Title: What really killed the dinosaurs?
Published in TED-Ed YouTube video on Nov 15, 2023
Link: https://youtu.be/PUptWlp-hoI?si=FitiyWYOhb5SUep6
Indonesian Translation by Annisa Putri

00:00:07.170 --> 00:00:12.884
66 million years ago, near what's now the Yucatán Peninsula,

00:00:12.967 --> 00:00:18.514
a juvenile sauropod feasted on horsetail plants on a riverbank.

00:00:18.639 --> 00:00:21.017
Earth was a tropical planet.

00:00:21.017 --> 00:00:25.480
Behemoth and tiny dinosaurs alike roamed its lands,

00:00:25.480 --> 00:00:30.234
while reptiles and tentacled ammonites swept its seas.

00:00:30.693 --> 00:00:34.280
But, in an instant, everything would change.

00:00:34.739 --> 00:00:39.535
A roughly 12-kilometer-wide asteroid was careening toward Earth

00:00:39.535 --> 00:00:42.413
at around 20 kilometers per second.

00:00:42.747 --> 00:00:44.832
From where the sauropod stood,

00:00:44.832 --> 00:00:47.543
there would have been no early warning signs.

00:00:47.668 --> 00:00:51.714
The asteroid barreled through Earth's atmosphere in a matter of seconds

00:00:51.798 --> 00:00:55.635
and struck the Yucatán's submerged continental shelf.

00:00:55.885 --> 00:00:57.929
It exploded upon impact,

00:00:57.929 --> 00:01:01.808
instantaneously creating a 100-kilometer-wide hole

00:01:01.808 --> 00:01:05.311
and ejecting sedimentary and crystalline rocks.

00:01:05.394 --> 00:01:10.108
Within minutes, the impact crater, known today as Chicxulub,

00:01:10.108 --> 00:01:12.235
began collapsing inwards.

00:01:12.568 --> 00:01:17.323

Meanwhile, the base rebounded some 20 kilometers above the Earth's surface,

00:01:17.323 --> 00:01:22.370
then fell back down and moved outwards, creating a ring of mountains.

00:01:22.954 --> 00:01:26.874
The energy released from the asteroid's impact is estimated to have been

00:01:26.874 --> 00:01:30.920
several billion times that of a nuclear bomb.

00:01:31.420 --> 00:01:34.257
The force sent seismic energy across the planet

00:01:34.257 --> 00:01:37.301
at a much greater magnitude than any earthquake

00:01:37.301 --> 00:01:39.804
a tectonic fault could ever produce.

00:01:40.179 --> 00:01:42.557
Massive landslides ensued.

00:01:42.557 --> 00:01:45.601
And a tsunami sped from the newly formed crater,

00:01:45.601 --> 00:01:49.730
potentially reaching 1,500 meters high.

00:01:50.064 --> 00:01:52.859
Countless lives were extinguished.

00:01:52.859 --> 00:01:58.489
Some instantly: all life within 1,500 kilometers of the impact site

00:01:58.489 --> 00:01:59.866
was incinerated;

00:02:00.032 --> 00:02:06.205
others right after: by colossal waves, landslides, and hurricane force winds.

00:02:06.747 --> 00:02:09.876
But many organisms across the planet survived.

00:02:10.293 --> 00:02:14.755
It was what came next that would bring about the end for many species,

00:02:14.755 --> 00:02:17.258
including almost all dinosaurs.

00:02:17.884 --> 00:02:22.013
This was just the beginning of one of the most devastating periods

00:02:22.013 --> 00:02:24.265
in the history of life on Earth.

00:02:25.099 --> 00:02:28.936
When the asteroid struck, it sent hundreds of gigatons

00:02:28.936 --> 00:02:33.316
of carbon-dioxide-rich limestone and sulfur-saturated-sediments

00:02:33.316 --> 00:02:34.650
into the atmosphere.

00:02:34.650 --> 00:02:38.863
The sulfur combined with water vapor to create sulfate aerosols.

