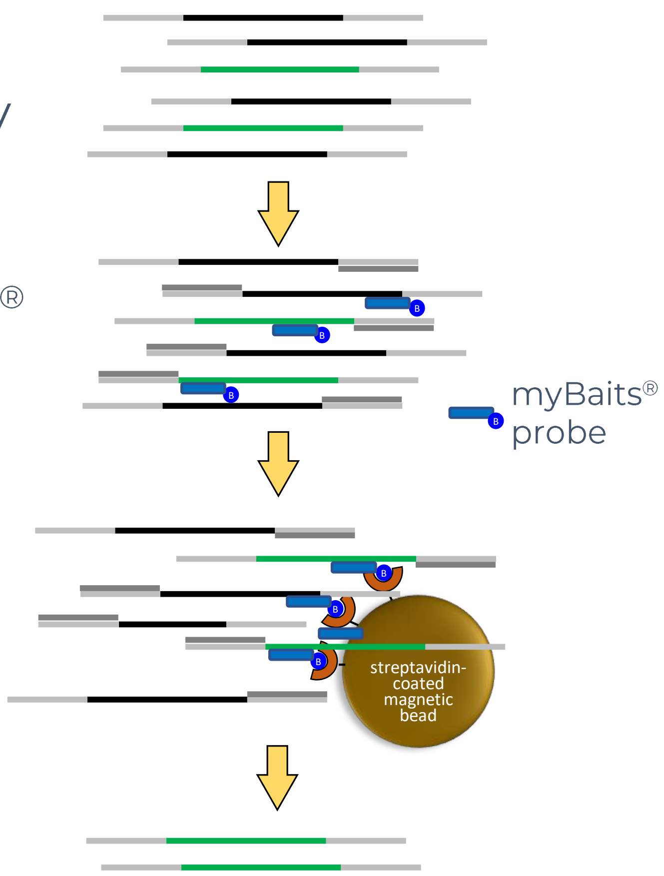




Sequence composition- & specificity-filtered subset

Use and development

Simple myBaits® workflow

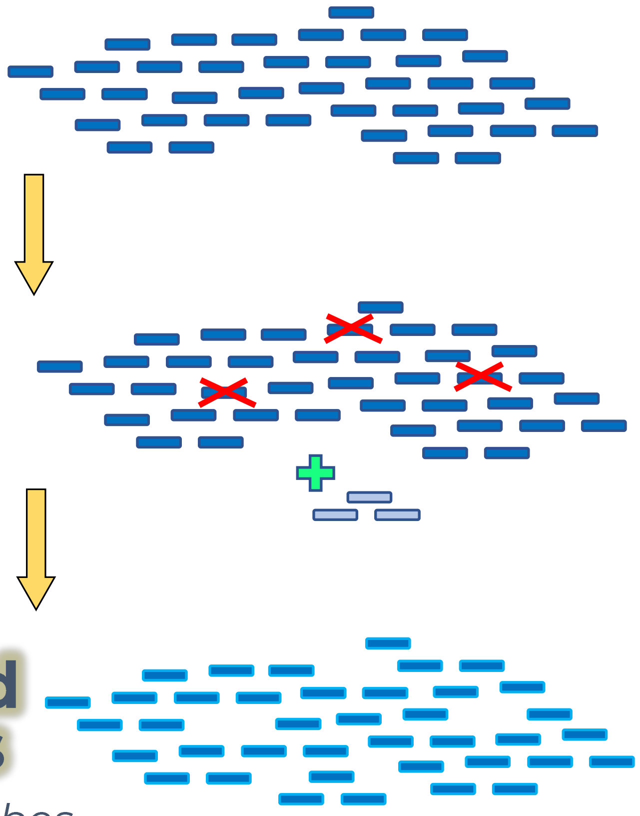


Amplifiable sequencing library

Hybridize myBaits® probes

Bind hybrids to magnetic beads

Wash, amp, sequence



“Alpha” probe set

Test

Refine to “Beta”

