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UNIT 1: THE CHANGING WORKPLACE

VIDEO: Sylvia Earle: A Woman in Science p. 16

I have parents who made me believe that it was okay to do things no matter what. I have an older brother and a younger brother, and I was one of the boys, if you will—tomboy, if you will. Although my mother did say, when I was a teenager, that I could look forward to a career perhaps as a teacher, as a nurse. Something really exciting. I could be an airline stewardess. Not a pilot, not a doctor, you know, not a superintendent of schools. It was just the way things were. Why shouldn't I be able to use the capabilities that I had to do what my brothers could do, or what Cousteau did? Along the way, I found that many people did think it was, not just unusual, but preposterous.

When I was selected to be an aquanaut for a mission in 1970, it was still considered to be unusual enough for women to want to be underwater explorers. The application for being a part of that didn't even bother to say that you had to be a man. Unlike the astronaut program that was going on at that time, it was clear this was for men only.

But the head of the program for the Tektite project that had men and women living underwater for two weeks at a time was philosophical about it. More than that, he was practical. He said, well, half the fish are female. I guess we could put up with a few women. The navy personnel involved were not quite so enthusiastic about it.

There is no question about it that there's still a gender bias with compensation for equal performance, for selection to be in charge of various projects. It's just a part of our culture. But I have to say that it is exciting to see women CEOs. I personally have served on the boards of major corporations—but always in the minority, always in the minority.

And I ... there is this, this attitude sometimes that you're there because you're a woman—you're the token woman. Today young women wanting to be oceanographers find that the doors are open. You can go aboard ships. You can be chief scientist on expeditions at sea.

Kids, they're all explorers. Little girls, little boys, doesn't matter. They're just curious. We shape categories. The boys can do this. Girls shouldn't be doing this.

Or sometimes you have the joy of just saying, I don't care what people think. I'm going to go this way because I really want to know what's out there. Those are the explorers who emerge, irrespective of what society thinks.

UNIT 2: CITY CHALLENGES

VIDEO: Turning to Nature p. 40

In 1991, architect Mick Pearce had a problem. An investment group in Harare, Zimbabwe, hired him to design the largest office and retail building in the country. But they didn't want to pay for the expensive air conditioning needed to cool such a large building. So that left Pearce with a seemingly impossible challenge: How do you design a building that cools itself?

This is a termite mound. Millions of termites live inside these structures, some of which stretch an astonishing 30 feet high. Although these termite skyscrapers may look solid from the outside, they are actually covered in tiny holes that allow air to pass through freely. Like a giant lung, the structure inhales and exhales as temperatures rise and fall throughout the day.

This termite ventilation inspired Pearce to use an approach known as biomimicry: imitating the ingenuity found in nature to solve human problems.

Meet the Eastgate Centre. The building is made from concrete slabs and brick. Just like the soil inside a termite mound, these materials have a high thermal mass, which means they can absorb a lot of heat without really changing temperature.

The exterior of the building is prickly, like a cactus. By increasing the amount of surface area, heat loss is improved at night, while heat gain is reduced during the day. Inside the building, low-power fans pull in cool night air from outside and disperse it throughout the seven floors. The concrete blocks absorb the cold, insulating the building and chilling the circulating air.

When the morning comes and temperatures rise, warm air is vented up through the ceiling and released by the chimneys. Thanks to this innovative design, temperatures inside stay at a comfortable 82 degrees during the day and 57 degrees at night. Not to mention, it uses up to 35% less energy than similar buildings in Zimbabwe.

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Since opening its doors in 1996, Mick Pearce's 90% natural climate control system has made the Eastgate Centre a global landmark for sustainability. So we must ask ourselves: If an architect could design a self-cooling building with termite-inspired climate control, what other innovations can Mother Nature inspire if we just paid closer attention?

UNIT 3: ART AND BEAUTY

VIDEO: Photo Contest p. 66

John Stanmeyer: This is a really hardcore tight edit, as it should be. I want to feel a photograph. I want it to touch me emotionally.

Erika Larsen: Of course, there's a sort of visual beauty, but I want to go one more layer. I want to be able to live inside of it.

