Integrins and the Social Network of Cells

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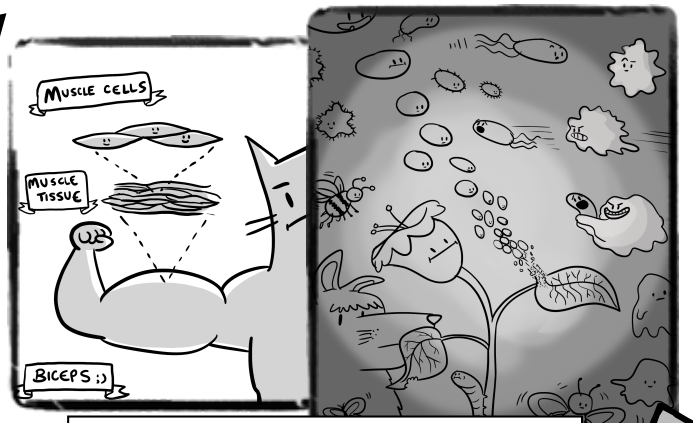

Cells organize in the millions to form many different types of structures and many different types of living things. Understanding how they do this is key for science and also our health.

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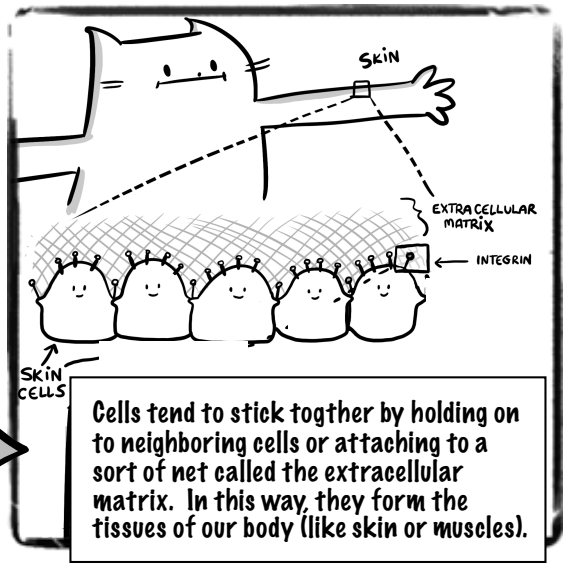

Cells tend to stick togther by holding on to neighboring cells or attaching to a sort of net called the extracellular matrix. In this way, they form the tissues of our body (like skin or muscles).

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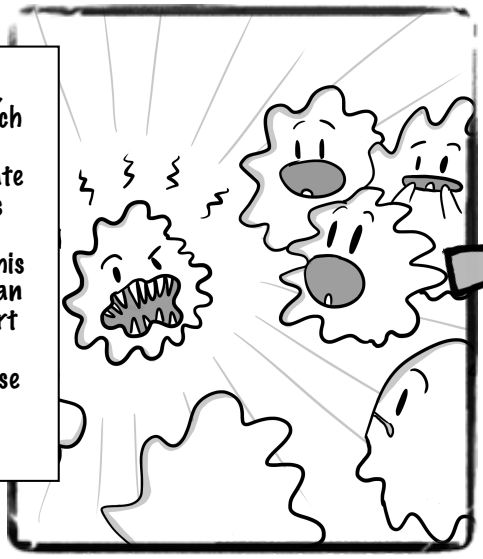
Apart from touching, cells also "talk" to each other by exchanging signals that coordinate their actions. If cells can't touch and communicate well, this ruin networks and can bring disease. It's sort of like when people can't get along because there is a failure to communicate.



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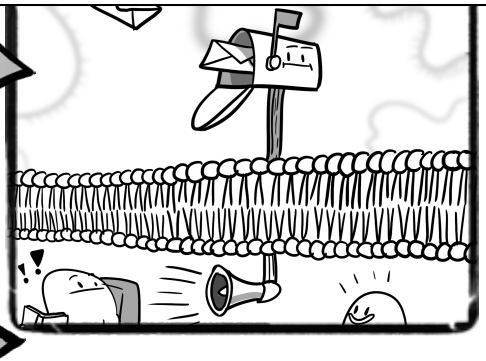
Cells use special proteins that span the membrane of the cell. This way they can relay information about both the inside and outside of a cell. One of these proteins is known as an integrin and their job is to help cells see the outside world. These cool proteins were first discovered by Dr. Timothy A. Springer.



