



Vectors for Genomic library in genetic engineering: P1-derived artificial chromosome

What is a P1-derived Artificial Chromosome?

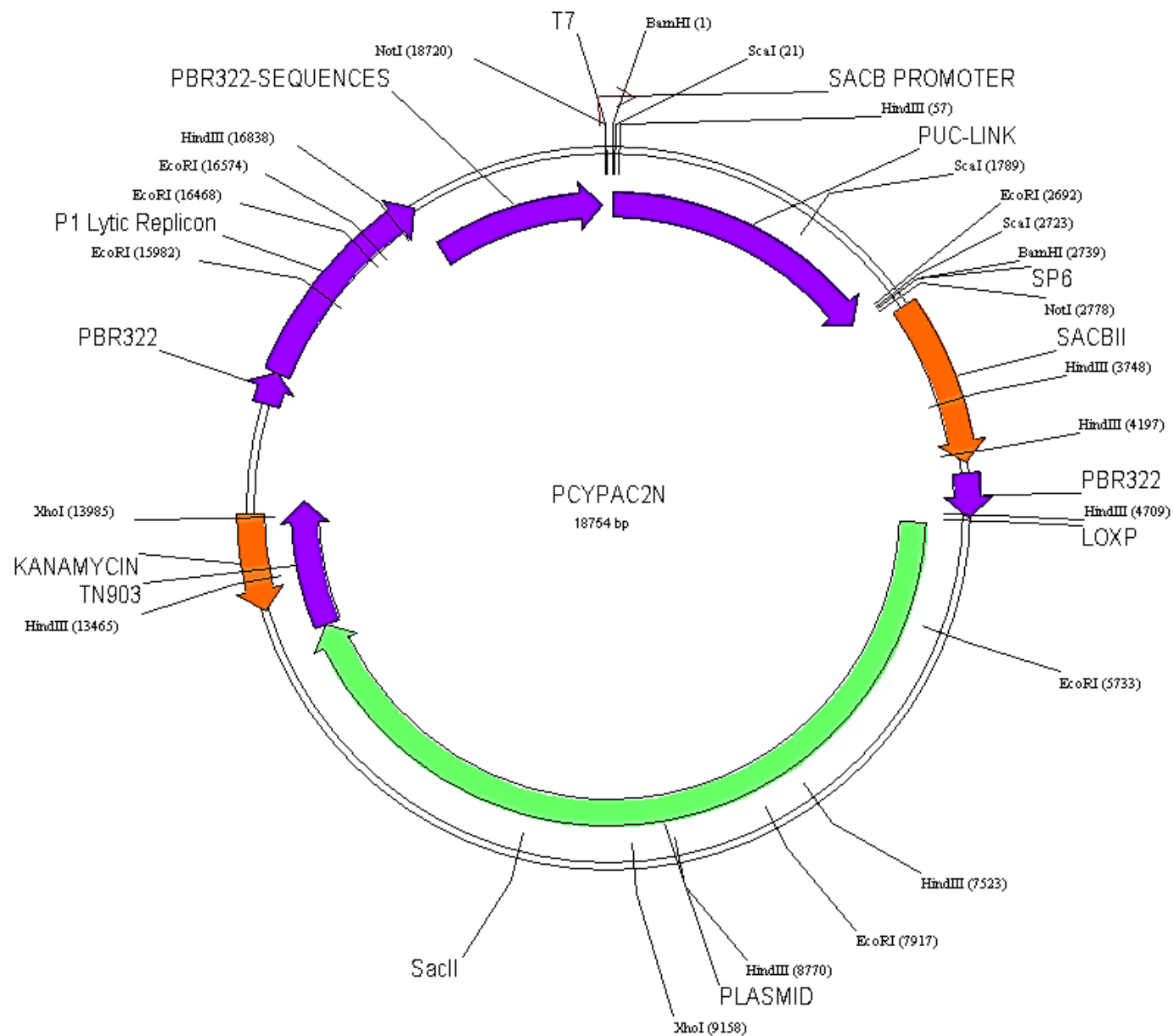


- ❑ A P1-derived artificial chromosome is a DNA construct that was derived from the DNA of P1 bacteriophage.
- ❑ It can carry large amounts (about 100–300 kilobases) of other sequences for a variety of bioengineering purposes in bacteria.
- ❑ It is one type of vector used to clone DNA fragments (100- to 300-kb insert size) in *Escherichia coli* cells.
- ❑ P1 was developed as a cloning vector by Nat Sternberg and colleagues in the 1990s.

Construction of PACs



- ❑ P1 vector contains a packaging site (*pac*) which is necessary for in vitro packaging of recombinant molecules into phage particles.
- ❑ The vectors contain two *loxP* sites. These are the sites recognized by the phage *cre* recombinase, the product of the phage *cre* gene, and which lead to circularization of the packaged DNA after it has been injected into an *E. coli* host expressing the recombinase.
- ❑ In strains containing a *lacI* repressor, the P1 plasmid replicon maintains the DNA at about one copy per host chromosome.
- ❑ However, if IPTG is added to the medium the P1 lytic replicon in the vector is induced and the copy number of the plasmid increases up to 25 folds in 6 generations..



Typical structure map of a PAC vector.

Applications of PAC



- ❑ PACs are in high demand when it comes to cloning important biomedical sequences, which are essential for many scientific functions.
- ❑ This P1 system has been used to construct genomic libraries of mouse, human, fission yeast, and *Drosophila*.
- ❑ One of its main uses is the genome analysis and map based cloning of complex plants and animals, which requires isolation of large pieces of DNA rather than smaller segments.
- ❑ PAC based cloning is useful in the study of 'phage therapy' and in scientific studies focusing on how antibiotics act on a particular bacteria.