Test & Optimize

Final Kit and Parameters

- *1.7 M RNA probes*
- *8-plex capture*

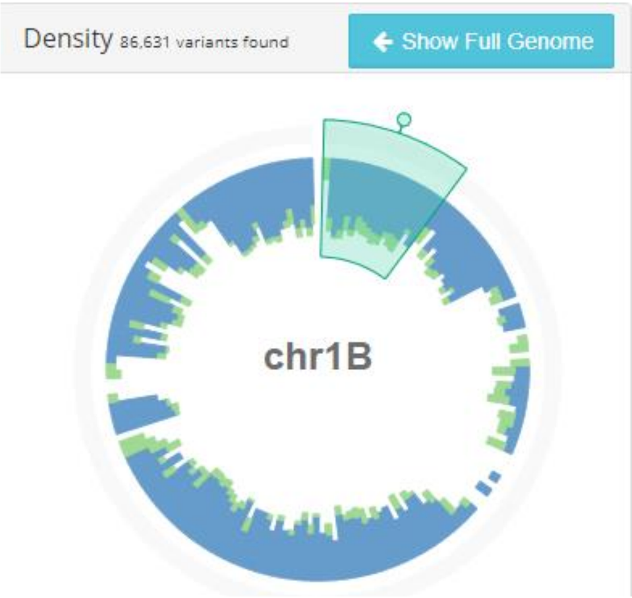
Use and development

Enhanced wheat NGS bioinformatics

CURIO

Crop Research Solutions

curiogenomics.com



Chinese Spring and Svevo fully integrated

Dynamic read alignment visualization

Rapid variant calling
Parameters tunable in real-time

Wheat Exome Kit V1

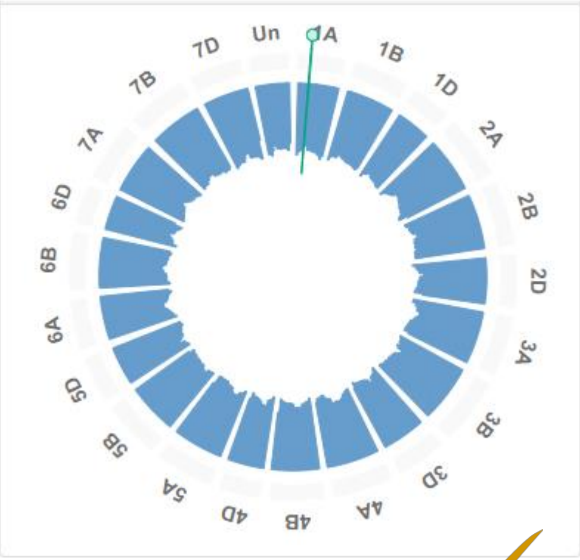
PERFORMANCE

Hexaploid exome capture

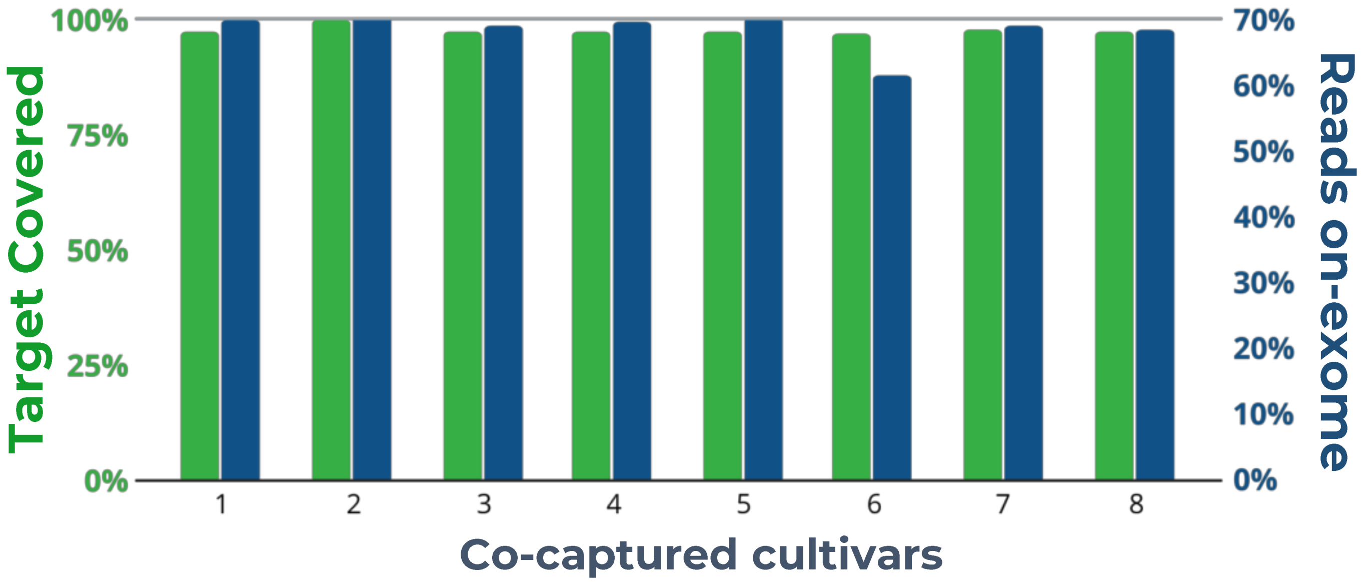
Comprehensive and specific

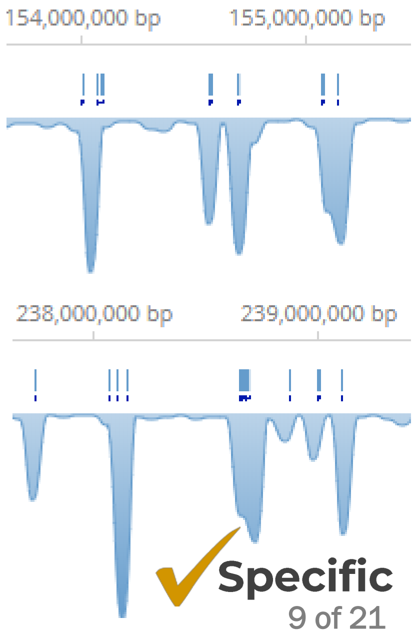
Total Target Space	230 Mbp (158 Mbp exonic)
Recommended Sequencing	18 Gbp per sample (Illumina®)
Target Read Depth	>32X mean unique read depth
Target Coverage	>97% high-confidence exons hit

