CHROMOS
DNA INSIDE CELLS
THE VR EXPERIENCE

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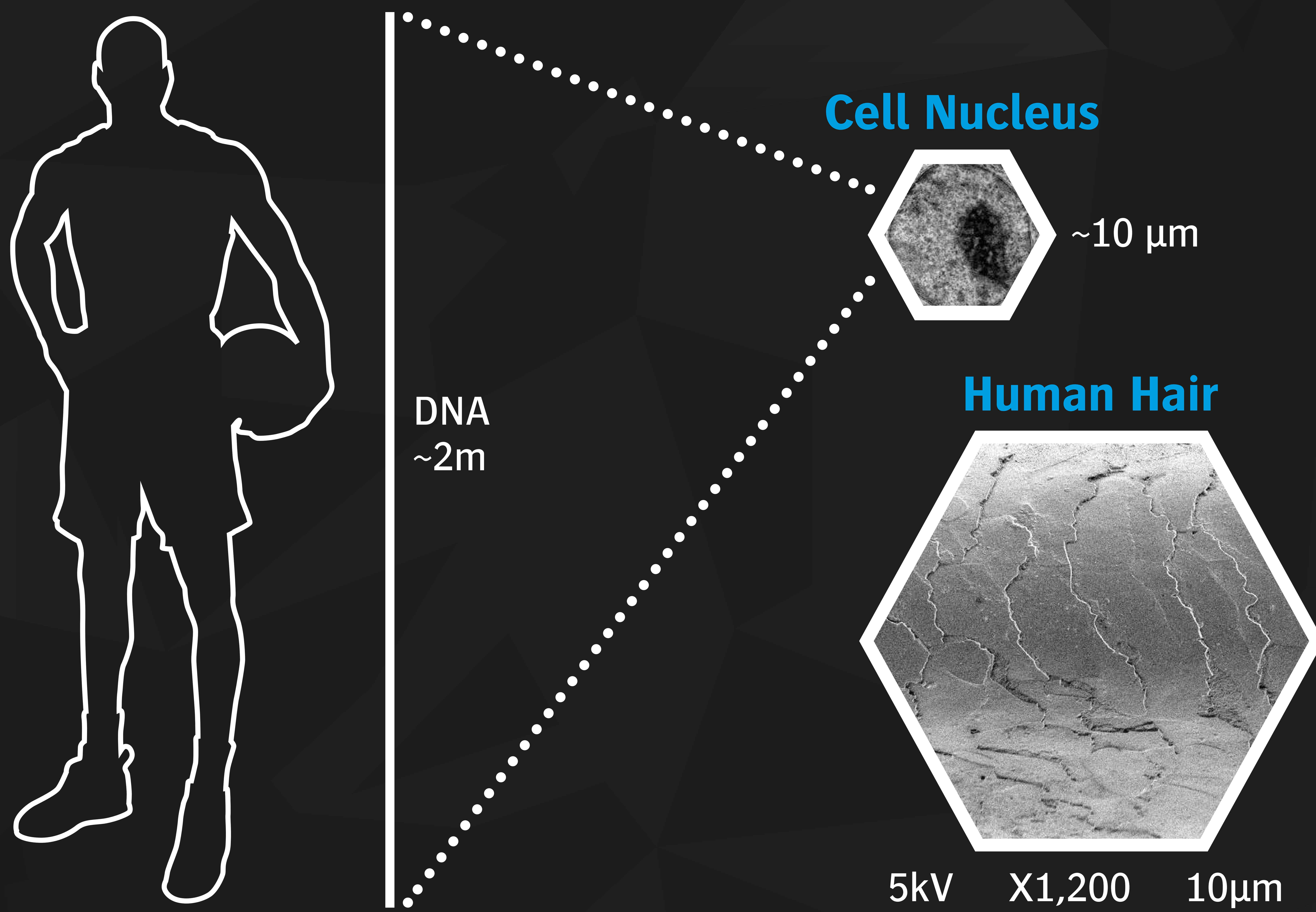
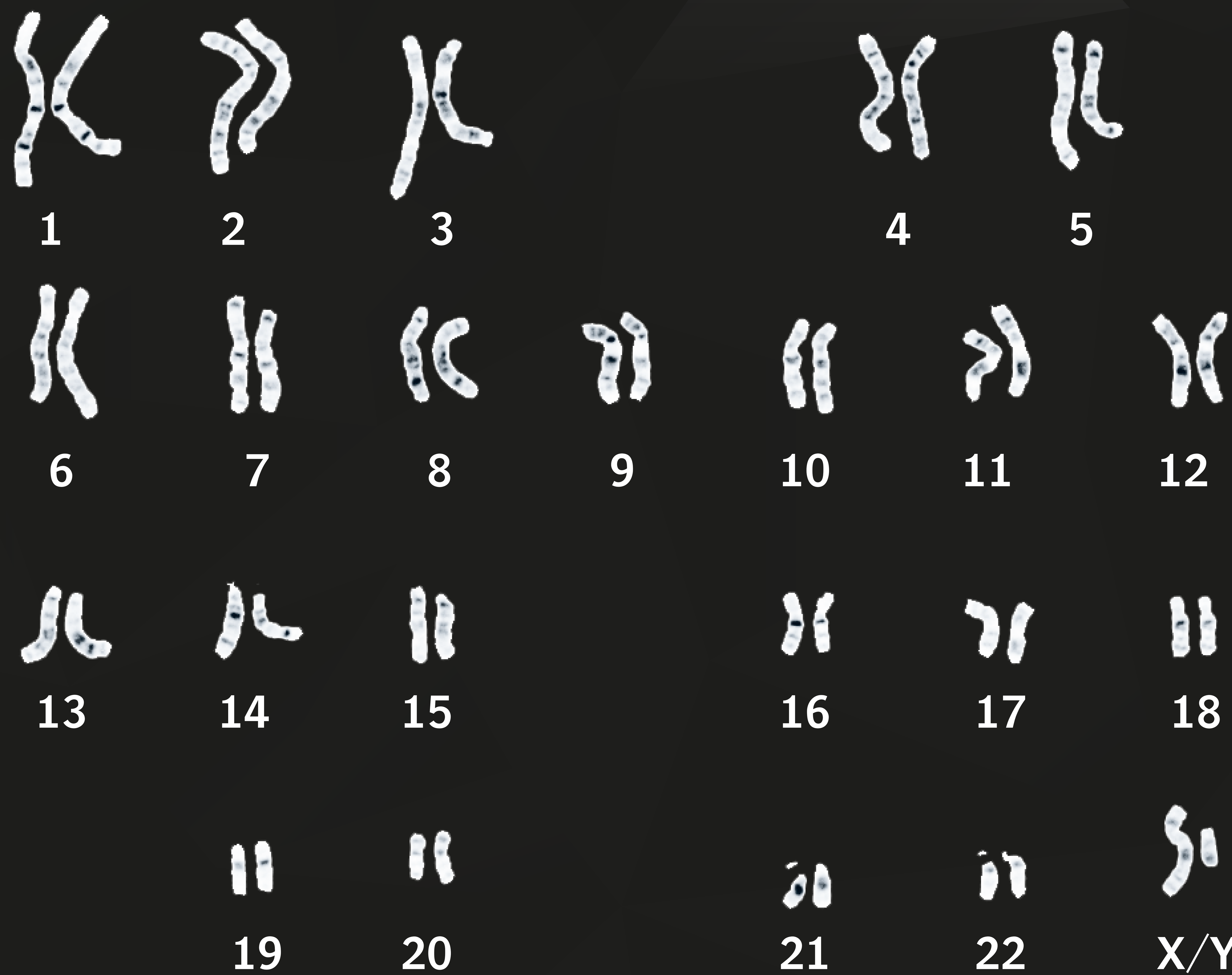
...ACGACATTGCCTACATGGTCAAA...