00:02:39.030 --> 00:02:43.826
This plume of limestone dust, soot, and sulfate aerosols

00:02:43.826 --> 00:02:47.788
spread from the impact site at several kilometers per second,

00:02:47.872 --> 00:02:50.875
blanketing the globe in a matter of hours.

00:02:51.292 --> 00:02:53.127
It’s thought to have blocked the Sun,

00:02:53.127 --> 00:02:56.422
plunging Earth into an extended period of darkness

00:02:56.422 --> 00:03:01.219
and dropping the temperature in many places by at least 25°C.

00:03:01.802 --> 00:03:05.139
The asteroid’s immediate impact was devastating,

00:03:05.139 --> 00:03:08.726
but it seems to have been the rapid climate change it triggered

00:03:08.726 --> 00:03:14.148
that ended the roughly 165-million-year reign of the dinosaurs.

00:03:14.357 --> 00:03:17.109
Plants and plankton rapidly died,

00:03:17.109 --> 00:03:20.279
causing the collapse of food webs worldwide.

00:03:20.446 --> 00:03:25.701
An estimated 75% of life on Earth went extinct,

00:03:25.701 --> 00:03:28.079
including almost all dinosaurs.

00:03:28.621 --> 00:03:31.874
Small birds were the only kinds that remained,

00:03:32.083 --> 00:03:37.338
perhaps because they relied on hardy seeds that weathered the
catastrophe.

00:03:37.797 --> 00:03:43.427
It's unclear why exactly the lifeforms that survived the extinction did.

00:03:43.552 --> 00:03:47.682
Many smaller organisms, like insects, persisted.

00:03:47.848 --> 00:03:53.354
So did early mammals— perhaps because of their ability to burrow and hibernate.

00:03:53.396 --> 00:03:56.482
And photosynthetic lifeforms like algae,

00:03:56.482 --> 00:03:59.485
that had ways of withstanding low-light conditions,

00:03:59.485 --> 00:04:00.861
also survived.

00:04:01.612 --> 00:04:07.868
Traces of the asteroid scattered worldwide and the scar of the Chicxulub crater

00:04:07.868 --> 00:04:11.622
attest to this period of monumental destruction.

00:04:12.123 --> 00:04:16.043
So, what are the chances of another Chicxulub happening?

00:04:16.335 --> 00:04:20.256
Space programs are continuously identifying and tracking

00:04:20.256 --> 00:04:22.258
near-Earth asteroids.

00:04:22.550 --> 00:04:27.221
Fortunately, the likelihood of one as large and cataclysmic

00:04:27.221 --> 00:04:31.976
striking in the next thousand or so years seems to be small—

00:04:32.018 --> 00:04:35.354
something like a 7 in a million chance.

00:04:35.438 --> 00:04:41.527
However, we are facing the consequences of another kind of rapid climate change,

00:04:41.527 --> 00:04:45.197
this time because of humanity's own emissions.

00:04:45.489 --> 00:04:49.785
Animals are going extinct faster than ever in our history,

00:04:50.077 --> 00:04:52.913
and people are being displaced from their homes.

00:04:52.913 --> 00:04:55.458
But, unlike the dinosaurs,

00:04:55.458 --> 00:05:01.213
we have the opportunity to avoid the large-scale devastation that will come

00:05:01.213 --> 00:05:04.717
if governments continue
with the status quo.

Judul: Apa yang sebenarnya membunuh dinosaurus?
Diterjemahkan oleh Annisa Putri

00:00:07.170 --> 00:00:12.884
66 juta tahun yang lalu, dekat tempat yang sekarang disebut Semenanjung Yucatán,

00:00:12.967 --> 00:00:18.514
seekor Sauropoda muda berpesta dengan tanaman ekor kuda di tepi sungai.

00:00:18.639 --> 00:00:21.017
Bumi adalah planet tropis.

00:00:21.017 --> 00:00:25.480
Behemot dan dinosaurus kecil sama-sama berkeliaran di tanahnya,

00:00:25.480 --> 00:00:30.234
sementara reptil dan amon yang bertentakel menyapu lautannya.