30-fold reduction in exome sequencing cost vs. WGS



Comprehensive ✓

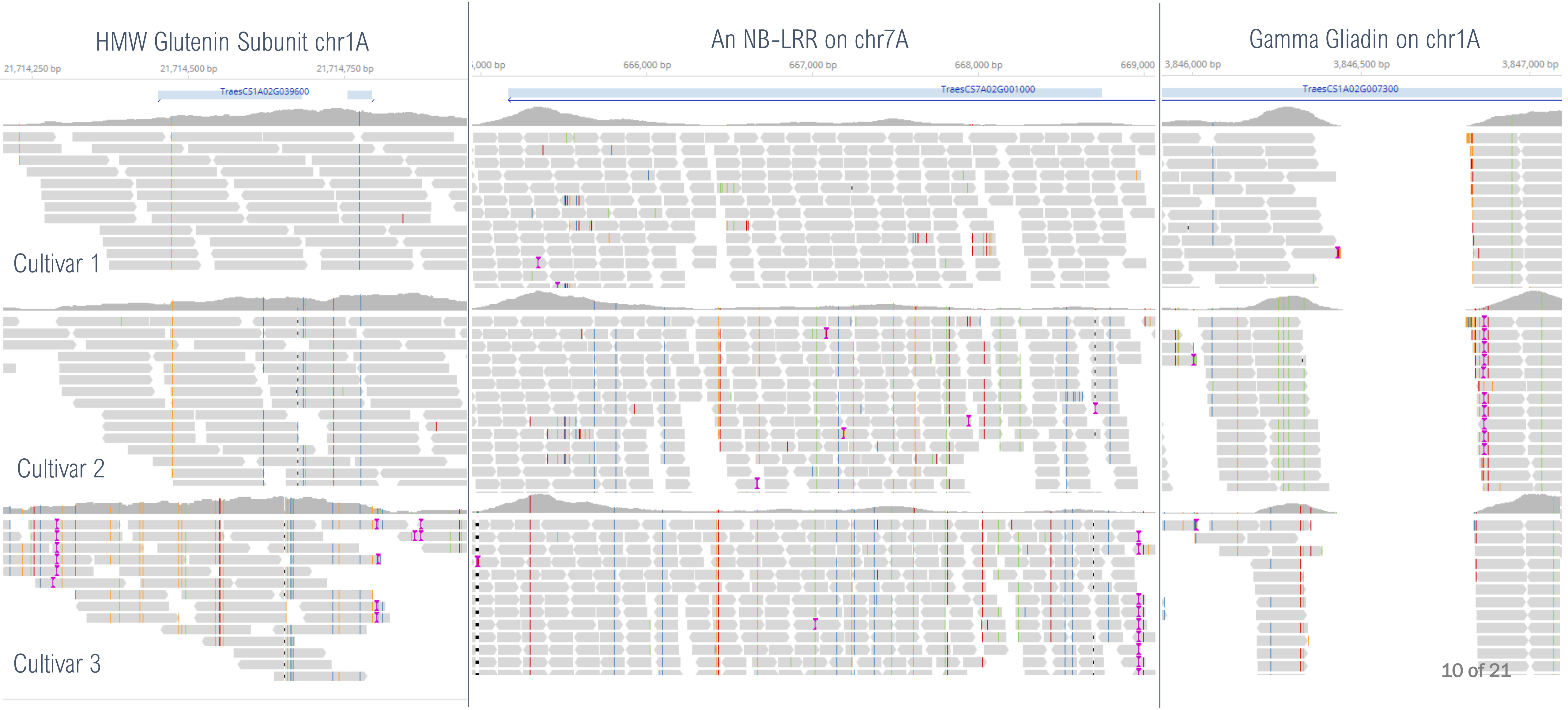




✓ **Specific**

Hexaploid wheat exome capture

Comprehensive and specific across cultivars



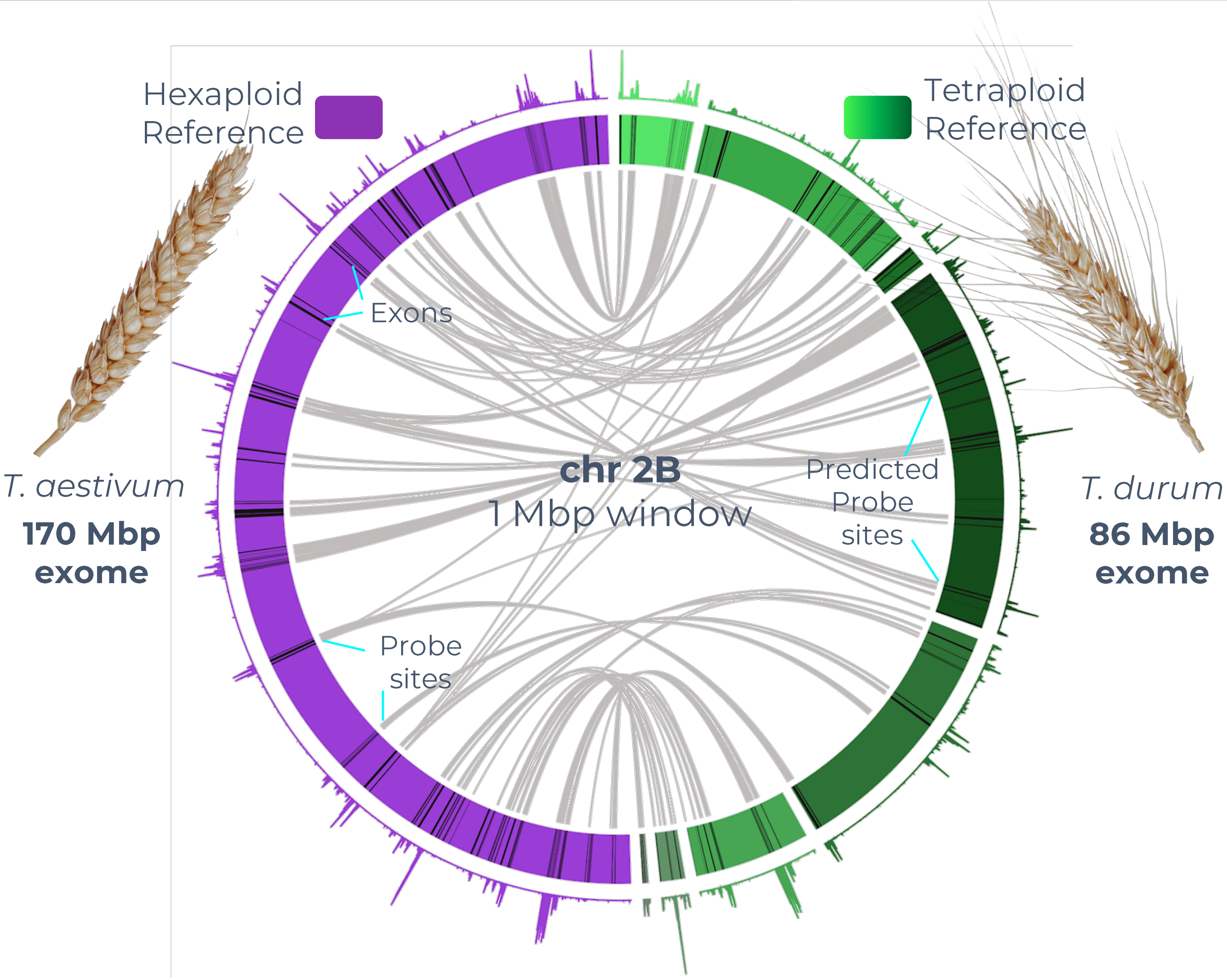
HMW Glutenin Subunit chr1A

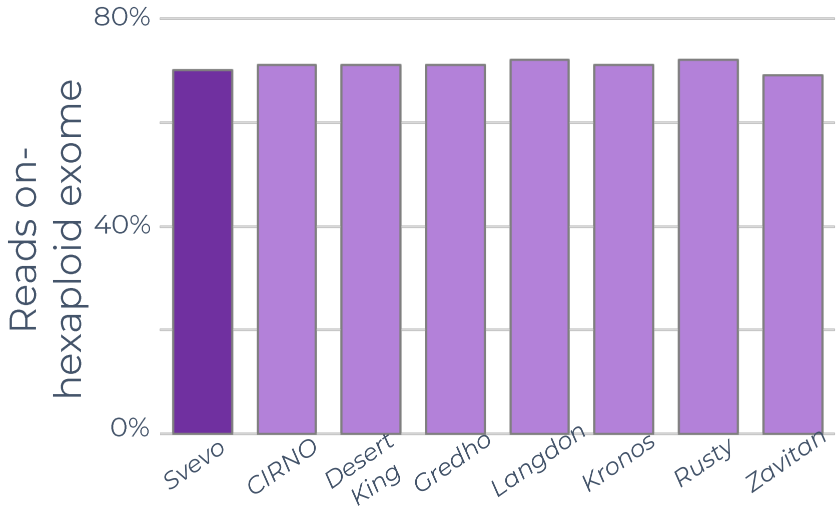
An NB-LRR on chr7A

Gamma Gliadin on chr1A

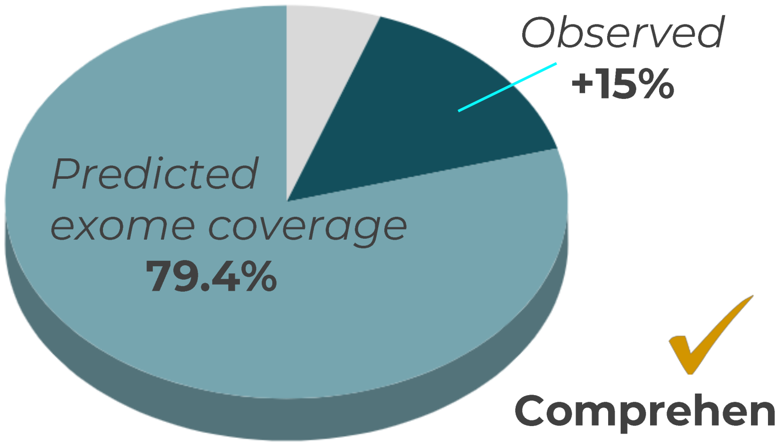
Tetraploid exome capture

Comparably high-performing





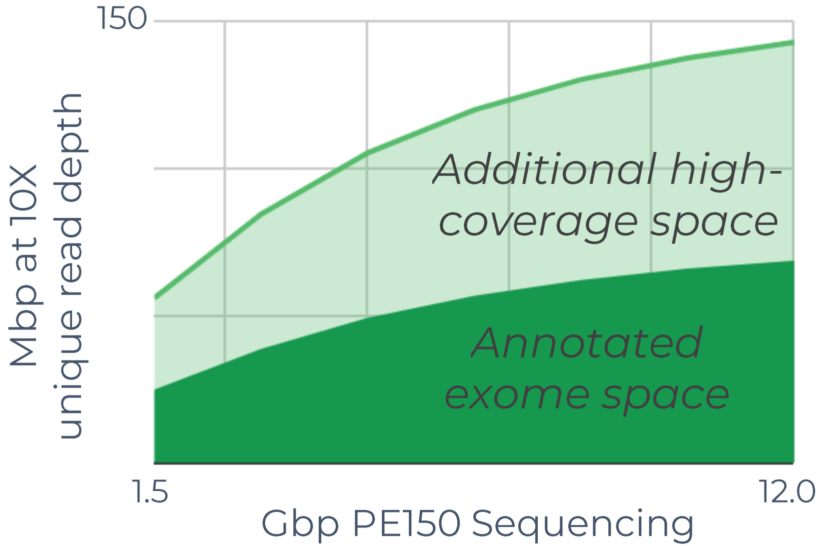
Highly specific ✓

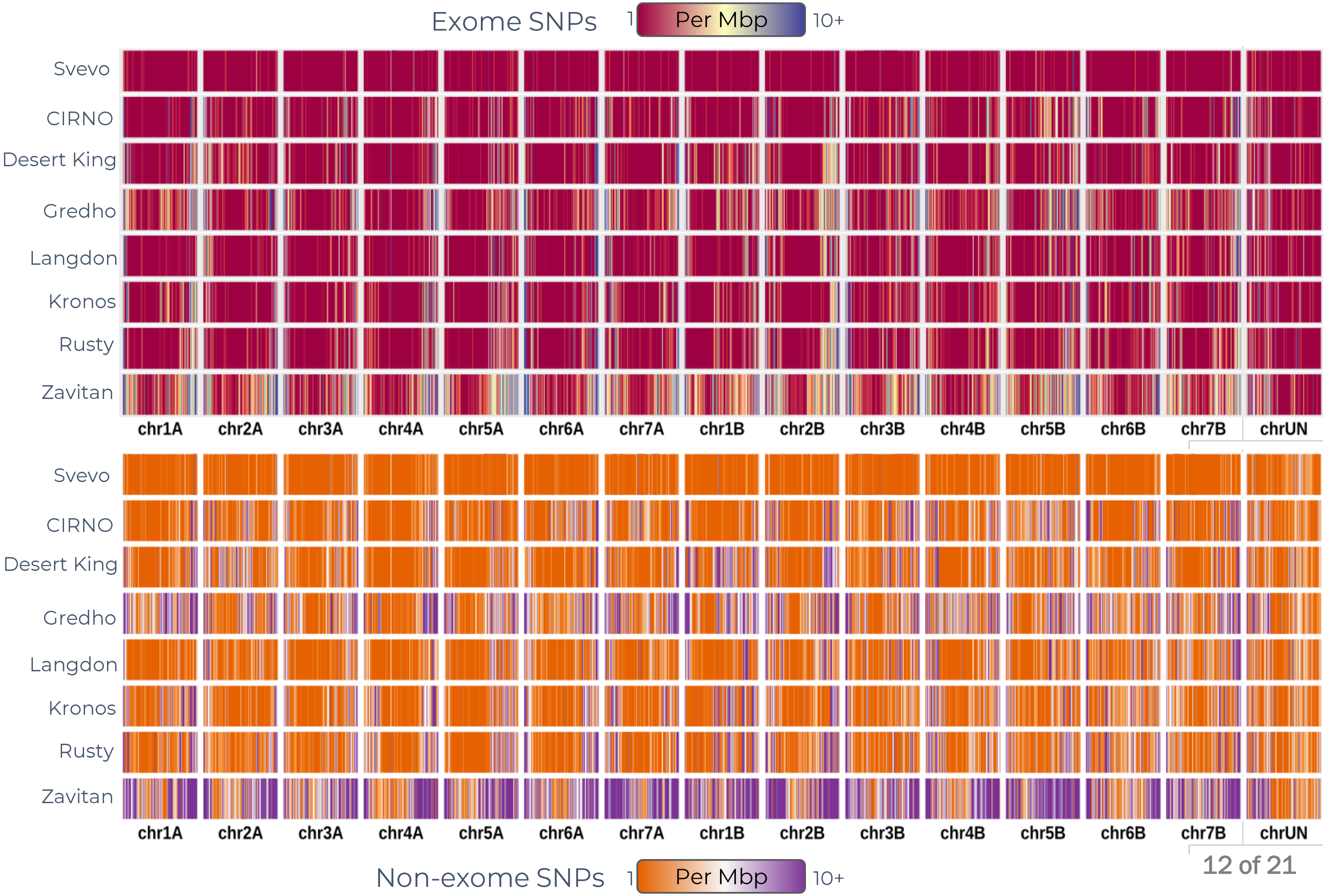


✓ **Comprehensive**

Tetraploid exome capture

Excellent genome-wide mutation discovery potential



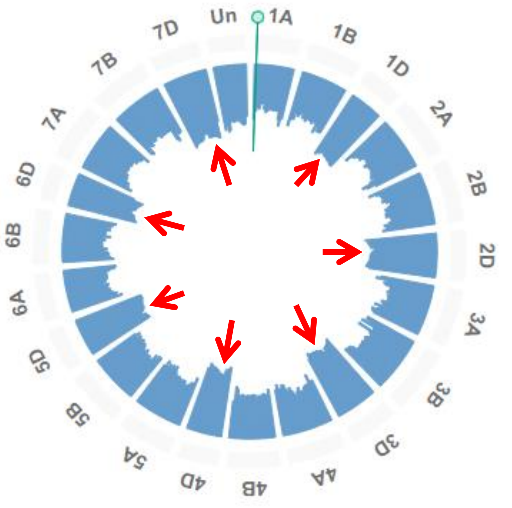


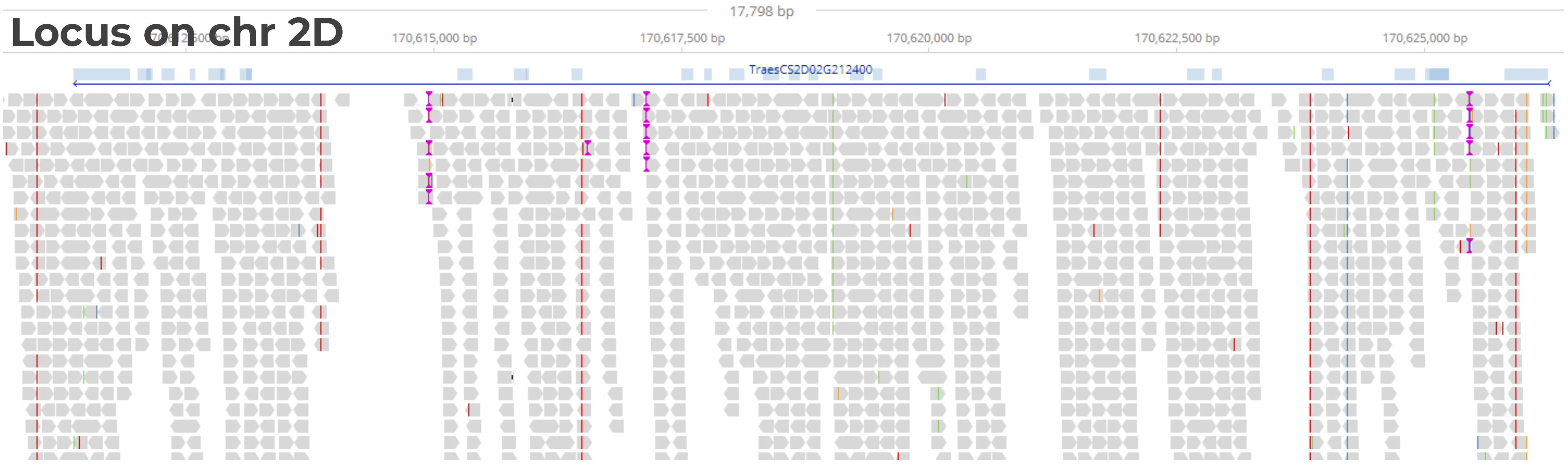
