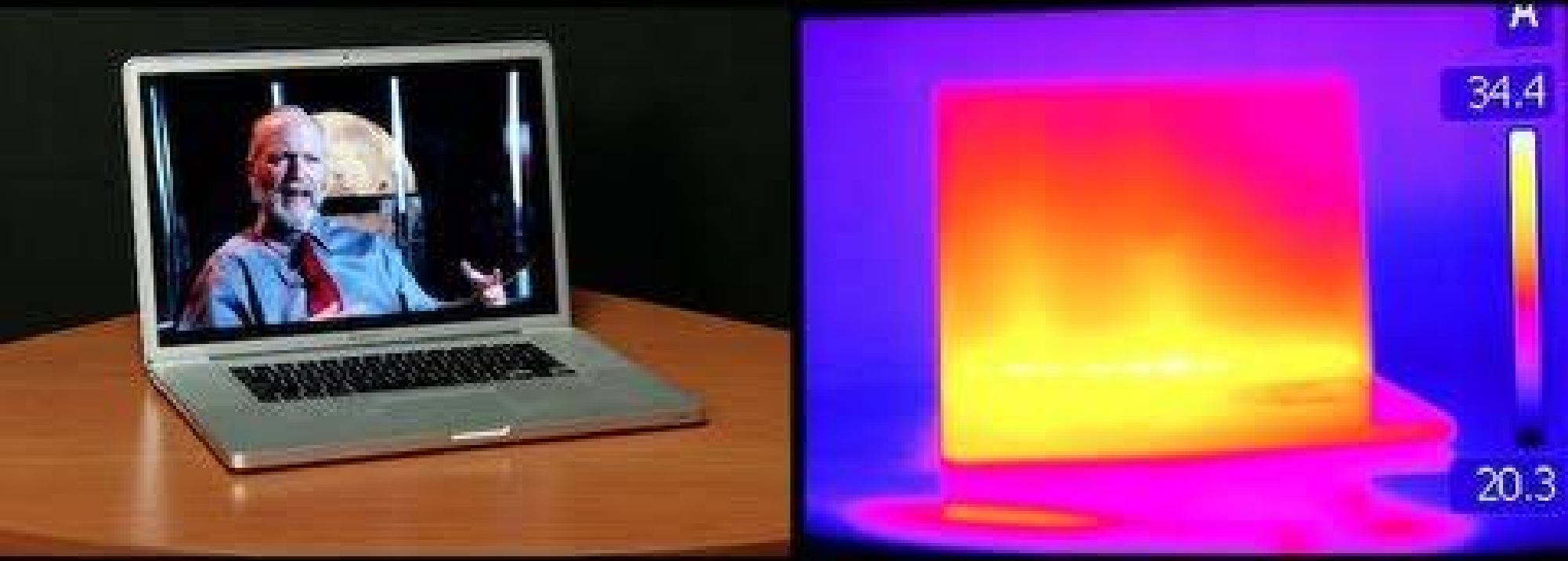
34.4
20.3

1
00:00:00,000 --> 00:00:04,040
Music

2
00:00:12,130 --> 00:00:16,140
Rob: Any form of matter that we can think of having a temperature, no matter how hot or cold,

3
00:00:16,160 --> 00:00:20,160
gives off thermal energy. [Music]

4
00:00:20,180 --> 00:00:24,190
Rob: A chair, a book,

5
00:00:24,210 --> 00:00:28,200
food, me. [Music]

6
00:00:32,250 --> 00:00:36,280
Rob: Everything around us, even the Earth itself, radiates thermal energy.

7
00:00:36,300 --> 00:00:40,330
Thermal energy forms the primary source of what we call infrared

8
00:00:40,350 --> 00:00:44,370
radiation. Infrared being the section of the electromagnetic

9
00:00:44,390 --> 00:00:48,410
spectrum that is just beyond visible light in terms of wavelength size.

10
00:00:48,430 --> 00:00:52,440
We cannot see infrared radiation. In fact, humans can

11
00:00:52,460 --> 00:00:56,490
only see a very small portion of the electromagnetic spectrum, but

12
00:00:56,510 --> 00:01:00,520
technology allows to detect and image matter in this very important part of the

13
00:01:00,540 --> 00:01:04,530

spectrum. NASA, NOAA, and other agencies, use thermal

14
00:01:04,550 --> 00:01:08,540
infrared imagery to study Earth systems in a way beyond what we could ever

15
00:01:08,560 --> 00:01:12,590
see. Through infrared data, we can study ocean and ice

16
00:01:12,610 --> 00:01:16,630
changes, map deforestation and forest fires,

17
00:01:16,650 --> 00:01:20,730
and monitor soil moisture and detect diseased vegetation.

18
00:01:20,750 --> 00:01:24,770
In fact, nearly every time we look at a weather report, from a heat wave to

19
00:01:24,790 --> 00:01:28,800
a hurricane, we are using thermal infrared imagery.

20
00:01:28,820 --> 00:01:32,830
Satellites detect infrared energy in a way that lets us study the Earth's weather patterns

21
00:01:32,850 --> 00:01:36,850
over both day and night, which is crucial for predicting the weather to come.

22
00:01:36,870 --> 00:01:40,860
In a way, it's as if the whole planet becomes visible to us at any time

23
00:01:40,880 --> 00:01:44,880
of day. Just over 200 years ago, Sir William Herschel

24
00:01:44,900 --> 00:01:48,930
discovered the existence of infrared by studying the sunlight passing through a

25
00:01:48,950 --> 00:01:52,990
simple prism. The prism separated all the colors that make up sunlight

26
00:01:53,010 --> 00:01:57,030
in an array called a spectrum. [Music]

27
00:02:01,090 --> 00:02:05,090
Here's a simple classroom activity that lets us see the phenomenon Herschel first observed.

28
00:02:05,110 --> 00:02:09,130
Herschel measured the temperatures of the different colors

29
00:02:09,150 --> 00:02:13,170
and found that the temperatures increased as he measured from violet to red.

30
00:02:13,190 --> 00:02:17,180
But what really struck him was the observation just beyond the visible spectrum.

31
00:02:17,200 --> 00:02:21,190
First, measure the ambient temperature of the box by placing

32
00:02:21,210 --> 00:02:25,200
the thermometers in the shade. Once the prism is adjusted for the widest

33
00:02:25,220 --> 00:02:29,230
spectrum possible, place the thermometers in the blue, yellow,

34
00:02:29,250 --> 00:02:33,250
and in the area just beyond red. Measuring over time,

35
00:02:33,270 --> 00:02:37,290
we will see the temperatures increase as we approach this infrared section of the spectrum.

36
00:02:37,310 --> 00:02:41,320
It may seem like a big jump to go from a prism on a box to

37
00:02:41,340 --> 00:02:45,340
the advanced imagery satellites provide around the globe, but it all helps