00:00:30.693 --> 00:00:34.280
Tapi, dalam sekejap, semuanya akan berubah.

00:00:34.739 --> 00:00:39.535
Asteroid dengan lebar sekitar 12 kilometer sedang meluncur menuju Bumi

00:00:39.535 --> 00:00:42.413
dengan kecepatan sekitar 20 kilometer per detik.

00:00:42.747 --> 00:00:44.832
Dari tempat Sauropoda berdiri,

00:00:44.832 --> 00:00:47.543
tidak akan ada tanda-tanda peringatan dini.

00:00:47.668 --> 00:00:51.714
Asteroid itu menembus atmosfer Bumi dalam hitungan detik

00:00:51.798 --> 00:00:55.635
dan menghantam landas kontinen Yucatán yang terendam.

00:00:55.885 --> 00:00:57.929
Itu meledak saat benturan,

00:00:57.929 --> 00:01:01.808
secara instan menciptakan lubang selebar 100 kilometer

00:01:01.808 --> 00:01:05.311
dan mengeluarkan sedimen dan batuan kristal.

00:01:05.394 --> 00:01:10.108
Dalam beberapa menit, kawah tumbukan, yang sekarang dikenal sebagai Chicxulub,

00:01:10.108 --> 00:01:12.235
mulai runtuh ke dalam.

00:01:12.568 --> 00:01:17.323
Sementara itu, alasnya melambung sekitar 20 kilometer di atas permukaan bumi,

00:01:17.323 --> 00:01:22.370
lalu jatuh kembali dan bergerak ke luar, menciptakan lingkaran pegunungan.

00:01:22.954 --> 00:01:26.874
Energi yang dilepaskan akibat tumbukan asteroid diperkirakan

00:01:26.874 --> 00:01:30.920
beberapa miliar kali lipat energi yang dihasilkan bom nuklir.

00:01:31.420 --> 00:01:34.257
Kekuatan itu mengirimkan energi seismik ke seluruh planet

00:01:34.257 --> 00:01:37.301
dengan kekuatan yang jauh lebih besar dari gempa bumi mana pun

00:01:37.301 --> 00:01:39.804
yang pernah dihasilkan oleh patahan tektonik.

00:01:40.179 --> 00:01:42.557
Tanah longsor besar-besaran terjadi.

00:01:42.557 --> 00:01:45.601
Dan tsunami melesat dari kawah yang baru terbentuk,

00:01:45.601 --> 00:01:49.730
berpotensi mencapai ketinggian 1.500 meter.

00:01:50.064 --> 00:01:52.859
Nyawa yang tak terhitung jumlahnya hancur.

00:01:52.859 --> 00:01:58.489
Beberapa secara instan: semua kehidupan di jarak 1.500 kilometer dari lokasi itu

00:01:58.489 --> 00:01:59.866
terbakar;

00:02:00.032 --> 00:02:06.205
bencana lain setelahnya: gelombang besar, tanah longsor, dan angin topan.

00:02:06.747 --> 00:02:09.876
Tetapi banyak organisme di seluruh planet bertahan.

00:02:10.293 --> 00:02:14.755
Apa yang terjadi selanjutnya yang akan membawa akhir bagi banyak spesies,

00:02:14.755 --> 00:02:17.258
termasuk hampir semua dinosaurus.

00:02:17.884 --> 00:02:22.013
Ini hanyalah awal dari salah satu periode paling menghancurkan

00:02:22.013 --> 00:02:24.265
dalam sejarah kehidupan di Bumi.

00:02:25.099 --> 00:02:28.936
Ketika asteroid itu menghantam, ia mengirim ratusan gigaton

00:02:28.936 --> 00:02:33.316
batu kapur kaya karbon dioksida dan sedimen jenuh belerang

00:02:33.316 --> 00:02:34.650
ke atmosfer.

00:02:34.650 --> 00:02:38.863
Sulfur dikombinasikan dengan uap air untuk membuat aerosol sulfat.

