What are B chromosomes?

B chromosomes (Bs) are a unique class of supernumerary chromosomes that are optional extras in the genomes of numerous plant and animal species. They are dispensable, being found in some individuals in populations that carry them, and absent from others, which raises significant biological questions in terms of genome organisation, population cytogenetics and evolution. Bs were first discovered 100 years ago in an insect, in species of the leaf-footed plant bug Metapodius, by Edmund Wilson in 1907. They were first recognised in plants in the 1920s, when Gotoh and Kuwada correctly classified them in rye, and later Longley found them in maize. Longley first called them supernumeraries, and Randolph 1928, also working with maize, later used the term B chromosomes, to distinguish them from the chromosomes of the basic complement called the A chromosomes. The term supernumerary B chromosomes is now simplified to Bs.

The essential features of Bs are: (i) they are dispensable; (ii) they pair only among themselves at meiosis (in species where they do pair) and do not recombine with the As; (iii) their inheritance is irregular, due to their polysomic nature and to the occurrence and elimination of univalents, all of which compromises their transmission through meiosis; (iv) meiotic elimination in some species is counter-balanced by processes of drive at mitosis, mainly in the gametophytes, and less frequently at meiosis, leading to equilibrium frequencies in populations; (v) they have adverse and quantitative effects on the phenotype when
present in high numbers, especially on fertility which also contributes to their loss; (vi) they lack any known major gene loci, but rDNA sequences are known in a few species; (vii) they contribute greatly to intraspecific variation in genome size; (viii) they have no obvious adaptive properties (ix), their mode of origin remains a mystery; and (x), new information is now accruing on their molecular sequence organisation and expression of some noncoding sequences, and their are early indications that they may be structurally modified (maize) to have useful attributes in plant biotechnology.