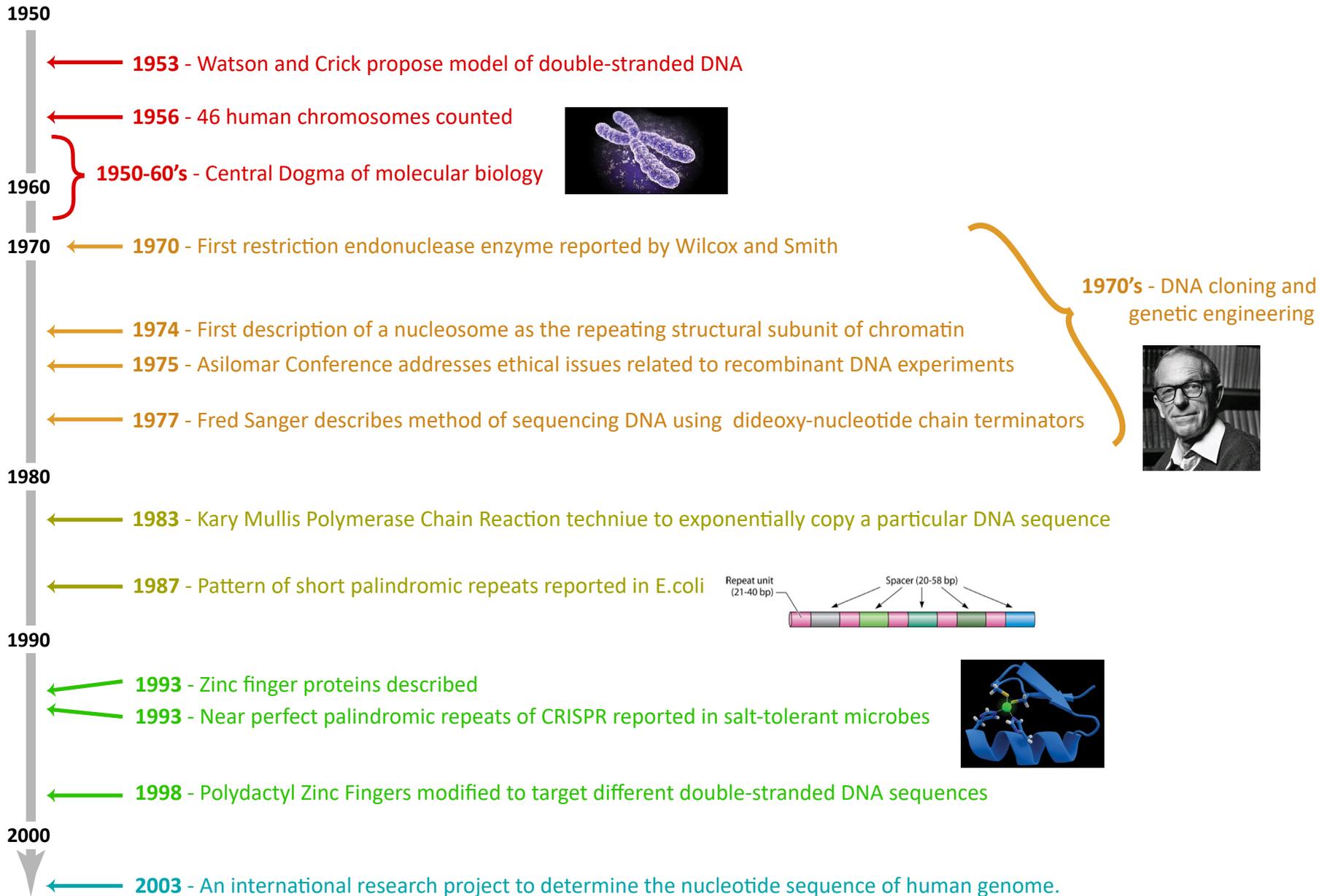


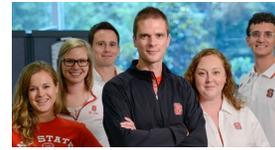
# The Historical Context of CRISPR-based Genome Editing



← 2005 - CRISPR sequences reported to contain foreign DNA suggesting an adaptive immune system

← 2007 - CRISPR provides acquired resistance against viruses in prokaryotes

← 2008 - CRISPR system cuts DNA of foreign pathogens



2010 ← 2010 - Transcription Activator Like Effector Nuclease Proteins (TALENs) used to target DNA sequences

← 2012 - Charpentier and Doudna describe single-guide RNA

← 2013 - Targeting CCR5 in HIV-AIDS patients with ZFNs

← 2013 - Addgene distributes CRISPR reagents to 25,000 labs over next 3 years

← 2013 - Feng Zhang and others modify CRISPR to edit mammalian genomes



← 2014 - The molecular structure of CRISPR Cas9 is reported by Jennifer Doudna's group

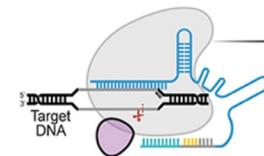


← 2015 - Asilomar 2 addresses ethical issues related to genome engineering

← 2016 - Programmable base editing in genomic DNA without double-stranded DNA cleavage



← 2019 - Prime editing without double-strand breaks or donor DNA



2020

← 2020 - Nobel Prize in Chemistry to Jennifer Doudna and Emmanuelle Charpentier



← 2020 - CRISPR-Cas12-based detection of SARS-CoV-2



← 2021 - In vivo CRISPR base editing of PCSK9 durably lowers cholesterol in primates

← 2021 - CRISPR-Cas9 gene editing for sickle cell disease and  $\beta$ -thalassemia