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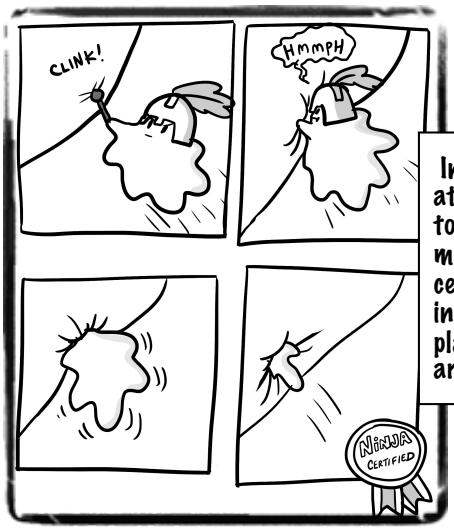

Integrins help cells attach and dettach to the extracellular matrix. This helps cells move around inside our bodies to places where they are needed.

An interesting example of an integrin's job is found in white blood cells (cells in charge of protecting the body against infection): White cells floating in the bloodstream detect a site in trouble whithin the body.

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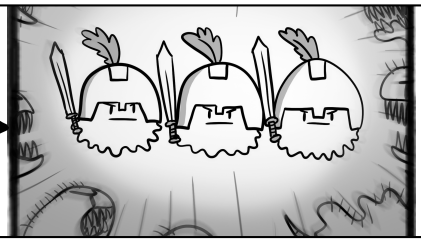

They then use their integrins to reach and stay with the damaged tissue. This is why integrins are heavily studied in medical research - you can imagine all the problems that might happen if your integrins aren't working properly!

Art by Armin Mortazavi and text by Daniela Salas Acosta. October 2019

Plants: Amazing Phyto-Pharmacies

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Cancer is the leading cause of death in Canada, and we need new medicines.

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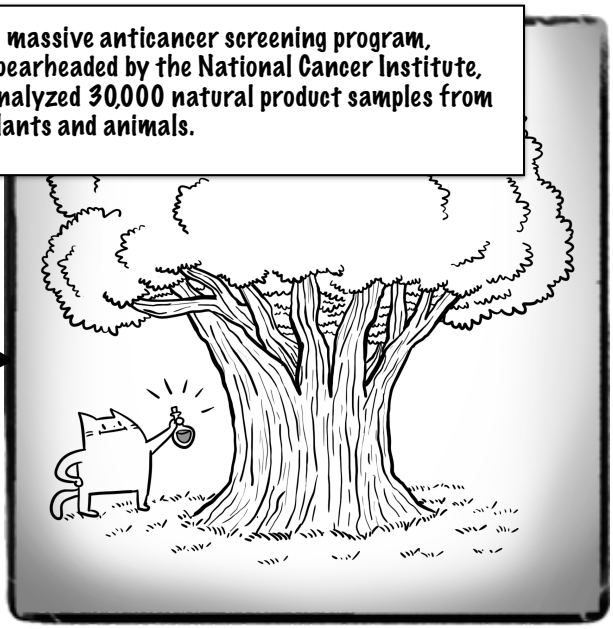
A massive anticancer screening program, spearheaded by the National Cancer Institute, analyzed 30,000 natural product samples from plants and animals.



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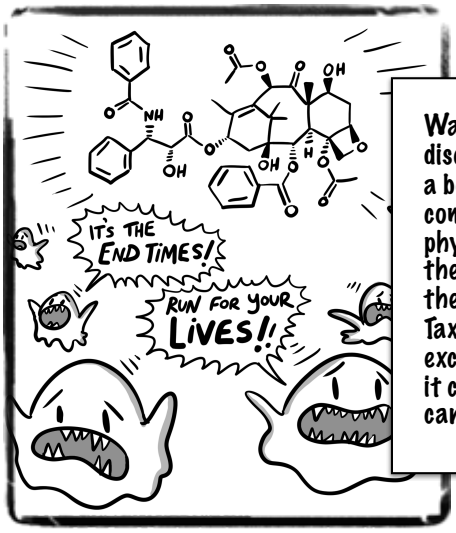

Wani and Wall discovered Taxol, a beautifully complex phytochemical, in the bark from the Pacific Yew. Taxol was exciting because it could kill cancerous cells.