Keith Jenkins: A lot of what we talk about when we try to explain why I like it gets very intellectual. But often, it's that first gut reaction: "Wow, that's cool!" or "Wow, that's interesting!"

John Stanmeyer: I think today's edit was really more of looking at the cream that sort of had already risen. And why they fall to the editing floor, it maybe just didn't work well. There was something a little better.

Erika Larsen: I think what makes an image go from beautiful and good to great, um, I think just first and foremost, it's technical. I mean, that's the base level. It just has to technically be executed well. I like it, but when I see it here, I think the quality, even if whatever they're focusing on, I think the quality looks really awful. I don't think it would hold up at all. So I'm going to go with "no."

John Stanmeyer: For me, the guy with the orange shirt to the left of the net, his shirt's clipping the thing. A photograph like this has got to be like a chessboard, where everything is there, and there's no foreground. You know, sometimes it just doesn't happen.

Erika Larsen: Well, it's up to you guys. I mean, I told you why I like it, but I think you two could argue against why I like it more, too.

John Stanmeyer: No, I agree with everything you're saying, 101 percent of it. I just think it's missing

one tiny aspect that jettisons it into unbelievable composition.

Erika Larsen: I don't know. I think it's beautiful composition. I could live again and again and again in there. They think they're beautiful. They're like having a little bit of a dance there. And then there's all this color. To me, this is where the color, you know, people were just going in one direction and the other with some of their pictures, this is where that color works so beautifully. It's intense here, and it's soft here. It doesn't look Photoshopped. It looks ... it's great.

John Stanmeyer: I think every photograph, every image, to some extent, had its merit, and had its weight, and had its measure. It's just in the end, certain moments, certain images really touched us and touched me.

Erika Larsen: Yeah, there was this picture of the owl. I mean, from the moment I got it in the first set of edits, it was really magical. It was a moment ... I don't get to see owls in that way. I looked and said, "Wow, you brought me in to see an animal in a way that I never have seen, and I probably won't get to see." The top images were great.

Keith Jenkins: The wildebeest picture, you know, springs to mind as something that had enough subtlety in it that we might have missed it had we not had that other conversation about taking the whole image in and letting it kind of soak over you and then seeing what's really in the frame.

Erika Larsen: And then the picture on the train. Everyone looks really peaceful, but at the same time, it just looks really surreal and something, you know, otherworldly.

Keith Jenkins: It was really the balance between the individual and the mass. And then do it, you know, in a very poetic way, with color and light. The overall tone of it was just very relaxing in what was a very chaotic scene, so there were a lot of things playing off of each other. I think the argument that, somehow, the proliferation of cameras attached to cell phones is somehow lowering the standards, I think is totally refuted. We are communicating visually much more so than we ever have before, and I think that's a good thing.

UNIT 4: RETHINKING TRANSPORT

VIDEO: A Driverless Future p. 90

Narrator: This is Trikala, a city in central Greece, and ground zero for an interesting experiment.

Mayor: Trikala is a medium-sized city and it's very easy for us to test things. We love, uh, find ways through innovation.

Narrator: The city is testing an autonomous bus. The bus has no driver, no steering wheel, and no brake pedal.

According to Odisseas Raptis, the CEO of the project, it is able to navigate its way through the city unassisted.

Vasilis Karavidas, an engineer working on the project, explains that the vehicle is powered by electric engines that also control the bus's steering and braking.

In order for the bus to operate autonomously, its route must first be driven through manually and recorded. The bus can then use the data to navigate the route without the need for human intervention.

To ensure safety, the bus uses lasers to scan its surroundings. If a person or object is detected less than ten meters in front of the bus, it is able to brake automatically and come to a gentle stop.

Raptis explains that although the bus operates autonomously, it is in constant digital communication with human operators in a remotely located control room.

The control room operators are able to use cameras to see the view behind, in front of, and inside the bus. Furthermore, they can listen to what's going on in the bus, and if necessary, communicate with its passengers. How does the public feel about these buses?