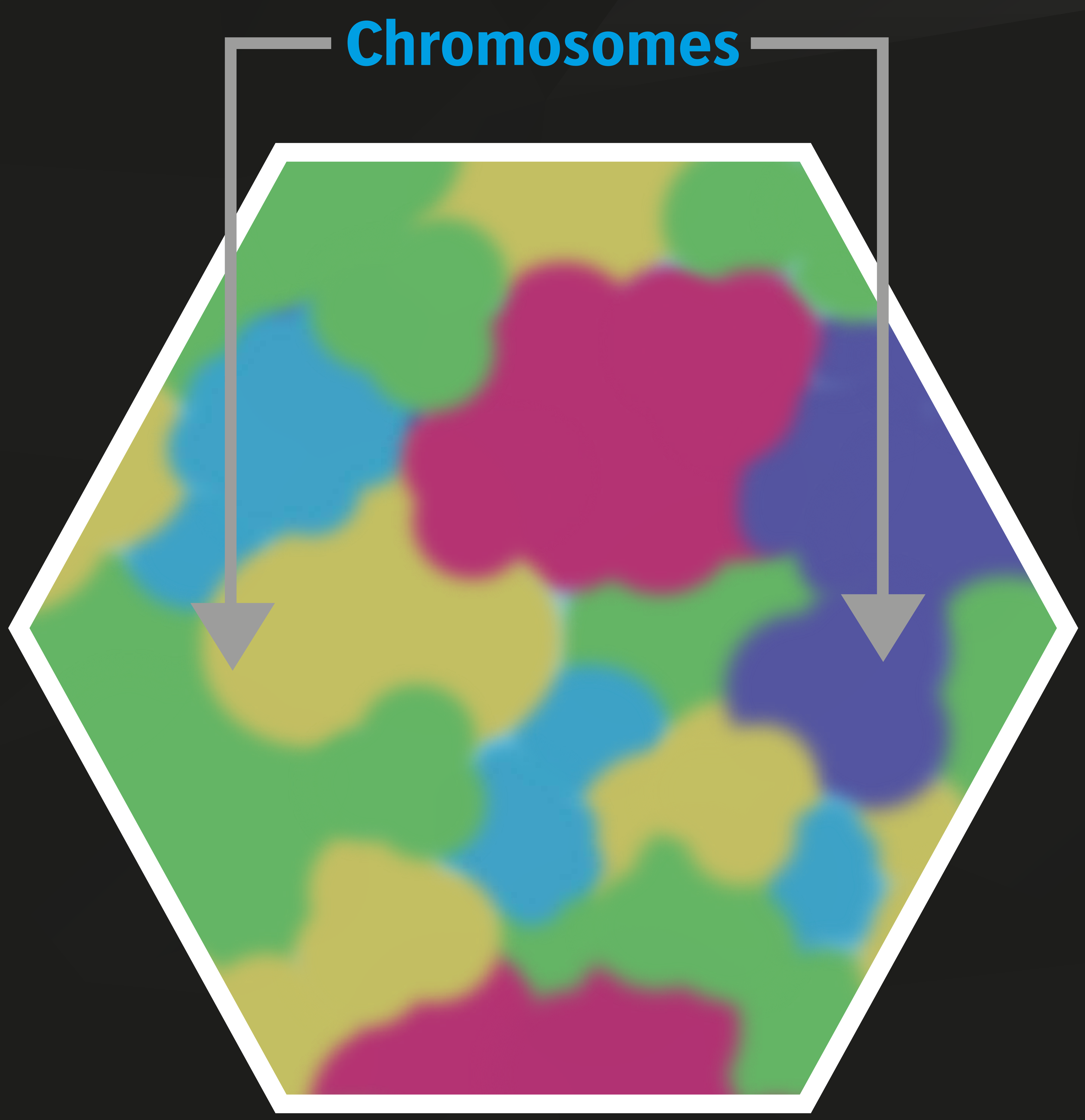
The human genome (all DNA in each cell's nucleus) is made up of 3.2 billion letters which amounts to a book with 2 million pages.