Diploid exome capture

Good coverage even at highly divergent loci

Aegilops tauschii

48% on-target

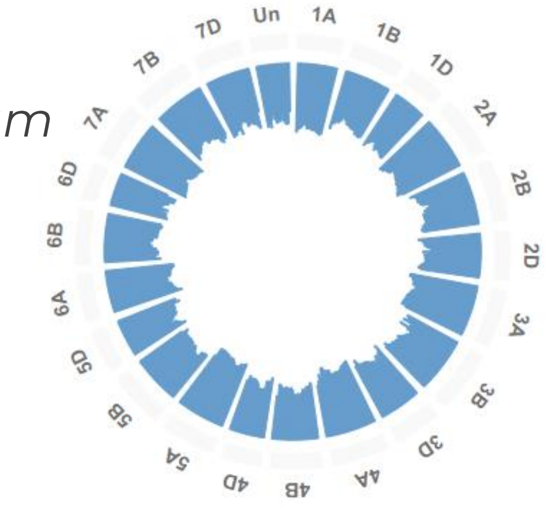


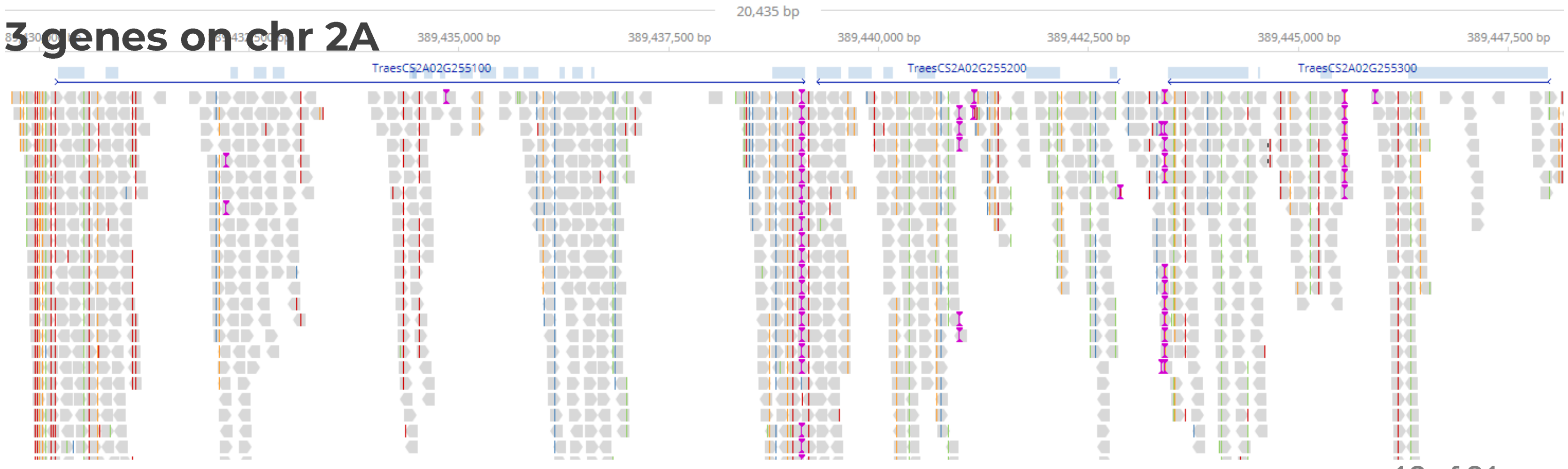


Locus on chr 2D

Triticum monococcum

45% on-target



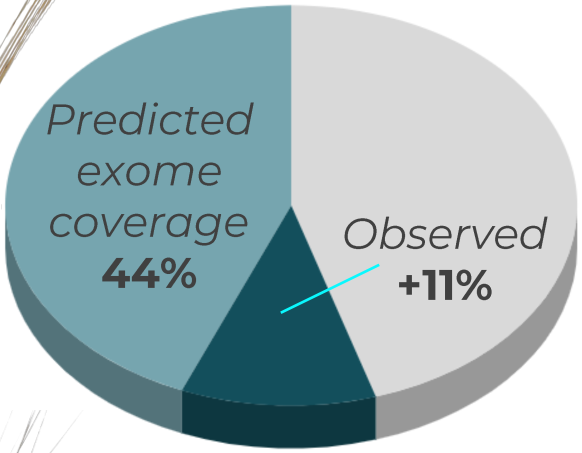


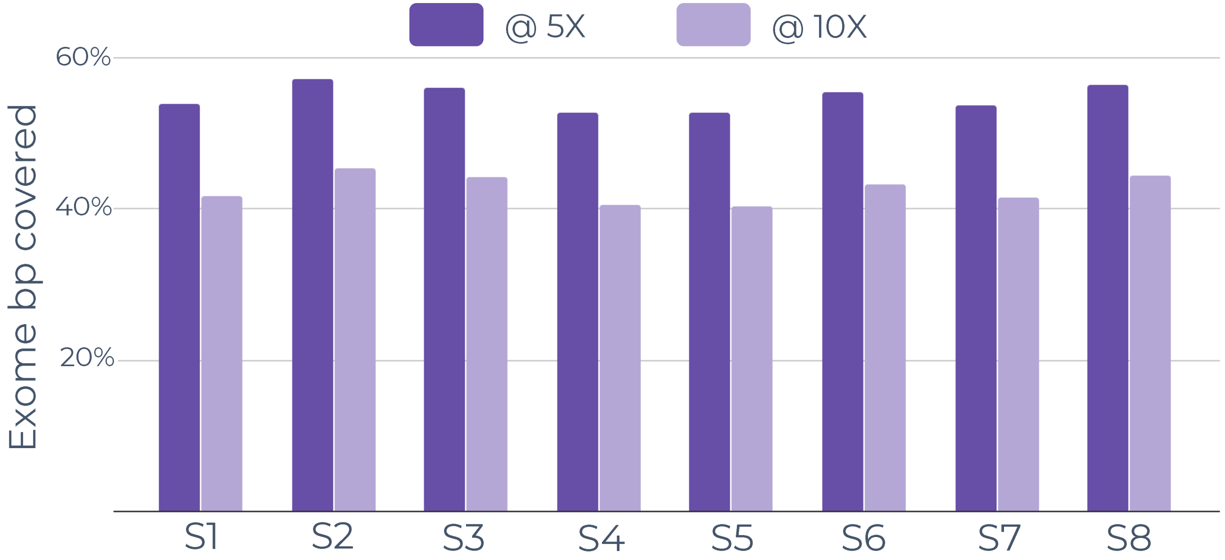
3 genes on chr 2A

Non-wheat exome capture

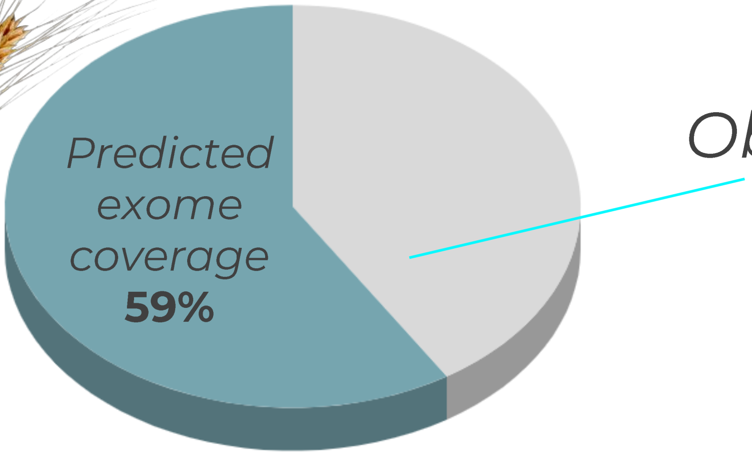
Potential for multi-taxon use

Barley
H. vulgare
121 Mbp
exome*
(Morex V1)





Rye
S. cereale
28 Mbp
exome



Observed
TBD

Exome Kit V1 target

vs. other wheat capture probe designs

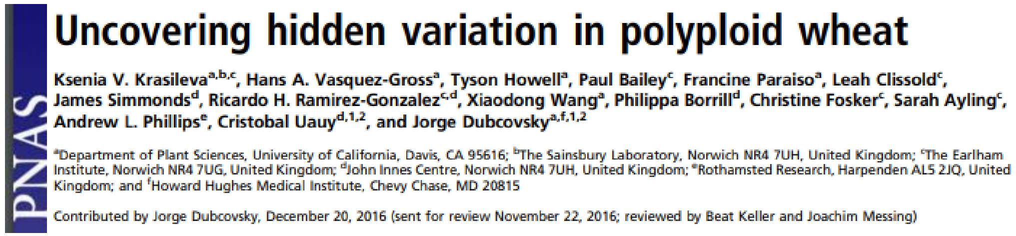
I W G S C

arbor biosciences

Genome Biology

A haplotype map of allohexaploid wheat reveals distinct patterns of selection on homoeologous genomes