CEO: When buses came into our city, we had people enthusiastically saying that "Alright, this is a new thing. We would like very much to be on board." And we had people that said, "This is dangerous, and probably, we're going to have accidents in our city." Six months later, we have proved that ... no accidents.

Narrator: Trikala's automated bus may look modest, but the city's mayor is taking a long view.

Mayor: We know that when internet was discovered, 40 years ago, they said, this is a very useless thing, what we need. They say the same thing for the bus now. Never mind. We keep on going.

UNIT 5: WORKING TOGETHER

VIDEO: Ant Teamwork p. 114

Narrator: Dr. Nigel Franks wants to know how ants make decisions. He's enlisted some tiny lab partners that he calls "rock ants." Each one of Nigel's ants has a chip on her shoulder.

Dr. Franks: Well, the chips are fantastic, I mean, they're absolutely tiny, so we can glue them on the back of an ant that's two millimeters long. And what the chips enable us to do is to get each individual ant to identify itself to us.

Narrator: By identifying individuals, Nigel can tell who collects information, how they communicate it, and how a consensus is reached. At the moment, they're living happily in their nest of cardboard and glass. The test: When that nest is destroyed, how do they decide where to move?

Dr. Franks: So here is the old nest, which I've destroyed by taking off the top microscope slide, and they're pretty annoyed about that and pretty angry with me, and so they've got nowhere to live currently, and they're going to have to find a new nest site to live in. And we've offered them, at the other end of the arena, a poor-quality site over here and a really beautiful high-quality nest site over there.

Narrator: The ants begin inspecting their two options. Every time an individual enters or exits the potential nest, a laser beam records its passing. This ant has discovered the good-quality nest site, so she returns to the old nest and reports her findings. There's a brush of antennae. Her body emits a pheromone—a chemical signal. Her sister ant receives the message: "Come and see."

Dr. Franks: They do a very special form of recruitment called "tandem running," and that's where one ant literally leads just a single other nest mate. And what we've been able to show is that tandem running qualifies as teaching. And what pleases me is that it was the first case that one could demonstrate teaching in any other animal than ourselves. So the ants are incredibly special.

Narrator: As for the ants that found the less desirable nest, their reports are less enthusiastic. They solicit fewer tandem runners. Dr. Franks suspects that each ant has a basic concept of what makes a good home,

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so more ants get recruited to the good nest—enough to convince the colony as a whole. Within an hour or so, the entire colony has moved.

Dr. Franks: And let me put this in very anthropocentric terms, that they'll think, "Well, it isn't just me who thinks this nest site is good. All of my friends think it's good, too." So, by using not just their own individual opinions, if you will, but the opinions of lots of their nest mates, they can form very accurate decisions.

UNIT 6: WHY LANGUAGE MATTERS

VIDEO: Discovering a Hidden Language p. 136

[woman and man speaking in different languages]

[woman speaking in Koro]

Narrator: Before this trip to a remote part of Northeast India, there were 6,909 living languages known to scientists.

[woman speaking in Koro]

Narrator: Now there is one more: a language called Koro. National Geographic's Enduring Voices project brought linguists Gregory Anderson and David Harrison to a region of India that requires a special permit just to enter. To reach one village, the expedition team had to cross a mountain river by bamboo raft. The researchers were heading there to study two poorly known languages, but in speaking to the locals, detected a third surprise language: Koro. It would be the first known time the language would be recorded.

Koro is part of the Tibeto-Burman language family, a group of some 400 languages. But until now, the language was unknown to world linguists. Only about 800 people are believed to speak it, with few under age 20. Harrison, Anderson, and Indian linguist Ganesh Murmu sat in the homes of the speakers, making recordings as people shared vocabularies and stories in Koro. David Harrison explains why he believes the endangered language needs to be recorded and preserved:

David Harrison: It contains very sophisticated knowledge that these people possess about this valley, the ecosystems, the animals, the plants, how they survived here, how they adapted. So if they switch over to another language, a lot of that knowledge will simply be lost.

Narrator: Linguists estimate that about half the world's nearly 7,000 languages are endangered. But at least with the Enduring Voices project, languages like Koro can be recorded and documented for the ages.