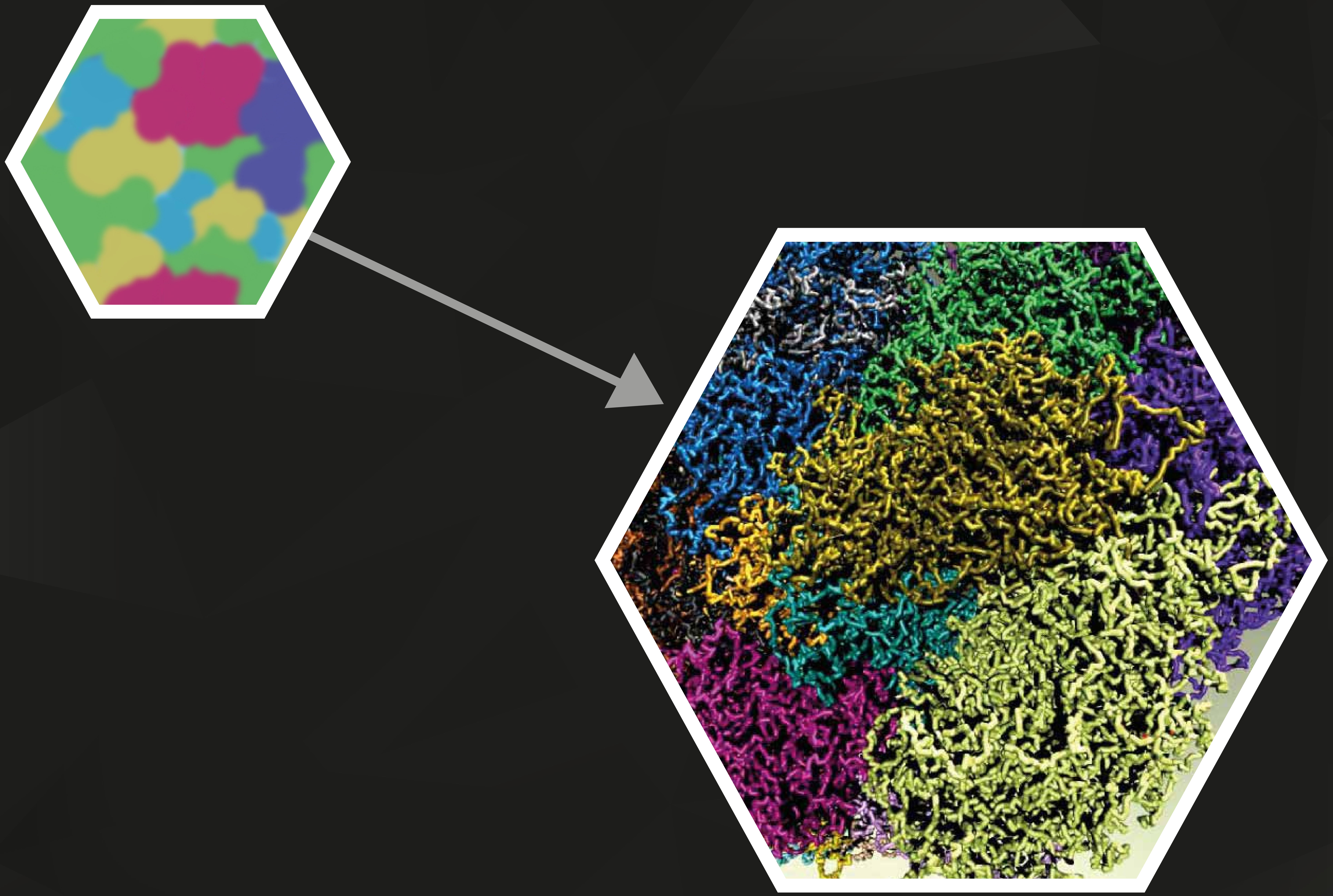
The total length of the DNA in each human cell is nearly 2 metres.
If you add up all the DNA in the body it would stretch to the Sun and back 67 times. So, our DNA needs to be tightly packaged in the cell's nucleus.



