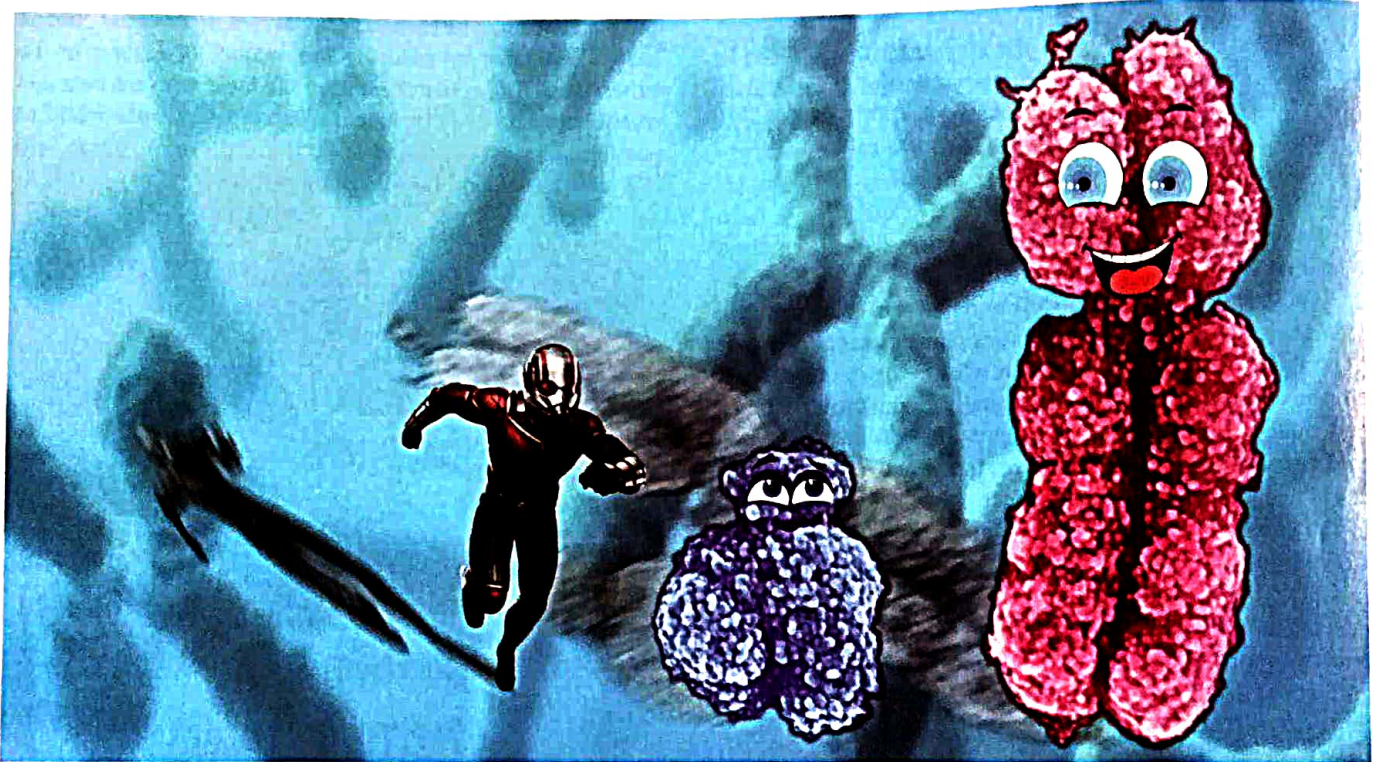


Men Losing it? The Y Chromosome's Evolutionary Struggle

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IMAGINE yourself as Ant-Man, shrinking and shrinking until you reach the size of a blood cell and even smaller. You are blasting through a fantastical world that looks ripped straight out of Wakanda in *Black Panther*. Yes, you have landed in the nucleus of a cell that houses the secret of life. The secret codes that build the human body are imprinted safe in this special vault, etched not on vibranium tablets but woven into the twists and turns of magical double-helical strands — the chromosomes! Navigating through the alleys, you bump into a friendly chromosome with bright pink arms that remind you of Shuri's holographic displays. 'Hi! Welcome to our secret world!' she greets cheerfully. 'I'm X, and meet my partner, Mr Y', she motions towards a shorter, mischievous-looking chromosome with a single blue arm. "We, the chromosomes, are the blueprints for building humans," X explains. "Each of us has specific sets of information, and together, we complete the entire blueprint," she adds. "I'm a bit choosy though; only guys get me!" smirks Y. This fascinates you to learn more about this dude, the Y chromosome.

For millions of years, the Y chromosome has been getting smaller, leaving scientists wondering: is it destined for extinction? Long back, around 180 million years ago, the Y chromosome was not as loner as it is today. It was

somewhat similar in size to its twin, the X chromosome. Both had tons of genes, but their job was not known much. Five 'stratification' events, presumably inversions of chromosome segments, reduced the Y chromosome's ability to pair with its partner, the X chromosome. Then, something unprecedented happened. The Y chromosome got some weird cycles of addition and attrition that morphed it into the player for sex determination as it is today. The most significant step in this metamorphosis is the acquisition of the "Sex-determining Region on the Y" (SRY) gene. SRY is a modified version of another gene, SOX3, found on the X chromosome. Studies suggest that the SRY evolved from SOX3 rather recently by mutation and loss of some sequences. SRY encodes a transcription factor, a protein which basically flips the switch for developing testis. This initiates male sex determination.

While the SRY gene is the crown of the Y chromosome, it is not alone. It contains other genes responsible for sperm production, male fertility, and even some aspects of behaviour, like how well you navigate a maze. However, the remaining genes are usually strewn with mutations, showing just how vulnerable the Y chromosome is. Fascinatingly, some Y chromosome genes have already "hopped" to the X chromosome, where a small region of recombination can occur, ensuring the survival of these essential functions.