Katherine W Jordan[1†], Shichen Wang[1†], Yanni Lun[1,2], Laura-Jayne Gardiner[3], Ron MacLachlan[4], Pierre Hucl[4], Krysta Wiebe[4], Debbie Wong[5], Kerrie L Forrest[5], IWGS Consortium, Andrew G Sharpe[6], Christine HD Sidebottom[6], Neil Hall[3], Christopher Toomajian[1], Timothy Close[7], Jorge Dubcovsky[8,9], Alina Akhunova[1,2], Luther Talbert[10], Urmil K Bansal[11], Harbans S Bariana[11], Matthew J Hayden[5], Curtis Pozniak[4], Jeffrey A Jeddeloh[12], Anthony Hall[3] and Eduard Akhunov[1*]



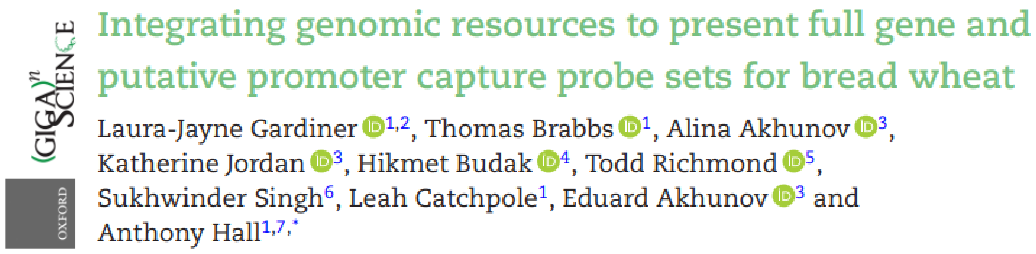
PNAS

Uncovering hidden variation in polyploid wheat

Ksenia V. Krasileva[a,b,c], Hans A. Vasquez-Gross[a], Tyson Howell[a], Paul Bailey[c], Francine Paraiso[a], Leah Clissold[c], James Simmonds[d], Ricardo H. Ramirez-Gonzalez[c,d], Xiaodong Wang[a], Philippa Borrill[d], Christine Fosker[c], Sarah Ayling[c], Andrew L. Phillips[e], Cristobal Uauy[d,1,2], and Jorge Dubcovsky[a,f,1,2]

[a]Department of Plant Sciences, University of California, Davis, CA 95616; [b]The Sainsbury Laboratory, Norwich NR4 7UH, United Kingdom; [c]The Earlham Institute, Norwich NR4 7UG, United Kingdom; [d]John Innes Centre, Norwich NR4 7UH, United Kingdom; [e]Rothamsted Research, Harpenden AL5 2JQ, United Kingdom; and [f]Howard Hughes Medical Institute, Chevy Chase, MD 20815

Contributed by Jorge Dubcovsky, December 20, 2016 (sent for review November 22, 2016; reviewed by Beat Keller and Joachim Messing)

