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Ash Dieback Disease

Since 1992, a fungal infection known as ash dieback disease has killed millions of ash trees across Europe and infected many more. Although it is unclear how the infection spreads, scientists say the fungal spores, or reproductive cells, on dead leaves are most likely picked up and carried by the wind. These spores land on healthy trees, and the fungus establishes itself in their young leaves before spreading into the branches and trunk. As the fungus takes hold, it prevents the affected tree from absorbing water. Young ash trees die soon after becoming infected. Though mature trees may survive for a few years, almost all infected trees eventually die.

Ash dieback disease was first observed in Europe in 1992, when it began to kill trees in Poland. At the time, scientists had no idea what was causing it. It was only in 2010 that Polish scientists were able to identify the fungus responsible, but by then it had cut a path through much of Europe. Lithuania has lost 99 percent of its ash trees, and in Denmark, up to 90 percent are dead or dying. In Britain, the disease was initially detected in February 2012 on a group of young trees imported from a tree farm in the Netherlands. The government reacted by imposing a ban on further imports. It became apparent, however, that the restriction may have been in vain when authorities discovered the disease in wild trees in East Anglia, an area of England close to continental Europe. They concluded that spores had crossed the English Channel between the land masses, carried either by the wind or possibly by animals or humans.

Britain has burned more than 100,000 trees that were exposed to the disease. Meanwhile, many affected countries have given up altogether. According to Ditte Olrik, a biologist with the Danish Nature Agency, the fungus spreads from leaves only after they fall to the ground. “We can’t see any point burning the trees, and you can’t burn the air,” Olrik says. Moreover, scientists warn that 60 of Britain’s rarest insect species rely heavily on ash trees. Ironically, these creatures depend mostly on dead or dying branches for food and habitat, so burning infected trees would have a devastating impact on their populations. It might also destroy the small number of ash trees thought to be resistant to the disease. If these trees do prove strong enough, they could play a critical role in reviving the species.

(35) What is one characteristic of ash dieback disease?

1 It acts so rapidly that, in the majority of cases, ash trees die before they display any signs of infection.
2 It gets inside the wood of ash trees, where it blocks moisture from spreading throughout the body of the trees.
3 It attacks the leaves of the healthiest ash trees first, preventing them from absorbing the sunlight they need to survive.
4 It only spreads when the wind is strong enough to carry drops of water containing the fungal spores.

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(36) Why might the ban imposed by Britain have been an ineffective measure?

1 The ban came after infected ash trees had already been imported from the Netherlands to East Anglia.
2 Wild trees in East Anglia were found to be infected with a different fungus that spreads faster than the ash dieback fungus.
3 Because the ban only applies to ash trees grown on farms, people can still import infected young trees taken from the wild.
4 Banning imports of ash trees does not prevent the fungus from being transported in other ways.

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(37) One reason the practice of burning ash trees has been criticized is that

1 the trees provide wood that is especially important for the survival of certain insect species.
2 it harms or kills many types of rare insects that depend on young, healthy ash trees for survival.
3 fungal spores released during the burning process can infect trees in the immediate area.
4 there are more healthy ash trees than diseased ash trees in some of the areas that have been chosen for burning.

A Super Solution to Energy Demands

In March 1987, nearly 2,000 physicists gathered in New York City to hear about a discovery that could change the way people lived. A few months earlier, researchers at two American universities had established that superconductivity—the ability to transmit electricity with zero resistance—could be achieved in relatively easy-to-create conditions. Whereas previous superconductive materials had only worked at temperatures around minus 273 degrees Celsius, newly designed materials called high-temperature superconductors displayed similar qualities at just minus 170 degrees Celsius. While still extremely cold, this temperature could be achieved using comparatively cheap and widely available liquid nitrogen. At the New York gathering, the American Physical Society announced that the benefits offered by superconductivity, such as ultrafast computers that never get hot, long-range electric vehicles, and highly efficient power lines, would soon be widely accessible.

Those predictions, though, proved to be too optimistic. More than 25 years later, attempts to make superconductor technology marketable have been largely unsuccessful. Initially, the new superconductive materials were delicate and broke easily, making them unsuitable as a replacement for copper and aluminum wires in curving power lines. What is more, although the liquid nitrogen used to keep the superconductive materials cool was cheap, the cost of keeping the liquid nitrogen itself cool was not. Since the early 2000s, however, concerns about climate change have brought renewed focus on wasteful electrical grids. In the United States, resistance in metal wires causes power lines to lose almost 10 percent of the energy they transmit each year. Even though energy is required to keep superconductive materials cold, the materials waste as little as 0.5 percent of power. If copper and aluminum wires could be replaced with thin strands of superconductive materials surrounded by liquid nitrogen, energy waste would be largely eliminated.

American Superconductor, a company founded in 1987, believes that despite recent breakthroughs in making flexible superconductive wiring, the adoption of superconductor technology still faces hurdles. In the long term it offers major savings, but in the short term it requires substantial investment in new infrastructure. Convincing the U.S. power industry to pay the costs required for removing old transmission lines and laying down new ones is not easy. Nonetheless, superconducting cables are now in limited use in some power grids in the United States. “The big barrier here, as with any new technology, is that electric utilities are very conservative,” says Jason Fredette, a spokesman for American Superconductor. The company is therefore looking overseas for buyers. South Korea, which plans to use the technology to replace its entire electrical grid, has become American Superconductor’s biggest customer, having purchased three million meters of cable.

In addition to electrical grid services, American Superconductor has entered into both the wind and solar power markets. As many wind and solar farms are located in remote areas, using superconducting cables would enable the delivery of generated electricity to urban centers without the energy losses that currently keep such efforts from being practical. If South Korea’s experiment with superconductors is successful, perhaps more countries will jump on board, initiating a worldwide shift to renewable energy sources.

(38) What did scientists discover about superconductivity in the 1980s?

1 Conventional superconductors were more effective if they were cooled first, and then warmed to higher temperatures.
2 Some materials could serve as superconductors under conditions that were easier to create than previously thought possible.
3 Liquid nitrogen itself could be used as a superconductor if it was maintained at minus 170 degrees Celsius.
4 Although superconductors transmitted electricity more freely than previous conductors, they did not do so with zero resistance.

(39) What is one reason that predictions about superconductivity proved to be too optimistic?

1 Superconductive materials did not bend easily, so they were not a practical alternative to conventional power lines.
2 The substance needed to cool superconductive materials down to very low temperatures was in limited supply.
3 The cost of the metals used in electrical power lines fell dramatically, discouraging efforts to find alternatives.
4 Most superconductive materials only generated a small percentage of the power generated by copper and aluminum wires.

(40) According to American Superconductor, superconductor technology has not been widely introduced in the United States because

1 there has been a shift away from electrical power as the main source of energy in technologically advanced countries.
2 the power industry is reluctant to rely on superconductor technology that was developed abroad.
3 power companies are unwilling to make the financial investment to build the necessary infrastructure.
4 American companies that sell superconducting materials tend to focus more on overseas customers than on the domestic market.

(41) What does the author of the passage say about South Korea's adoption of superconducting cables?

1 It could eliminate the need for less effective renewable energy sources such as wind and solar farms.
2 It will only be possible for South Korea to replace its electrical grid if a number of countries provide assistance.
3 It may help lead to a more widespread adoption of energy sources that are now seen as impractical for cities.
4 It shows that superconducting cables can be just as efficient in rural areas as they were in the urban areas where they were first tested.