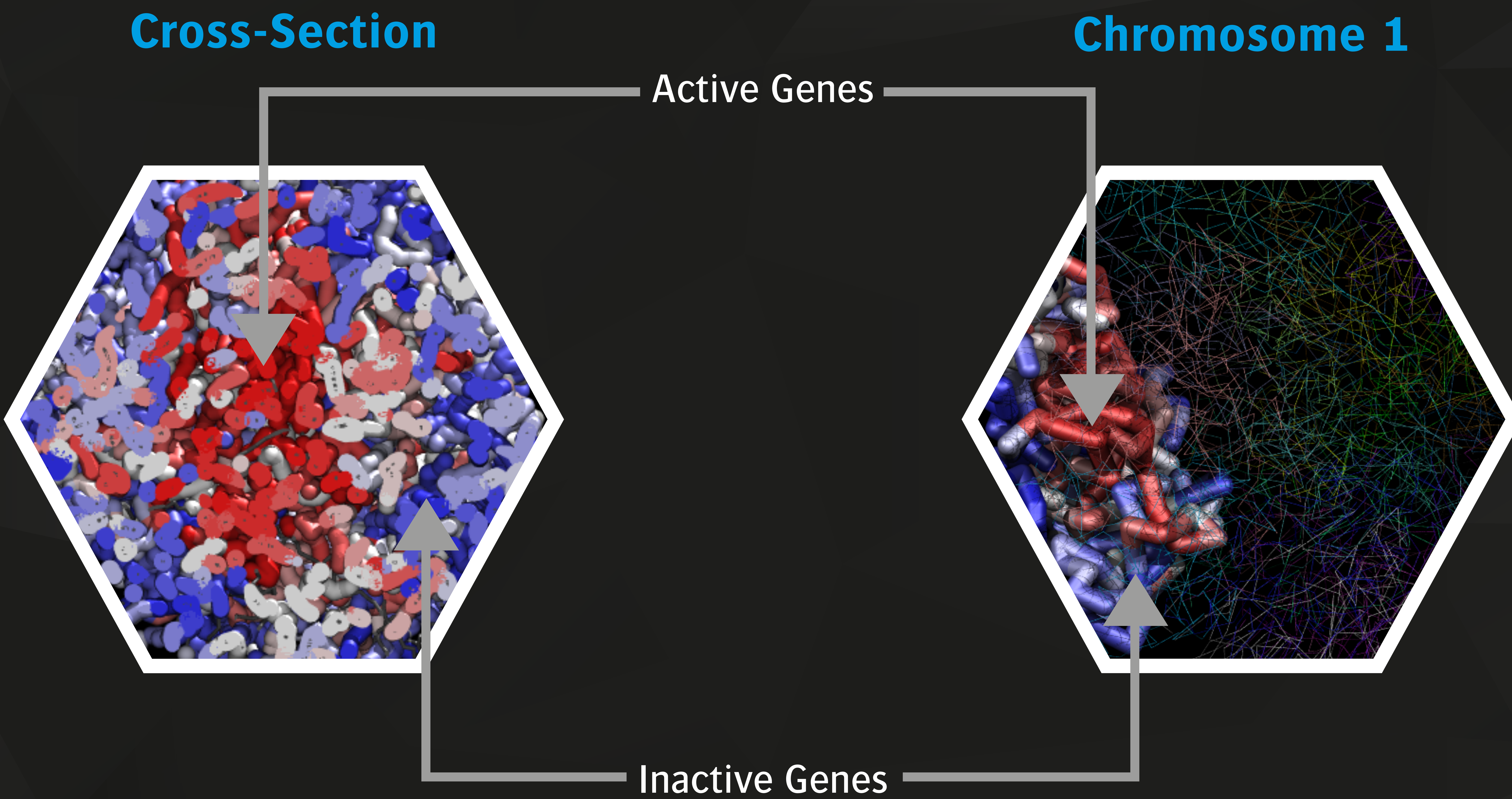
Human DNA is packaged into 46
separate chromosomes. This is the view of the chromosomes
that we’re used to seeing, but it’s only like this when cells are dividing.



Between cell divisions, chromosomes are much more ‘fuzzy’ and less structured. But, this is a low resolution view.