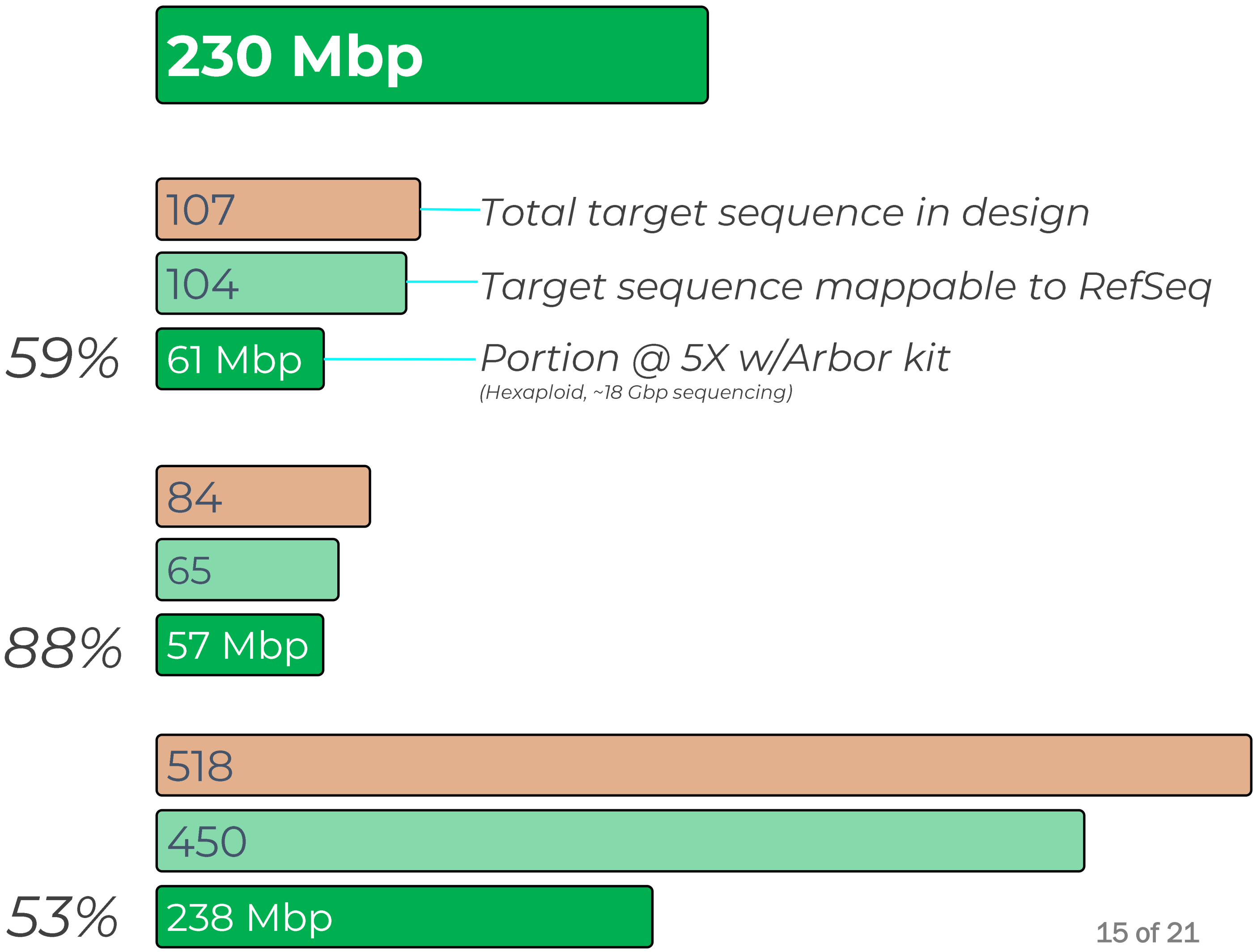


GIGA SCIENCE

OXFORD

Integrating genomic resources to present full gene and putative promoter capture probe sets for bread wheat

Laura-Jayne Gardiner[1,2], Thomas Brabbs[1], Alina Akhunov[3], Katherine Jordan[3], Hikmet Budak[4], Todd Richmond[5], Sukhwinder Singh[6], Leah Catchpole[1], Eduard Akhunov[3] and Anthony Hall[1,7,*]



Total target sequence in design

Target sequence mappable to RefSeq

Portion @ 5X w/Arbor kit

(Hexaploid, ~18 Gbp sequencing)

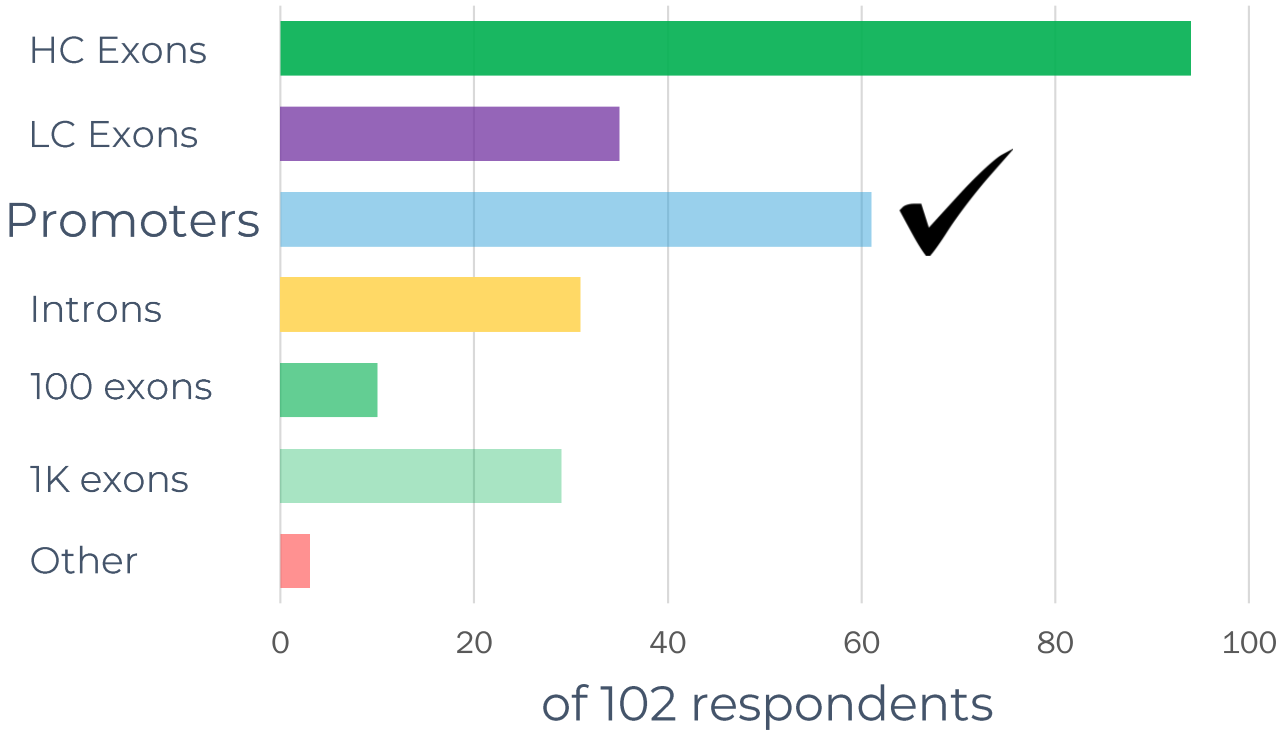
Wheat Exome Kit

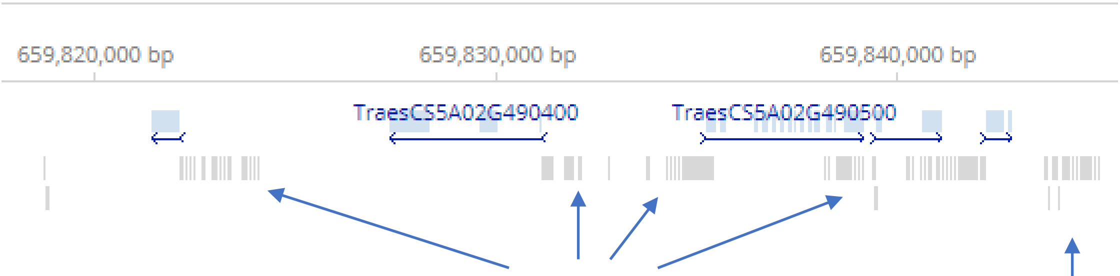
WHAT'S NEXT

Additional modules

Promoters from RefSeq and others

Q: What would be useful to your research?





