

# TEDTALK ANNOTATED VIDEO TRANSCRIPTS

## Unit 1 LOUIE SCHWARTZBERG

### Hidden Miracles of the Natural World

#### Part 1

What is the intersection between technology, art, and science? Curiosity and wonder, because it **drives us**<sup>1</sup> to explore, because we're surrounded by things we can't see. And I love to use film to take us on a journey through portals of time and space, to make the invisible visible, because what that does, it **expands our horizons**,<sup>2</sup> it transforms our perception, it opens our minds and it touches our heart. So here are some scenes from my 3-D IMAX<sup>3</sup> film, *Mysteries of the Unseen World*.<sup>4</sup>

There is movement which is too slow for our eyes to detect, and time-lapse makes us discover and broaden our perspective of life. We can see how organisms emerge and grow, how a vine survives by creeping from the forest floor to look at the sunlight. And at the **grand scale**,<sup>5</sup> time-lapse allows us to see our planet in motion. We can view not only the vast sweep of nature, but the restless movement of humanity. Each streaking dot represents a **passenger plane**,<sup>6</sup> and by turning air traffic data into time-lapse imagery, we can see something that's above us constantly but invisible: the vast network of air travel over the United States. We can do the same thing with ships at sea. We can turn data into a time-lapse view of a global economy in motion. And decades of data give us the view of our entire

planet as a single organism sustained by currents circulating throughout the oceans and by clouds swirling through the atmosphere, pulsing with lightning, crowned by the aurora borealis. It may be the ultimate time-lapse image: the anatomy of Earth **brought to life**.<sup>7</sup>

**At the other extreme**,<sup>8</sup> there are things that move too fast for our eyes, but we have technology that can look into that world as well. With high-speed cameras, we can do the opposite of time-lapse. We can shoot images that are thousands of times faster than our vision. And we can see how nature's ingenious devices work, and perhaps we can even imitate them. When a dragonfly flutters by, you may not realize, but it's the greatest flyer in nature. It can hover, fly backwards, even upside down. And by tracking markers on an insect's wings, we can visualize the air flow that they produce. Nobody knew the secret, but high-speed shows that a dragonfly can move all four wings in different directions at the same time. And what we learn can lead us to new kinds of **robotic flyers**<sup>9</sup> that can expand our vision of important and remote places.

#### Part 2

We're **giants**,<sup>10</sup> and we're unaware of things that are too small for us to see. The **electron microscope**<sup>11</sup> fires electrons which creates images which can magnify things by

<sup>1</sup> Something that "drives you," motivates and compels you to take a specific action.

<sup>2</sup> The term "expand [someone's] horizons" refers to introducing new ideas that open a person's mind.

<sup>3</sup> The IMAX film format lets large-size movies be made with images of a higher resolution than what is typical.

<sup>4</sup> *Mysteries of the Unseen World* came out in 2013. It was a 3-D IMAX film.

<sup>5</sup> The "grand scale" refers to the bigger perspective or purpose.

<sup>6</sup> A "passenger plane" is any plane that carries people instead of things.

<sup>7</sup> The phrase "brought to life" means to animate something or create relevance for it with others.

<sup>8</sup> Something that is "on the other extreme" is on the other side of a spectrum based on a topic previously spoken about. The phrase is a way to introduce an opposing subject, but one that is connected to the original topic.

<sup>9</sup> The "robotic flyers" that Schwartzberg is referring to are likely drones used for research.

<sup>10</sup> Humans are called "giants" to show how small many other living organisms actually are.

<sup>11</sup> An "electron microscope" uses electron beams and high magnification, allowing it to see very tiny things in greater detail.

as much as a million times. This is the egg of a butterfly. And there are unseen creatures living all over your body, including mites that spend their entire lives dwelling on your eyelashes, crawling over your skin at night. Can you guess what this is? Shark skin. A caterpillar's mouth. The eye of a fruit fly. An eggshell. A flea. A snail's tongue. We think we know most of the animal kingdom, but there may be millions of tiny species waiting to be discovered.

A spider also has great secrets, because spider's silk thread is **pound for pound**<sup>12</sup> stronger than steel but completely elastic. This journey will take us all the way down to the nano world. The silk is 100 times thinner than human hair. On there is bacteria, and near that bacteria, 10 times smaller, a virus. Inside of that, 10 times smaller, three strands of DNA, and **nearing the limit**<sup>13</sup> of our most powerful microscopes, single carbon atoms.

With the tip of a powerful microscope, we can actually move atoms and begin to create amazing nano devices. Some

could **one day**<sup>14</sup> patrol our body for all kinds of diseases and clean out clogged arteries along the way. Tiny chemical machines of the future can one day, perhaps, repair DNA. We are **on the threshold**<sup>15</sup> of extraordinary advances, born of our drive to unveil the mysteries of life.

So under an endless rain of cosmic dust, the air is full of pollen, micro-diamonds, and jewels from other planets, and supernova explosions. People **go about their lives**<sup>16</sup> surrounded by the unseeable. Knowing that there's so much around us we can see forever changes our understanding of the world, and by looking at unseen worlds, we recognize that we exist in the living universe, and this new perspective creates wonder and inspires us to become explorers in our own backyards.

Who knows what awaits to be seen and what new wonders will transform our lives? We'll just have to see.

Thank you.

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<sup>12</sup> The phrase "pound for pound" is used to show the value of someone or something in relation to size. It is commonly used to talk about sport fighters, such as boxers.

<sup>13</sup> When something "nears the limit," it is almost at the end of what it's capable of doing.

<sup>14</sup> The term "one day" is commonly used to talk about an unspecified time in the future.

<sup>15</sup> When we are "on the threshold" of something, we are about to experience something new.

<sup>16</sup> To "go about our lives" simply refers to participating in everyday life.