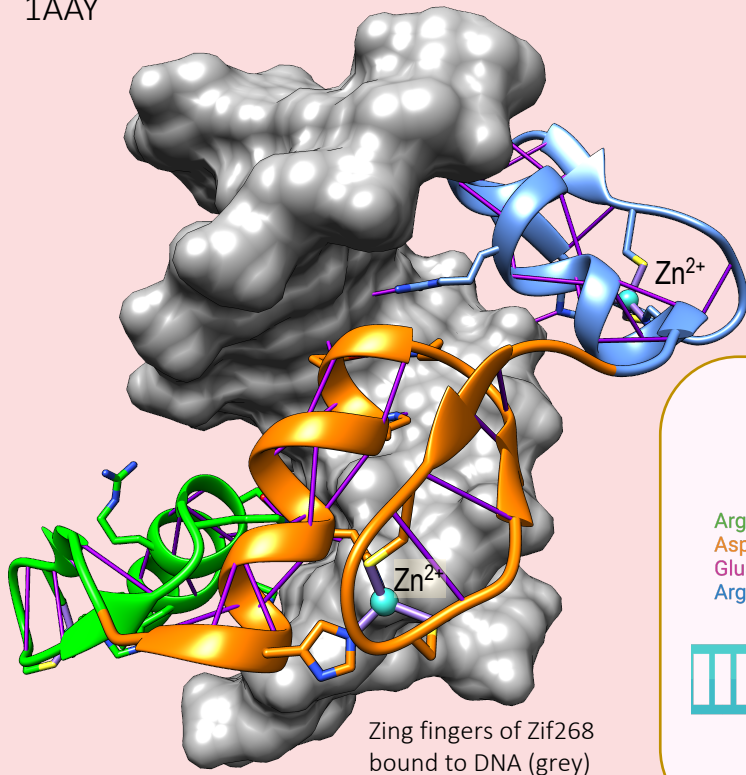


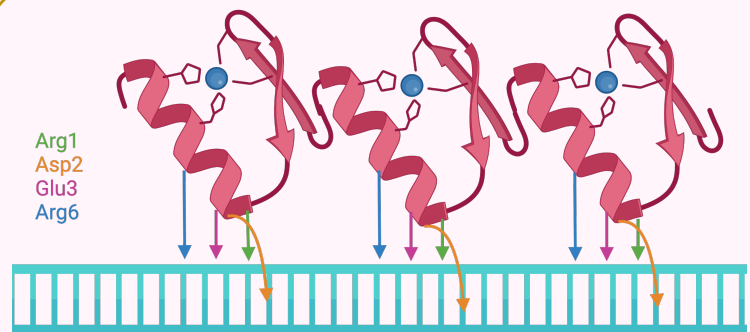
# MOLECULE OF DNA BINDING

1AAY



## Zinc Finger

- structural motif found in many different eukaryotic nucleic acid binding proteins
- given the name because it contains a zinc ion ( $\text{Zn}^{2+}$ ) and grips DNA like a finger<sup>1</sup>



Three Zn fingers of the Zif268 transcription factor and the amino acids that interact with DNA<sup>1</sup>

### STRUCTURE

- each zinc finger has a short **antiparallel beta sheet** and an **alpha helix** held together by hydrophobic interactions
- zinc ion ( $\text{Zn}^{2+}$ ) is coordinated to two cysteine residues on the beta sheet and two histidine residues on the helix
- $\text{Zn}^{2+}$  is essential for stability of the structure
- finger helices interact with bases in the DNA in the **major groove**
- three amino acids (position 1<sup>Arg</sup>, 3<sup>Asp</sup>, and 6<sup>Arg</sup> on the alpha helix) hydrogen bond to three consecutive bases on the coding strand of the DNA
- amino acid in helix position 2<sup>Ser</sup> can hydrogen bond to a base on the opposite DNA strand
- amino acids in these positions vary and dictate which nucleotide sequence is recognized in the DNA

### FUNCTION

- common structure to many **transcription factors**, proteins that bind to DNA and regulate **transcription** (synthesis of RNA from a DNA template)
- also found in proteins involved with DNA repair, RNA binding, protein degradation, and signal transduction

### Applications in research and medicine<sup>1,2</sup>

- engineered in the laboratory to recognize specific DNA sequence<sup>3</sup>
- can be linked to **nucleases** (enzymes that degrade nucleic acids) and other proteins for use in gene editing and as potential therapies for HIV infection, cancer, and Alzheimer's disease<sup>3</sup>

<sup>1</sup> Cassandri et al. Cell Death Discovery (2017) 3:17071. <sup>1</sup> Cross. C&EN Global Enterprise (2020) 98:25. <sup>3</sup>Klug. Annu. Rev. Biochem. (2010) 79:213–31.  
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