UNIT 7: RESOURCES AND DEVELOPMENT

VIDEO: Honey and Pepper p. 160

Narrator: In the mountains of Northwest Cameroon lies one of the country's hidden treasures: Oku white honey. Each year, more than a thousand beekeepers collect this sweet, sticky substance, which owes its color to the pale flowers which bloom on the forest canopy. In 2013, Oku white honey was one of the first African products to earn a geographical indications, or G.I., label, and the honey soon doubled in price.

Michel Gonomy: It's a honey which is white in color, which is very rare, and it's a honey with a particular aroma, which is creamy and firm, too. These factors arise from the fact that the honey is found in this forest with specific trees—the Kilum Ijim trees.

Narrator: The only other food in Cameroon to earn a G.I. label is Penja pepper, which is grown in a volcanic area to the west. The pepper is popular with Europe's top chefs and fetches as much as 35 dollars per 100 grams.

Rene Claude Metomo: We're here on the basaltic soil beneath the volcanoes. The richness of the soil is transmitted through the pepper in a remarkable way.

Narrator: The idea behind the label is to protect foods unique to their region, like Italy's Parma ham and France's Roquefort cheese. Now, an increasing number of farmers are growing Penja pepper, with an annual production of around 300 tons per year. Almost half of the produce is exported to France and Germany.

Emmanuel Nzenowo: There has been an increase in production, an improvement in yields, and better prices on the market.

Narrator: Until a few years ago, the notion of intellectual property was unknown in Africa—now, countries are lining up to have their products registered. But as the orders pour in and the prices shoot up, the challenge is how to guarantee quality, ensuring that Cameroon's honey and pepper meets the high standards outlined by the protective label.

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UNIT 8: LIVING LONGER

VIDEO: Longevity Village p. 184

Narrator: The proportion of people over 100 years of age in Bama County is nearly seven times that of the rest of China.

Pan Qifang [in Mandarin]: There is the hereditary factor, the cultural factor, but most important, it's the environment here that makes people generally live longer.

Narrator: But Bama County's clean air is also bringing in tourists.

Chen Xisong [in Mandarin]: If there are tourists, the economy here may get better, but the air will probably be polluted. There is both gain and loss.

Narrator: For one poor Bama village so far untainted by the influx of tourists, a change is about to happen.

Huang Zhongkang [in Mandarin]: A plan is underway to turn this village into a place for health and ecological tourism. For more than 30 years, I have gone fishing every day. This lifestyle is carefree. My son works in Nanning City. He asked me to go live with him. But I'd rather live in the village than in the urban area. It's too hot there and overpopulated.

Narrator: A short drive from Long Hong is Changshou village. Once a poor farming community, now reinvented as a tourist destination. Its attraction: centenarians.

Huang Yingchun [in Mandarin]: The secret to our longevity is very simple. We eat what we plant. The meat, too, comes from what we raise ourselves.

Narrator: At 118 years old, Huang Buxin claims to be Bama's oldest person.

Huang Zhongshun [in Mandarin]: My father eats corn, peas—all sorts of vegetables—every day. He doesn't eat much meat.

Pan Qifang [in Mandarin]: Bama now has 83 centenarians out of a population of about 278,800. The proportion of centenarians here is the highest in China.

Narrator: Back in Long Hong Village, tensions are rising. Tourists have begun arriving, and they are starting to impact the village.

Huang Zhongkang [in Mandarin]: Some young people come here to take wedding photos, which is

fine, because this village is very scenic. But there are tourists who come here to swim or come here for picnics, leaving garbage behind. That's what we're afraid of. This is a paradox. Tourism will bring us more income and make our lives better. In that regard, it keeps us healthy. The village was so poor that there wasn't even a proper road. The road was bumpy and muddy. People didn't have opportunities to go out to work. As long as tourists don't litter here, we welcome the development. If we have more income, we'll have better health.

Narrator: A new eco resort is now planned for the village.

Huang Zhongkang [in Mandarin]: I just hope I live long enough to see the resort completed.

Narrator: In Bama, that could be a very long time.