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Horwitz and Schiff figured out that Taxol killed cells in a way no one had ever seen before (binding to microtubules to interrupt mitosis).

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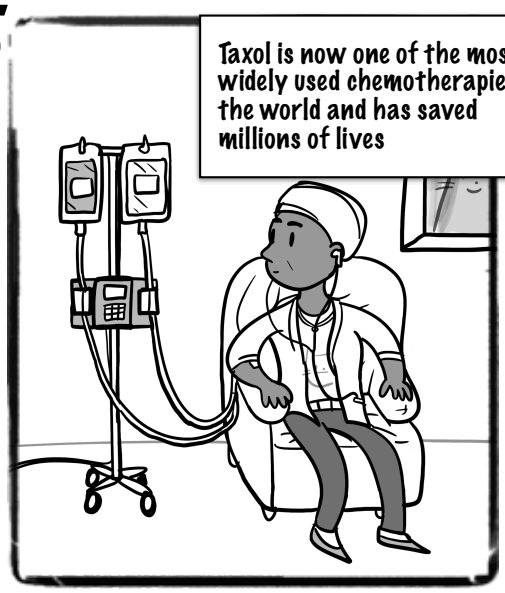
Taxol is now one of the most widely used chemotherapies in the world and has saved millions of lives



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More medicinal phytochemicals exist, undiscovered, in our natural environment, and we have to preserve the environment if we ever hope to find them. Your life could depend on it.

Art by Armin Mortazavi and text by Alison McAfee. October 2019

Kinesin: The Little Engine that Could

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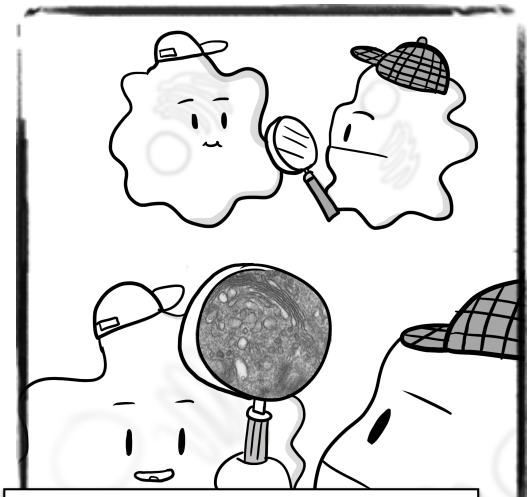

Cells operate like tiny machines and their inner workings are very complex. There is still a lot that needs to be figured out.

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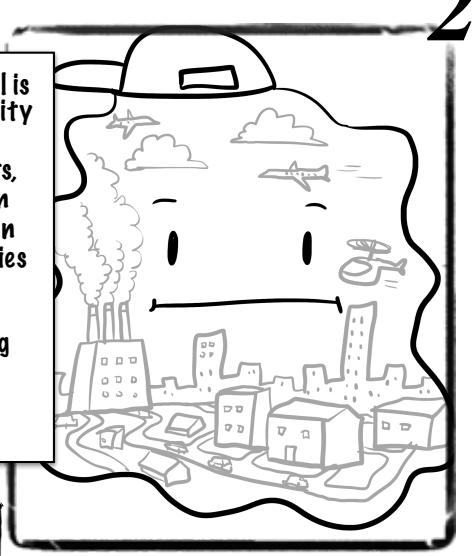

The inside of a cell is organized like a city with many different districts, each with its own important task. In both cells and cities alike, motorized transport plays a key role in moving things between these different districts.

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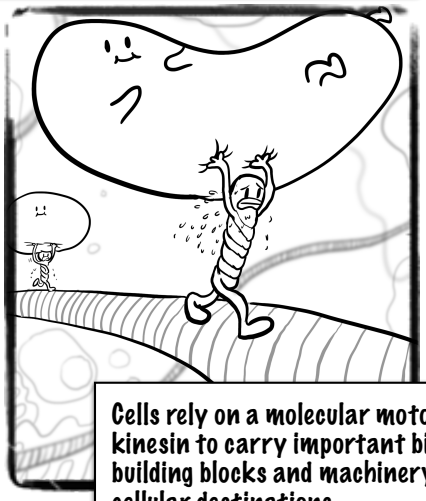

Cells rely on a molecular motor called kinesin to carry important biological building blocks and machinery to their cellular destinations.