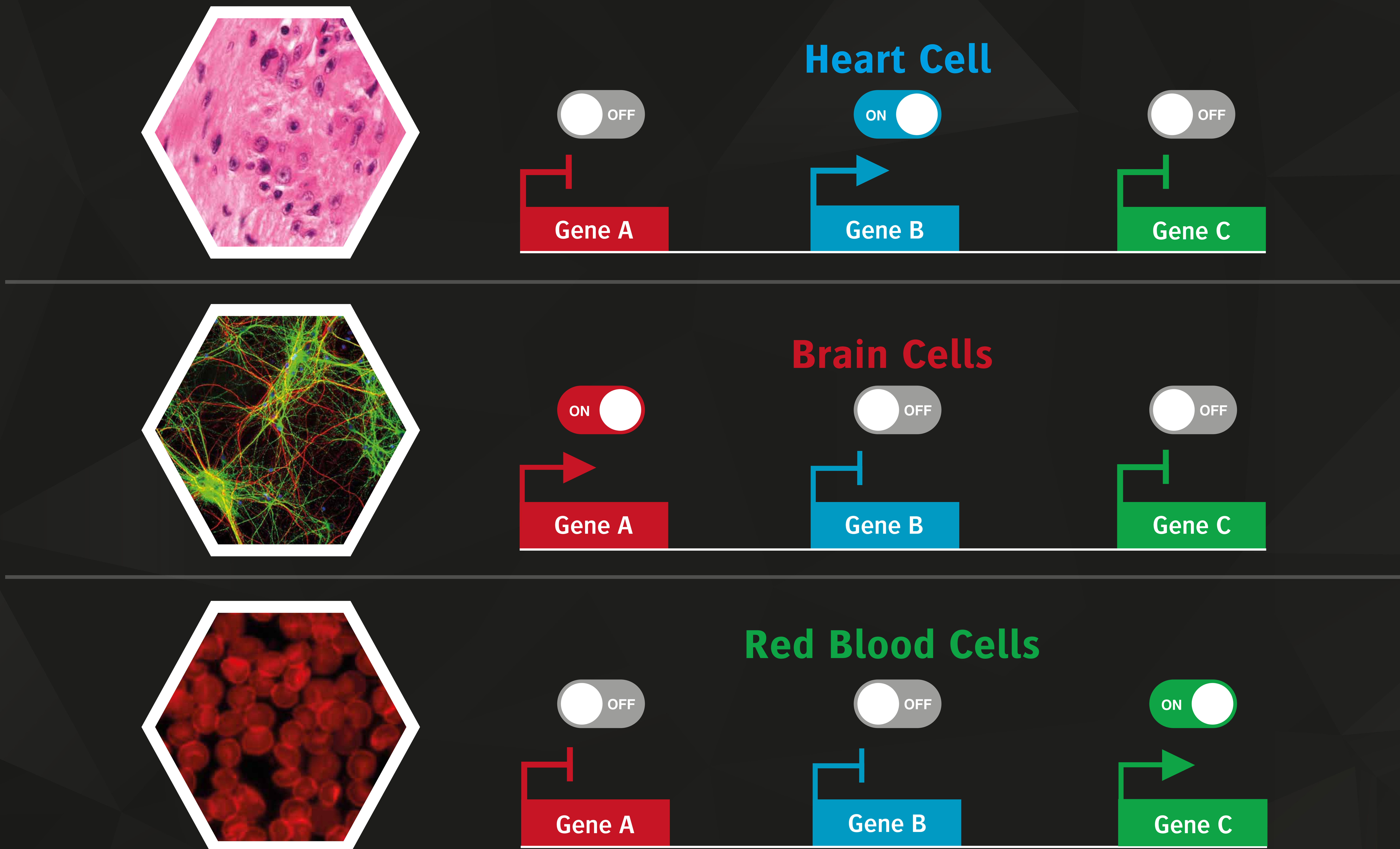


Biochemical methods developed by us and others, coupled with computational modelling result in a higher resolution picture of what DNA looks like “normally”.



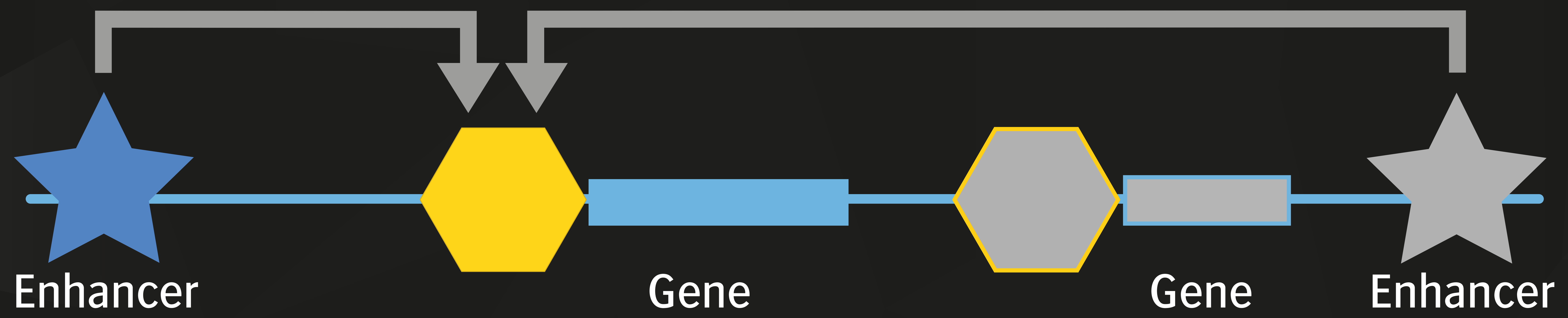
DNA packaging is not just about stuffing the DNA into the nucleus – it's also about regulating its activity. Active and inactive parts are segregated in the nucleus. Active genes are organised into hubs inside the nucleus with inactive ones pushed to the periphery.

There are more than 200 cell types in the human body
and different cells need to read different parts of the DNA.