UNIT 9: TRUTH AND DECEPTION

VIDEO: Learning to Lie p. 208

Ellen: My name's Ellen. I'm a research assistant at Kang Lee's development lab. This is where we do our deception studies, and here we play three games with the kids.

"You've been doing such a good job, and we got off to such a good start that I kind of want to give you a prize. So, I've actually picked one out just for you. So, you can open it up, and I'm going to get set up for the next activity."

Child one: "OK."

Ellen: "Do you like your prize?"

Child One: "Yes, because it smells good."

Kang Lee: Children begin to tell lies at two years of age, and these kinds of lies tend to be for their own benefit, such as to cover up their transgression or to gain some benefits for themselves. But with increased age, they become more and more likely to tell white lies to spare other people's feelings or to be polite. Ironically, even though we morally do not condone lying in general, lying is an essential part of our everyday life. And imagine a world that nobody lies, and that is going to be an incredibly cruel world.

Researcher: "Let's try ... this one. Do you think it's higher or lower?"

Child Two: "Lower."

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Researcher: “Right, stand up and see. Oh-oh! Eliza, this is the moment of truth, this is the last round that we are playing. So, if you can guess this one right, that candy bag is yours! But, if you can’t guess it right, then I get to keep that bag of candy. But you know what? I think I hear my phone ringing. OK, hang on one second, I’ll be right back. Don’t look at the card. You can make your guess when I get back, and then just give me two minutes, OK?”

“Oh my god, Eliza, I’m so sorry. I knew I heard it ringing, it was my mom—super important, so sorry! OK, so let’s get back to it. Eliza, when I was out of the room, did you peek at the card?”

Child Two: “Maybe.”

Researcher: “Can you put your hands down for me? And can you say “yes” or “no”?”

Child Two: “Er ... Um ... Yes!”

Researcher: “That’s OK.”

Kang Lee: Once young children under seven years of age lie, you can ask follow-up questions, and then you can easily detect if they actually lied, just lied, because they cannot cover up their initial lie. Children’s ability to tell lies at a young age tends to be indicative of their other abilities, such as their ability to communicate with the others, their ability to understand other people’s emotions, and their ability to know the difference between what they know, what they feel, and what others know others feel. These abilities are essential for us to interact with each other. So having the ability to tell lies is really a milestone to tell you your child is doing OK.

UNIT 10: CHANGING THE PLANET

VIDEO: Trees of Life p. 232

Narrator: Forests cover about 30 percent of the planet, and the ecosystems they create play an essential role in supporting life on Earth. But deforestation is

clearing Earth’s forests on a massive scale, and at the current rate of destruction, the world’s rainforests could completely disappear within a hundred years. Why should we care about deforestation?

Together, forestry and agriculture are responsible for 24 percent of greenhouse gas emissions, making deforestation a significant contributor to climate change. Deforestation impacts the amount of greenhouse gases in the atmosphere in two ways: First, when trees are felled, they release the carbon they are storing into the atmosphere. Second, trees play a critical role in absorbing the greenhouse gases that fuel global warming. Fewer forests mean larger amounts of greenhouse gases entering the atmosphere and increase speed and severity of global warming.

In addition to helping regulate the Earth’s climate, forests provide habitats for over 80 percent of the plants and animals that live on land. But deforestation destroys these habitats, diminishing biodiversity. Some estimate that four to six thousand rainforest species go extinct each year. This also affects the more than two billion people who rely on forests as sources of food and shelter.

The biggest driver of deforestation is agriculture. Farmers chop down trees in order to plant crops like soybeans, palm trees, and cocoa, or to make room to raise livestock for beef. Logging operations, which provide the world’s wood and paper products, also cut countless trees each year. Forests are also destroyed as a result of growing urban sprawl as land is developed for dwellings.

The effects of deforestation are grave but not irreversible. Efforts such as managing forest resources, eliminating clear-cutting, and planting new trees to replace those removed, are already being made to reduce deforestation’s environmental impact on our planet. And while some plant and animal species are gone forever, combatting deforestation can help prevent further loss of biodiversity.