Movies of life show the dance of dividing cells *by* Ed Yong

Imagine filming a movie hundreds of thousands of times with an infinitely patient crew. Every time you shoot it, you remove just one thing, be it an actor, a line of dialogue or a crew member. By comparing the resulting films, you'd soon work out which elements were vital to the movie's success, and which could be lost without consequence. Beate Neumann, Thomas Walter and a group of scientists known as the Mitocheck Consortium have taken just such an approach to better understand one of the most fundamental processes of life, cell division.

Neumann and Walter wanted to work with far more dramatic stars – DNA, proteins and the like. Their task was to work out which genes were vital for the process of mitosis, the immensely complicated operation where one cell divides into two. To do that, they systematically went through each of the 21,000 or so genes in the human genome and turned them off, one by one, in different cells. They then filmed the consequences as the cells divided in two.

Name a gene, any gene, and with a couple of mouse clicks, you can find a movie that shows you what happens when it's knocked out. You can work out if your favorite gene is essential to cell division, and you can even find other genes that have similar effects.

The movies are certainly useful, but they are beautiful in their own right. For a daily and microscopic process, mitosis is an astonishingly beautiful dance. It begins with cells creating the right number of partners, by duplicating all of their chromosomes (**interphase**). At first, the dancers haphazardly mingle with each other (**prophase**) but as things get underway, they separate and line up in a neat row (**metaphase**). Then, dramatically, they shimmy across to opposite ends of the room, following long spindles of protein (**anaphase**). Once the partners split up, the cell pinches down its middle (**telophase**) and separates them forevermore (**cytokinesis**). Without this courtly dance, you would never have been anything more than a fertilized egg. Life simply wouldn't work.

The first video shows mitosis working normally, when no genes have been silenced. Each cell is green and its chromosomes are decked out in red. It's all very festive. Two days are condensed into 36 seconds, and two cells become eight.

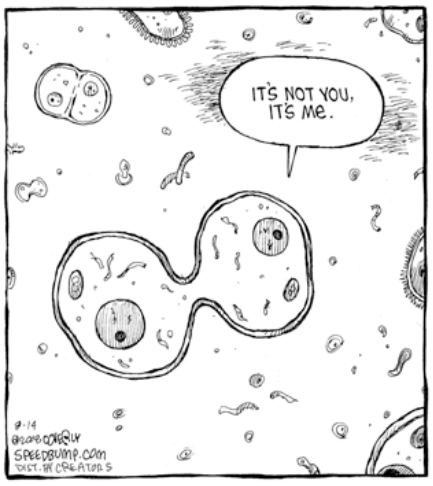
One video shows the chaos that ensues when a single gene called OGG1 is turned off. No longer is mitosis the orderly tango of before; this is more like a rave. Cells fail to separate properly, leaving multiple bundles of chromosomes jangling about in the same space.

In the end, Neumann and Walter identified 572 genes that play a role in mitosis and less than half of these had been linked to the process before. The rest were new, and they reveal just how much we still don't know about this most fundamental of processes.

But already, the sheer scale of the data that have been collected is a tremendous boon to scientific research. There implications for cancer alone are huge. Cancer cells divide all too often and many cancer drugs are designed to stop them from doing so. Scientists could use the Mitocheck data to find new targets for tomorrow's drugs or to better understand how existing drugs work. They could also work out the genetic differences that cause cancer cells to divide differently from normal cells. "Now that we have narrowed down the gene set relevant for cell division to about 600, we can systematically investigate those differences in a number of different cell types, which would not be possible across the entire genome," says Ellenberg.

Even cell division is just the tip of the iceberg. The movie library also contains shots of cells growing, moving and dying and they can be used to understand the genes that underlie these processes too. The Mitocheck team are even working on next-generation technologies that will allow them to watch proteins interacting in living cells, revealing the dances of not just mitotic chromosomes but of all a cell's molecular characters.

For years to come, scientists will be watching, poring over, and adding to the movies that have been unveiled today. There has surely never been a more informative or intimate video collection of our lives.



Science in the News #6

Name: **Period:**

1. Read and 'talk' with the text on the back of this page ☐

2. Complete all of the sentences below ☐

To 'talk' with the text on back:

1. underline : important facts
2. ☆ : interesting ideas
3. ◯ : vocabulary
4. **?** : What you want to know more/ don't

The article that I just read is about_____

_____

_____

_____

_____

I think I am reading this article because in _____ class we are/were studying_____

_____

_____.

One word from the article I did not know the meaning of was_____. When I looked this word up in the dictionary I find out it meant _____

_____.

The most important sentence in the article to me is "_____

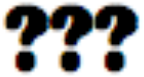
_____."

This quote means _____

_____.

I think this quote is the most important sentence in the article because _____

_____



After reading the article I wonder _____?

Another question I still have after reading the article is _____

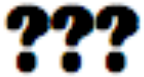
_____?


summarizing


making connections

Research


Important details


questioning