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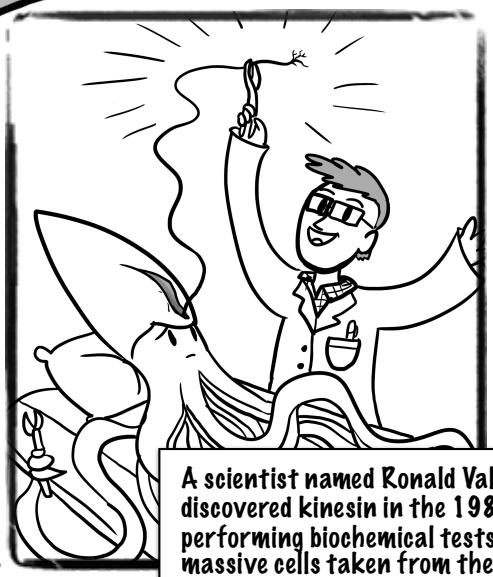

A scientist named Ronald Vale discovered kinesin in the 1980's by performing biochemical tests on massive cells taken from the giant squid. These cells were chosen because their large size made them easier to study.

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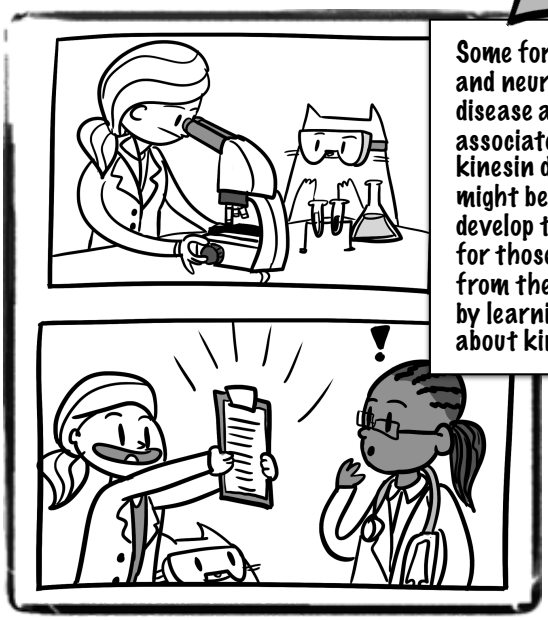

Some forms of cancer and neurological disease are associated with kinesin defects. We might be able to develop treatments for those who suffer from these diseases by learning more about kinesin.

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Dr. Ronald Vale is the recipient of a 2019 Canada Gairdner Award for his contributions to cell biology. The Gairdner Award is a prestigious honor that recognizes researchers who have made a big impact in their field of study.

Art by Armin Mortazavi and text by Shawn P Shortill. October 2019

DNA Replication: Not your Office Photocopier

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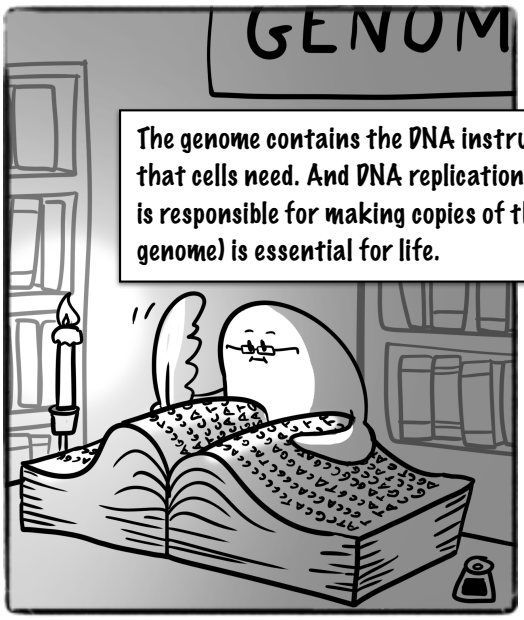

The genome contains the DNA instructions that cells need. And DNA replication (which is responsible for making copies of this genome) is essential for life.