00:02:39.030 --> 00:02:43.826
Gumpalan debu kapur, jelaga, dan aerosol sulfat ini

00:02:43.826 --> 00:02:47.788
menyebar dari lokasi benturan dengan kecepatan beberapa kilometer per detik,

00:02:47.872 --> 00:02:50.875
menyelimuti dunia dalam hitungan jam.

00:02:51.292 --> 00:02:53.127
Diperkirakan menghalangi Matahari,

00:02:53.127 --> 00:02:56.422
sehingga membuat Bumi berada dalam kegelapan yang berkepanjangan

00:02:56.422 --> 00:03:01.219
dan menurunkan suhu di banyak tempat setidaknya 25° C.

00:03:01.802 --> 00:03:05.139
Dampak langsung asteroid itu sangat menghancurkan,

00:03:05.139 --> 00:03:08.726
namun tampaknya hal ini disebabkan oleh perubahan iklim yang cepat

00:03:08.726 --> 00:03:14.148
yang mengakhiri kekuasaan dinosaurus selama sekitar 165 juta tahun.

00:03:14.357 --> 00:03:17.109
Tumbuhan dan plankton mati dengan cepat,

00:03:17.109 --> 00:03:20.279
menyebabkan runtuhnya jarring makanan di seluruh dunia.

00:03:20.446 --> 00:03:25.701
Diperkirakan 75% kehidupan di Bumi punah,

00:03:25.701 --> 00:03:28.079
termasuk hampir semua dinosaurus.

00:03:28.621 --> 00:03:31.874
Burung kecil adalah satu-satunya jenis yang tersisa,

00:03:32.083 --> 00:03:37.338
mungkin karena mereka mengandalkan benih yang kuat dan tahan pada bencana.

00:03:37.797 --> 00:03:43.427
Tak jelas mengapa sebenarnya makhluk hidup yang selamat dari kepunahan mengalaminya.

00:03:43.552 --> 00:03:47.682
Banyak organisme yang lebih kecil, seperti serangga, bertahan.

00:03:47.848 --> 00:03:53.354
Begitu pula mamalia purba—mungkin karena kemampuan untuk menggali dan berhibernasi.

00:03:53.396 --> 00:03:56.482
Dan makhluk hidup fotosintetik seperti alga,

00:03:56.482 --> 00:03:59.485
yang memiliki cara untuk bertahan dalam kondisi cahaya redup,

00:03:59.485 --> 00:04:00.861
juga bertahan.

00:04:01.612 --> 00:04:07.868
Jejak asteroid tersebar di seluruh dunia dan bekas kawah Chicxulub

00:04:07.868 --> 00:04:11.622
membuktikan periode kehancuran yang luar biasa ini.

00:04:12.123 --> 00:04:16.043
Jadi, apa kemungkinan Chicxulub lain terjadi?

00:04:16.335 --> 00:04:20.256
Program luar angkasa terus mengidentifikasi dan melacak

00:04:20.256 --> 00:04:22.258
asteroid dekat Bumi.

00:04:22.550 --> 00:04:27.221
Untungnya, kemungkinan serangan sebesar itu dan sedahsyat

00:04:27.221 --> 00:04:31.976
serangan yang terjadi dalam seribu tahun ke depan tampaknya kecil—

00:04:32.018 --> 00:04:35.354
kira-kira peluangnya 7 berbanding sejuta.

00:04:35.438 --> 00:04:41.527
Namun, kita menghadapi konsekuensi lain dari perubahan iklim yang cepat,

00:04:41.527 --> 00:04:45.197
kali ini karena emisi umat manusia sendiri.

00:04:45.489 --> 00:04:49.785
Hewan akan punah lebih cepat dari sebelumnya dalam sejarah kita,

00:04:50.077 --> 00:04:52.913
dan orang-orang dipindahkan dari rumah mereka.

00:04:52.913 --> 00:04:55.458
Tapi, tidak seperti dinosaurus,

00:04:55.458 --> 00:05:01.213
kita memiliki kesempatan untuk menghindari kehancuran skala besar yang akan datang

00:05:01.213 --> 00:05:04.717
jika pemerintah terus mempertahankan *status quo*.