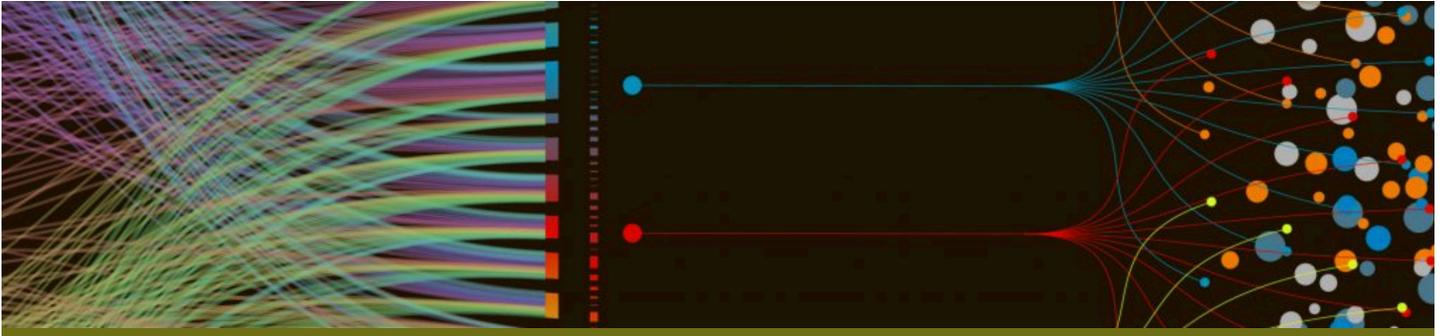# Now.
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Data Visualization Brings the Numbers to Life

Population studies for personalized medicine. Particle physics collisions. The internet of things, driven by omnipresent 24/7 smart devices. The exploding levels of data available across the globe makes data visualization a necessity. Only the data we can "see," after all, has value.

But it's not all line graphs and bar charts. Many artists and even scientists themselves use creativity and imagination to reach new audiences. From an artist who explains flow dynamics through landscape sculpture to a tropical-disease researcher making an impact through sand art, data visualization brings the numbers alive.

Why Visualize?
Maybe you remember your first thrilling encounter with Excel, where a few clicks created "art" in the shape of graphs, pie charts and box-and-whisker plots. Suddenly the columns of numbers came to life and made sense. You can see this power amplified in infographics, such as this one on assistive technology: More eye-catching than lists of numbers, graphics help the viewer interpret and digest information intuitively.

Fluid Dynamics in Motion
What's more meaningful to you, a mathematical theorem or a walk among the fountains in Alnwick Castle's Serpent Garden?

Torricelli's equation shows that the speed of water leaving a container is a function of the height of the fluid above its exit point. Sculptor William Pye's Torricelli fountain in the Serpent Garden shows water jets falling in step with the columns of water that feed them.

Both illustrate Torricelli's theorem of fluid dynamics, but only Pye's fountain shows data visualization at work. The equation explains what factors affect the magnitude of the jets. The fountain shows that shorter columns make smaller jets with fluid dynamics in action.

Put On a Show

Performances can also make data come to life. Medical researcher Shelly Xie learned all she could about sand art to teach people about schistosomiasis, a parasitic disease with as much global impact and burden as malaria.

For her piece "Neglected: A Story of Schistosomiasis Infection in Ghana," Xie built a light table on which she could project images of sand being manipulated with her hands in a real-time animation that took her audience beyond medical textbooks and health statistics and into daily life in the schistosomiasis zone. Creating shapes and images in sand brought audiences face to face with the inevitability of disease in endemic areas in a way that raw data never could.

Digital animation similarly helps visualize data. For example, while it's difficult to explain the complexity of cancer and how cells escape control as they grow, digital artists Ben Fry and Casey Reas capture the complexity of malignant transformation using algorithms to display protein signaling among cancer cells. Generated from clinical research lab data, growing webforms vividly depict how protein signaling changes, becoming more dysfunctional and more "cancerous."

Entertainment, Education, Information

It's not all about entertainment, though. Data visualization translates information into more accessible forms.

University of Toronto astrophysicists translated data from the Cassini spacecraft's unique mission into a tactile woodcarving of Saturn's ring structure for visually impaired people. They also made music by boosting the natural frequencies of Saturn's moons and rings system. This created a musical score that illustrates Cassini's final descent through the rings towards the planet.

Even CERN, the European Council for Nuclear Research's massive underground facility, uses music. Software translates Large Hadron Collider event data into sounds that represent the different particles emitted during collisions.

As the term itself suggests, data visualization helps us "see" data. Artist Johannes Girardoni's installations rebroadcast the impact gallery visitors make on their surroundings to highlight the data we're surrounded with every day. Since you can't "see" the data generated by simply walking through an art gallery, art and technology collide as his pieces pick up subtle signals. Microprocessors translate sound, movement and light disturbances from visitors, replaying it back as noises and light or color changes within the piece of art. By confronting the viewer with all the data they generate, Girardoni

hopes to inspire reflection on the amount of data that influences us in our daily lives.

Value in Visualization
Increasing data's value through visualization helps researchers, too. When bioinformatics researchers set protein folding data to a musical score, they found that reviewers quickly matched the sounds to structural conformation and molecular properties. Simply listening to the data helped pattern recognition. Combining visual analysis with listening could boost research into diseases driven by altered protein function, like Alzheimer's.

Data visualization also untangles big data problems. Health information systems often rely on different data streams for proactive public health management. The Centers for Disease Control (CDC) Zika virus response, for example, depends on data streams from a number of sources, including disease surveillance and mosquito activity reports. Combining the streams into a meaningful and easily read display makes sense for a faster response.