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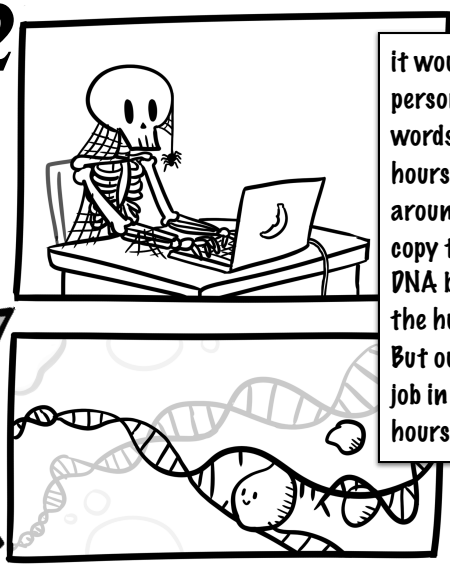

it would take a person typing 60 words per minute, 8 hours a day, and around 50 years to copy the 3 billion DNA base pairs of the human genome. But our cells do this job in only 8 to 12 hours!

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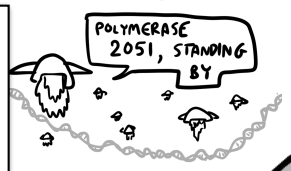
For this to happen, DNA replication starts at thousands of places at the same time. Scientists Dr. Stillman and Dr. Diffley were the first to figure out how this worked.



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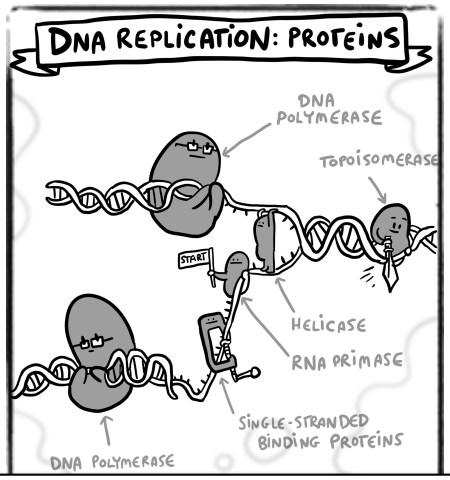

These starting points all recruit the proteins needed for DNA replication, which then all get going once the cell is ready to divide.

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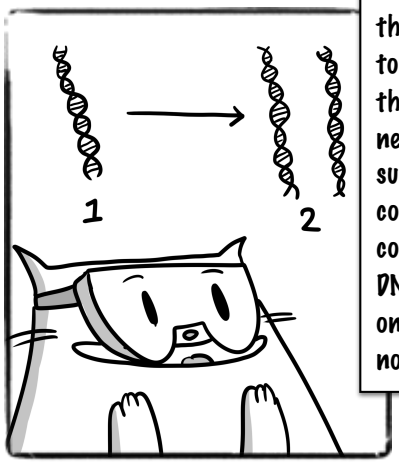

Not only does the timing have to be right, but the cell also needs to make sure that it copies the complete set of DNA exactly once (not more, not less!)

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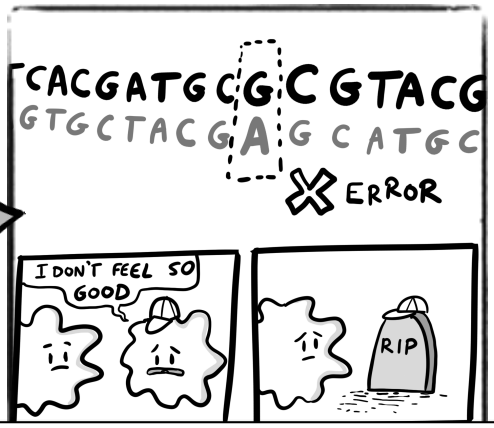

Basically, DNA replication of the genome has to be incredibly accurate because, otherwise, the instructions in the DNA code would get changed or deleted. Even the smallest mistakes can lead to cell death or cancer.

Art by Armin Mortazavi and text by Krysta Coyle. October 2019