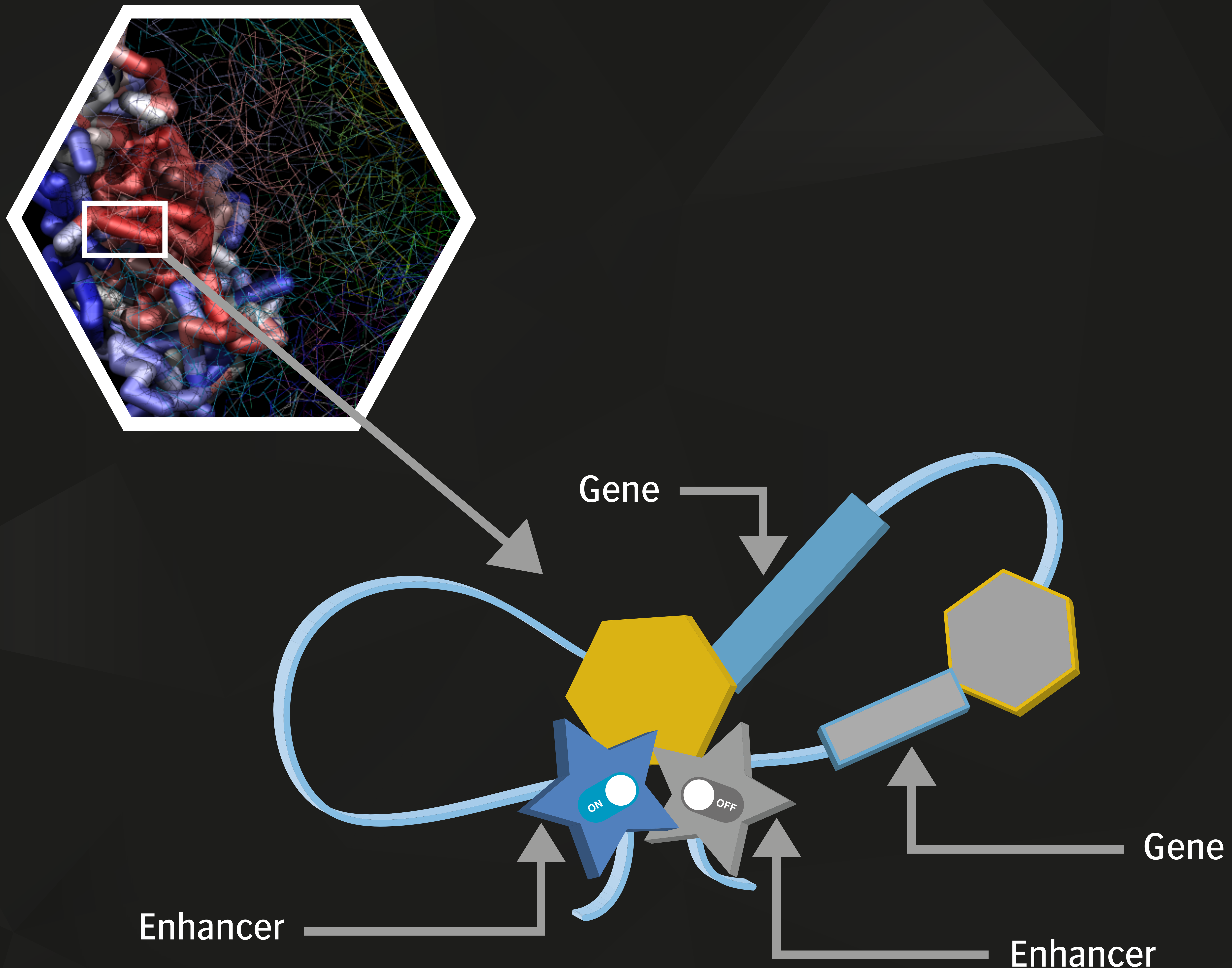


Molecular switches on the DNA known as 'enhancers' control which genes are turned ON and OFF in different cells. Intriguingly, they are often far away on the DNA from the genes they control – in some cases, a million base pairs away.

Linear View

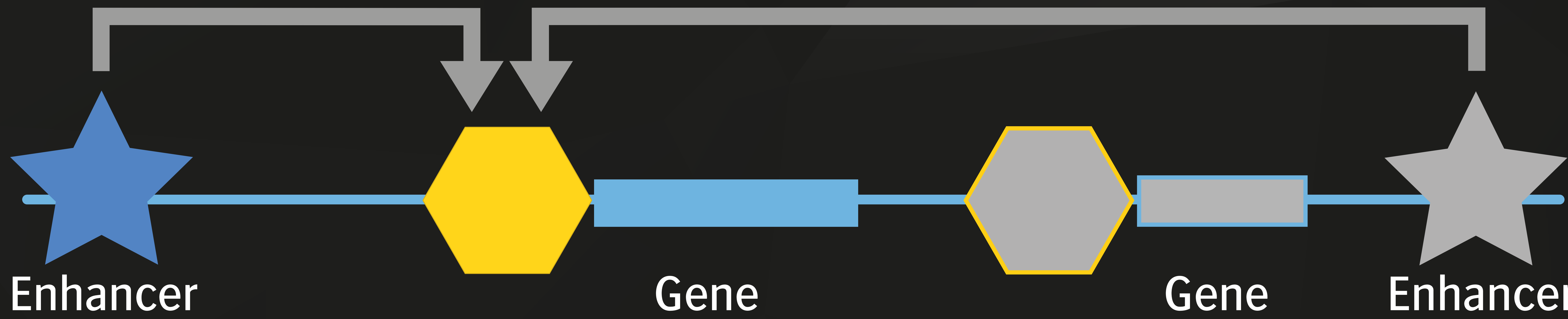


If you looked at the linear strand of the DNA,
you'd never guess that these regions were close together.