~2 kbp Regions 5’ of each gene

+ ATAC-seq open chromatin regions

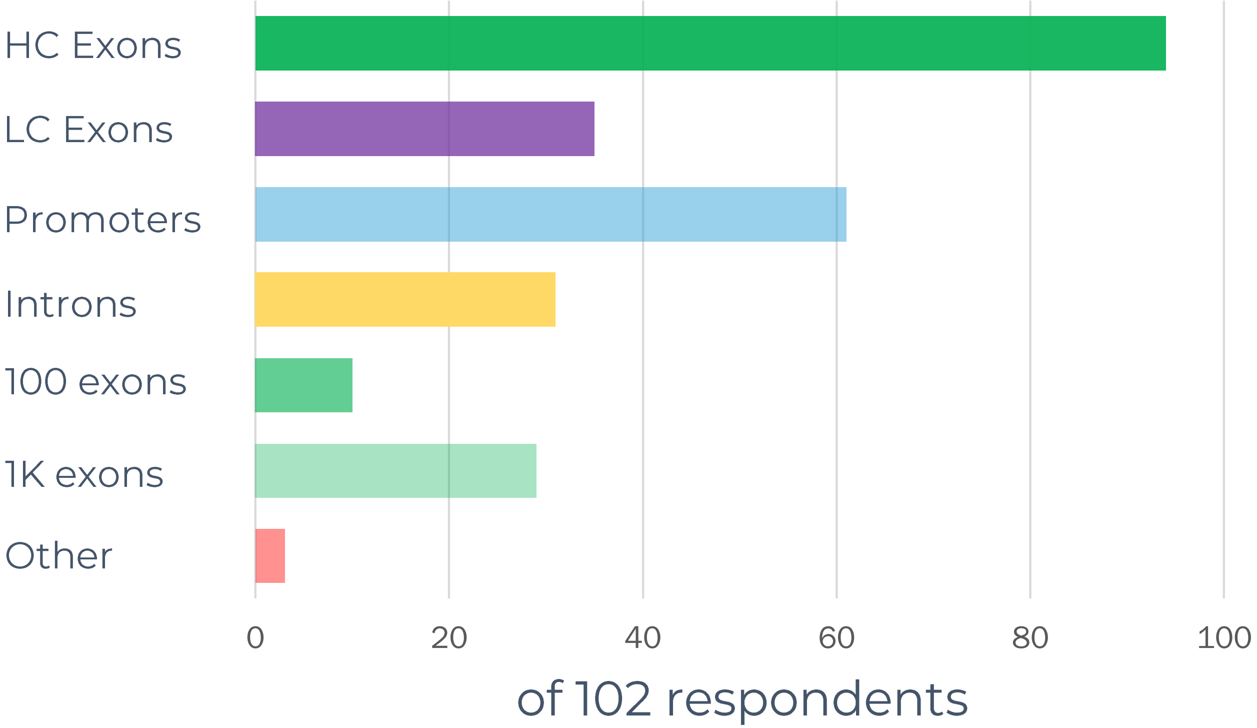
− Experimentally- and informatically-identified nonspecific regions

Final: 191 Mbp optional add-on

Additional modules

Reference sequence and annotation updates

Q: What would be useful to your research?



- **+ New RefSeq 1.0 annotations**
- **+ RefSeq 2.0 sequence updates**
- **+ Genome-wide SNPs**

Offerings in perspective

Cost-effective exome capture and custom options

Your Lab

+ USD $37/sample

Your gDNA

Your Library Prep

myBaits®

Your Sequencing

myReads®

USD $539/sample (hexaploid)

Your gDNA

Arbor Library Prep

myBaits®

Arbor Sequencing

CURIO

CUSTOM ADD-ONS

- Introns
- New exons
- NB-LRR candidates

25% discount

For the rest of 2020 with purchase of Wheat Exome Core Kit

Special Thanks

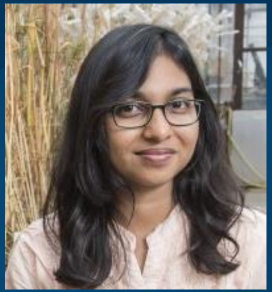
IWGSC

Advisors and Beta Testers

Burkhard Steuernagel

John Innes Centre

Sreya Ghosh



John Innes Centre

Ute Baumann

THE UNIVERSITY of ADELAIDE

Etienne Paux

INRAE
science for people, life & earth

Sébastian Praud

Limagrain
de la terre à la vie

Expansion Leaders

Jorge Dubcovsky

UCDAVIS
UNIVERSITY OF CALIFORNIA

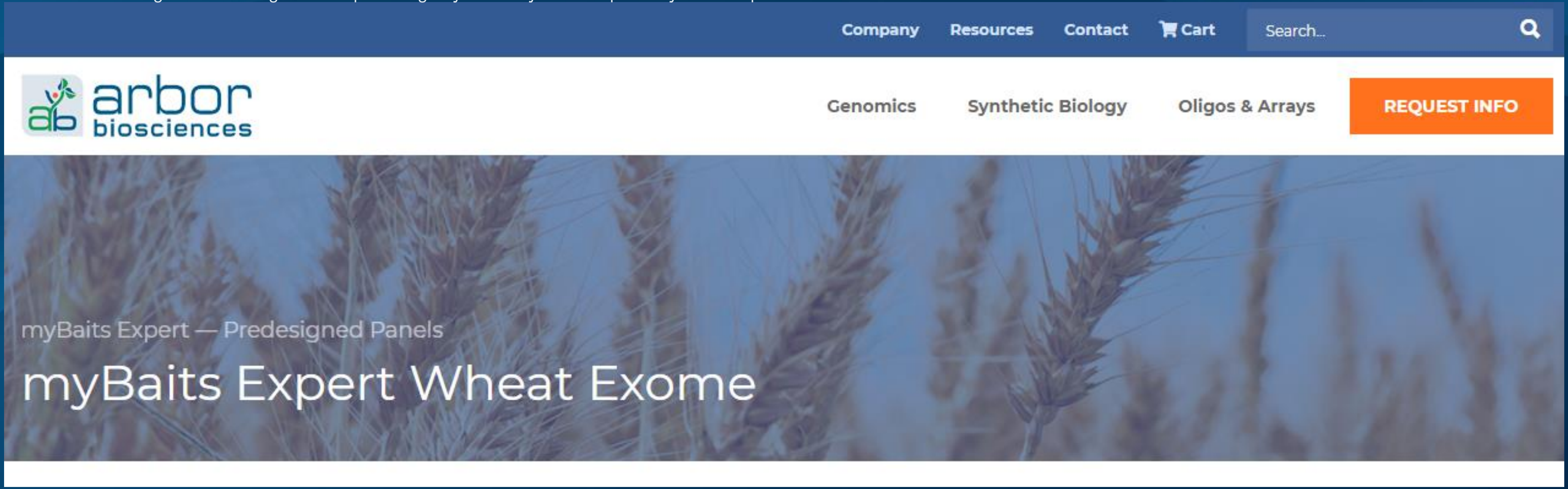
Jan Gielen

syngenta

Vijay Tiwari

UNIVERSITY OF MARYLAND

arborbiosci.com/genomics/targeted-sequencing/mybaits/mybaits-expert/mybaits-expert-wheat-exome/



myBaits Expert — Predesigned Panels

myBaits Expert Wheat Exome

arbor biosciences

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Thanks!