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Few plants are as agriculturally consequential as bread wheat. Yet its genome is massive and highly repetitive, making it particularly difficult to assemble. In this issue, Alonge and Shumate *et al.* present a new chromosome-scale assembly of the bread wheat genome that is about 1 billion nucleotides longer than the current reference. This extra sequence contains thousands of previously collapsed and potentially functional gene duplications dispersed throughout the genome. On the cover, a circos plot shows the location of these ~5700 additional gene copies in the new assembly (on the left side of the plot) and their original single-copy location in the reference (right side). The image underscores the vast potential for high-quality wheat genome assemblies to provide new insights into genome structure and function. Image courtesy of Michael Alonge, made with Circa (<http://omgenomics.com/circa/>). See Alonge *et al.*, pp 599–608.

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