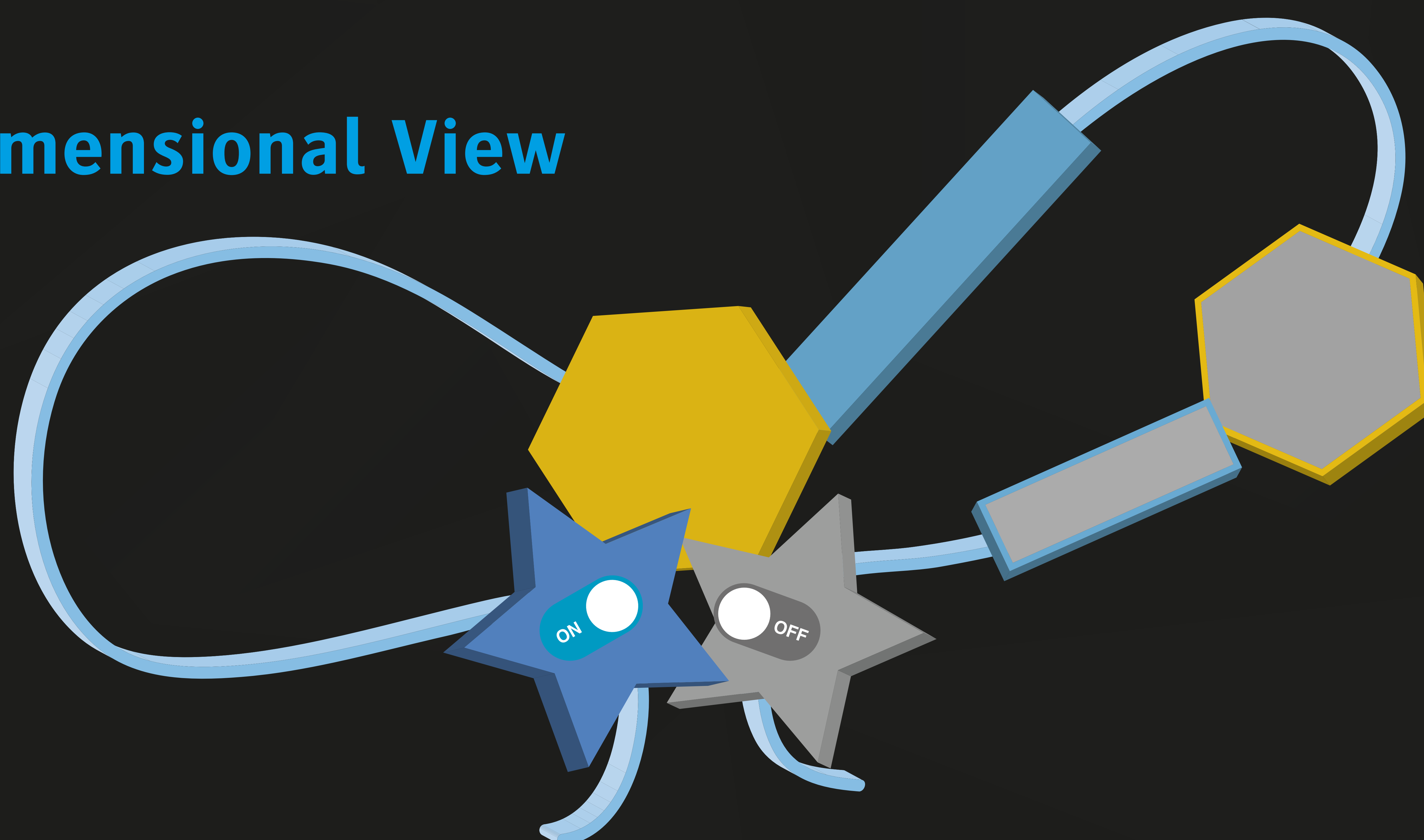


The genome folds in a way that brings
these switches close to the genes they control.

