COLLECTIVE LEARNING

PART 3
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EXCHANGE NETWORKS AND FEEDBACK CYCLES

By David Christian, adapted by Newsela
Exchange networks drive the pace of change

Collective learning has increased throughout human history. More people and diversity leads to more ideas being exchanged. But there is also inequality. Some groups get less information. This leads to them having less power and wealth. This is a key feature of all agrarian civilizations. As networks get larger this inequality usually increases.

But networks don’t just get more powerful as societies get larger and more diverse. Their power also seems to increase faster and faster.

In human history, information has accumulated faster and faster. History itself seems to accelerate. Today, the pace of change is many times faster than it was just a few centuries ago.

Why? Because of feedback cycles.

The mechanics of feedback cycles

A feedback cycle exists when one thing has an effect on another thing. That thing then has an effect on yet something else. That second thing then has an effect on the original thing. Causes and effects are linked together. They form a loop.

A familiar example is a thermostat. Thermostats control temperature in your house. Imagine a fan is cooling a room. But there’s a thermometer connected to a switch. When the room is cool enough the switch stops the fan. The room starts warming up again. Once the temperature hits a certain point, the thermometer trips another switch. It restarts the fan and the room starts getting cooler once more. The fan, the thermometer, and the switch are connected in a feedback loop. This is a negative feedback loop. One part of the chain counteracts the effects of the other parts: the thermostat stops the fan. The result is that the temperature remains fairly stable. As a general rule, negative feedback keeps things stable.
Positive feedback is very different. Imagine a feedback cycle where each cause increases the effect of the next element. That is a positive feedback cycle. Feedback in a music amplifier is an example. A sound goes through a microphone to an amplifier, which amplifies it. As the sound turns up it feeds back into the microphone. It gets amplified even more until you have to run screaming from the room! Positive feedback makes things happen faster and faster.

In studying collective learning and human history we find many positive feedback cycles. We are interested today in one particular type. We want to look at improvements in the way information is exchanged and stored. Basically, these are innovations in communication and transportation.

Communication and transportation

How have humans shared information? Modern forms of human language are one way. Early humans used cave paintings to store information and tell stories. Storytelling was another method of saving and sharing information. People would memorize and pass on important information.

During the last 10,000 years, innovations in communication technologies came faster and faster. We jumped from writing to mail delivery to printing. Modern innovations like the telegraph, the telephone, the radio, and the Internet followed. Each innovation allowed information to be spread and stored more efficiently. The ability to save and share information made collective learning more efficient. This encouraged even further innovations — a classic example of positive feedback. Innovation today continues at an astonishing pace. But it’s simply part of a large trend that goes back to the very beginnings of human history. Collective learning seems to feed upon itself!

We see similar patterns in the history of transportation technologies. Early humans traveled mainly on foot, sometimes by boat. Humans began to ride on domesticated animals such as horses and camels about 5,000 years ago. Animals were also used to pull carts carrying goods. At the same time boats were being sailed on major rivers. Technological innovation in ship building
FOUR WORLD ZONES CONNECTING

When the four world zones connected, the first global network formed
allowed for the movement of goods through the Indian Ocean. Starting in the sixteenth century, humans began circling the world. Geography influenced both communication and transportation.

How geography shapes networks of collective learning

By now, you are familiar with plate tectonics. You know that the geography of the Earth has changed over time. But things might have gone a bit differently. We humans could have evolved in a world that had only one giant continent. That’s how the Earth was 250 million years ago. All of today’s continents were connected as a single landmass called Pangaea.

Imagine if humans had evolved on Pangaea. How would that have affected collective learning? It would have been much easier for humans to spread through the world. Maintaining contact with each other would have been simpler. Even facing barriers such as rivers and mountains, humans would surely have found ways to explore all of Pangaea. On Pangaea humans might have formed a single, global network much earlier than they did in our actual world.

Now imagine that humans had evolved in a world with many isolated islands. Each was separated from the other by oceans. It would have been difficult to move from one landmass to another. This is a world of separate, isolated human networks. Each would have developed in its own way and at its own pace. Something similar happened on some of remote islands, like Easter Island in Polynesia.

Our world is somewhere between these two scenarios. It has one vast landmass, Afro-Eurasia, made up of two connected continents, Africa and Eurasia. But there are additional, harder-to-reach continents and islands. Our ancestors evolved in Africa. Because it was connected to Eurasia they had many places they could move into. By 20,000 years ago, the last ice age was ending. Even then, you could already find small human communities in most parts of Afro-Eurasia. But humans had also reached Australia (perhaps 50,000 years ago) and the Americas (perhaps 15,000 years ago). In the last 4,000 years humans entered another region: the Pacific.

The four world zones

We refer to these distinct regions as the great world zones. The first, Afro-Eurasia, is by far the oldest and largest and best connected of the zones. The second largest is the Americas. But this zone was never as well networked as Afro-Eurasia. The last two zones, Australia and the Pacific, held smaller human populations and networks. It was almost as if humans had appeared on four separate planets. Each had its own geography, environments, and history.
By comparing these four zones we can see how geography affected the evolution of collective learning. Populations and networks were much larger and more diverse in Afro-Eurasia. It's little surprise that innovations appeared first there. Improvements in ship technology brought the zones together. The Americas also saw the appearance of farming and agrarian civilizations. They exchanged among networks within the region. But the networks were much smaller than those of Afro-Eurasia.

Collective learning worked differently in the world zones. Because of that, the zones had very different histories. After 1492, goods, ideas, peoples, crops, animals, and diseases were shared between the world zones. This first global network of exchange was powerful. It may explain why collective learning and innovation increased so suddenly in recent centuries.

In the last 200 years, transportation has advanced at a head-spinning pace. We built railways and steamships. Then we developed internal combustion engines to power cars and airplanes. Now space travel is possible. Like the innovations in communication, these inventions increased contact between humans and different cultures. That increased the scale, diversity, and efficiency of collective learning networks.

How collective learning works

<table>
<thead>
<tr>
<th>Rule</th>
<th>Description</th>
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<tbody>
<tr>
<td>Rule 1</td>
<td>Collective learning increases when more people are connected</td>
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<tr>
<td>Rule 2</td>
<td>Collective learning increases when there is greater diversity within a network</td>
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<tr>
<td>Rule 3</td>
<td>Uneven distributions of information produce uneven distributions of power and wealth</td>
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Positive feedback cycles compound the effects of these three rules, accelerating collective learning
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