Linear View

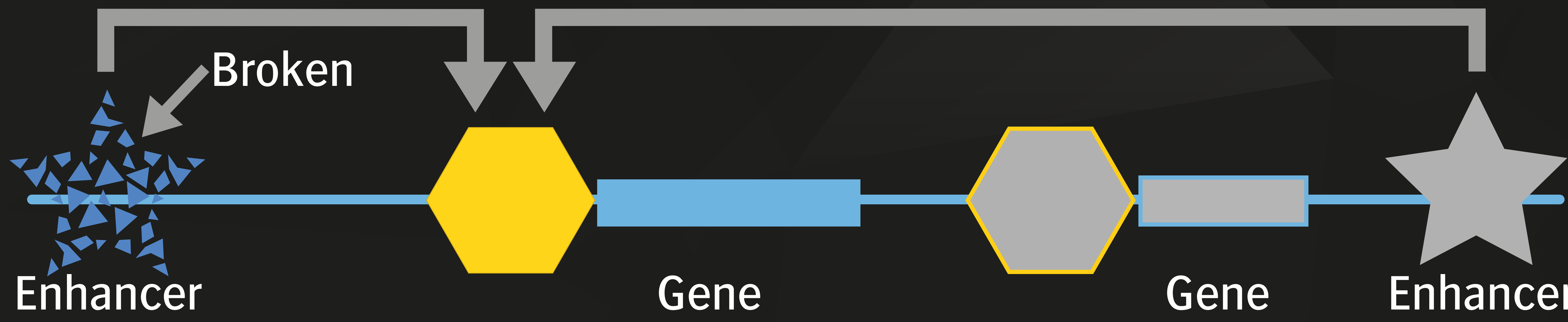


Three Dimensional View

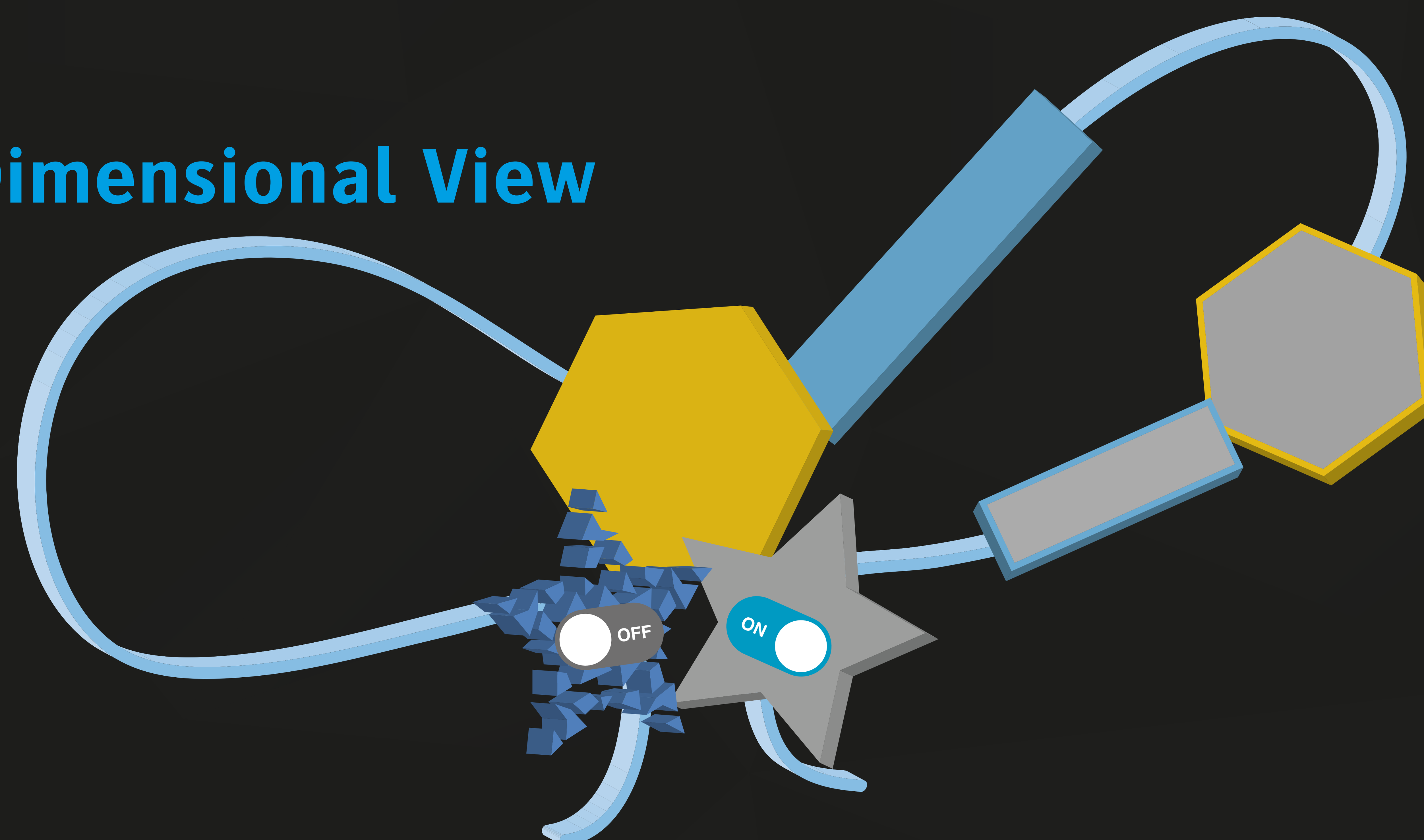


Research by us and others has mapped 3D genome folding at high resolution, so that we now know which switches regulate which genes.

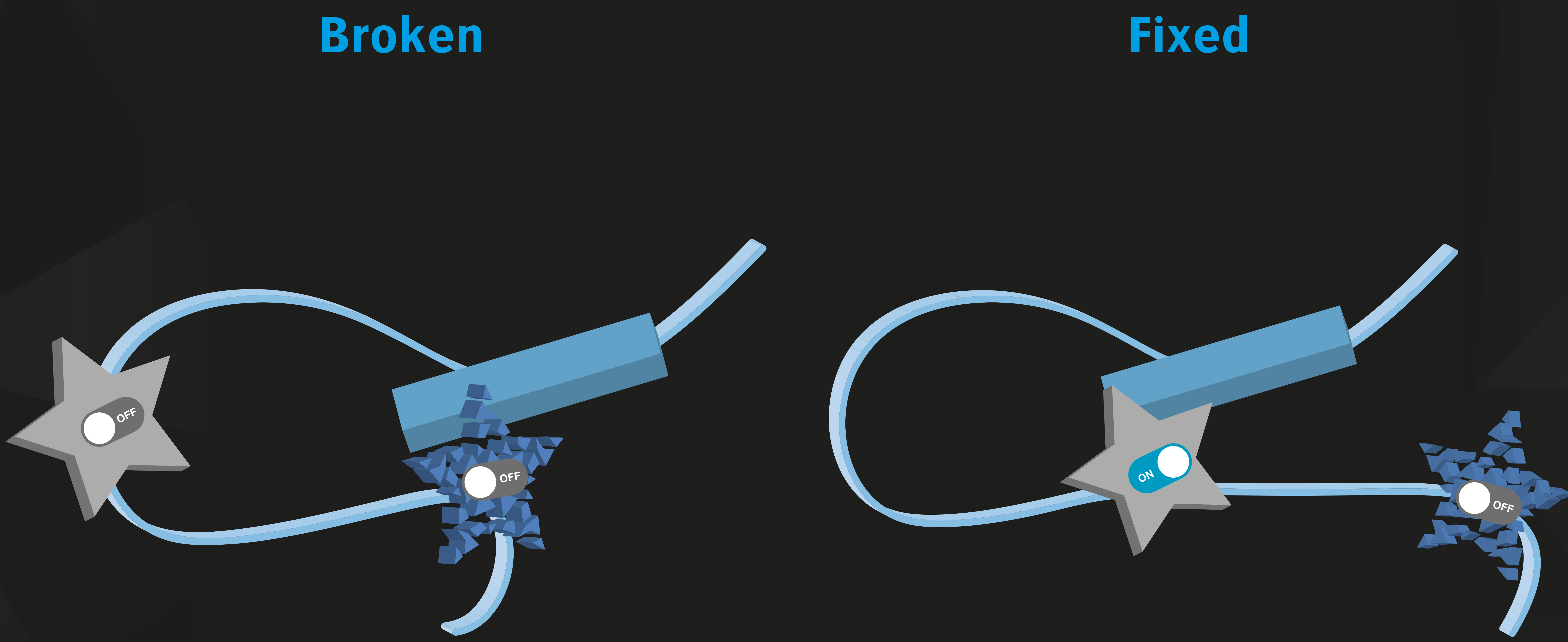
Linear View



Three Dimensional View



This research is important as these switch regions contain mutations that cause disease, and without knowing the 3D structure it's impossible to know what genes are affected, and what can be done to alleviate or treat it.



In the future, it may be possible to rewire genes away
from faulty switches and reconnect to those that are functional.

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