

1
00:00:07,259 --> 00:00:11,580
Comets are scary looking things.

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00:00:11,580 --> 00:00:16,600
Seeing them up there, their long tails sprayed
out across the pristine calm of our night

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00:00:16,600 --> 00:00:23,780
sky, it is easy to understand how they have
terrorized our imaginations for so long.

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00:00:23,780 --> 00:00:26,160
For centuries humanity has worried:

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00:00:26,160 --> 00:00:27,160
Where do they come from?

6
00:00:27,160 --> 00:00:29,269
Are they going to hurt us?

7
00:00:29,269 --> 00:00:33,539
Why do they appear, gradually getting larger
and larger?

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00:00:33,539 --> 00:00:37,119
Will they leave us alone?

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00:00:37,119 --> 00:00:40,558
Sometimes comets do hit the Earth.

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00:00:40,558 --> 00:00:44,968
Earth's history is full of comet impacts,
huge collisions that have changed the nature

11
00:00:44,969 --> 00:00:46,850
of our planet.

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00:00:46,850 --> 00:00:50,989
These collisions would have wrought terrible
destruction, but they're also credited with

13
00:00:50,988 --> 00:00:56,849
bringing water and other essential elements

for life to Earth.

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00:00:56,850 --> 00:00:58,319

Why do they hit us?

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00:00:58,319 --> 00:01:01,699

Well that depends on what type of comet we're talking about.

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00:01:01,698 --> 00:01:08,929

There are two main types of comets, characterized primarily by where they come from.

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00:01:08,930 --> 00:01:16,070

Comets usually originate in one of two places: the Kuiper Belt or the Oort Cloud.

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00:01:16,069 --> 00:01:21,109

Comets from the Kuiper belt are short-period comets that follow orbits around the Sun and

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00:01:21,109 --> 00:01:24,790

make repeat visits to our night sky.

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00:01:24,790 --> 00:01:31,340

Comet Halley is like this, it becomes visible from Earth every 75 to 76 years.

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00:01:31,340 --> 00:01:34,990

Most of these comets return within 20 years or less.

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00:01:34,989 --> 00:01:41,169

The most dangerous orbits however come from the second type: the long-period comet.

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00:01:41,170 --> 00:01:45,430

These celestial bodies originate from the outer edges of the solar system beyond the

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00:01:45,430 --> 00:01:47,750

orbit of Neptune.

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00:01:47,750 --> 00:01:52,280

These long-period comets are gravitationally

kicked out of their safe orbits, tucked far

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00:01:52,280 --> 00:01:53,950
away in the Oort Cloud.

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00:01:53,950 --> 00:01:59,420
They then form highly elongated orbits that
pass across the path of the planets.

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00:01:59,420 --> 00:02:06,640
Long period comets follow parabolic and sometimes
hyperbolic trajectories. These are the most

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00:02:06,640 --> 00:02:11,590
dangerous to the Earth as their paths and
inclinations are the most extreme.

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00:02:11,590 --> 00:02:16,840
These are the comets to keep your eyes on,
and in September 2012, we found one.

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00:02:16,840 --> 00:02:22,579
We call it Comet ISON, after the Russian observatory
known as the International Scientific Optical

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00:02:22,579 --> 00:02:25,409
Network that discovered it.

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00:02:25,408 --> 00:02:30,449
This chunk of ice and rock a few kilometers
across was found using only a 40 centimeter

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00:02:30,449 --> 00:02:33,128
(16") telescope.

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00:02:33,128 --> 00:02:38,459
It's orbit has been measured and is probably
parabolic, meaning ISON is a long period comet,

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00:02:38,459 --> 00:02:41,289
and it will pass extremely close to the Sun.

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00:02:41,289 --> 00:02:46,340
The parabolic orbit indicates that this is
probably Comet ISON's first pass ever through

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00:02:46,340 --> 00:02:48,700

our solar system.

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00:02:48,699 --> 00:02:56,919

But regardless of whether it has a hyperbolic or parabolic orbit, one question looms large:

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00:02:56,919 --> 00:03:01,339

will Comet ISON actually hit the Earth?

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00:03:01,340 --> 00:03:05,598

Current projections of the comet's trajectory show it will reach its closest approach to

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00:03:05,598 --> 00:03:13,778

Earth on December 26, 2013, where it will pass no closer than 63 million km overhead.

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00:03:13,778 --> 00:03:18,699

So it appears the Earth will get a pass on this one.

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00:03:18,699 --> 00:03:25,988

However, in January 2014, the Earth will swing past a part of space that Comet ISON already

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00:03:25,989 --> 00:03:29,930

traveled through, at a small distance of only 4.4 million km.

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00:03:29,930 --> 00:03:35,590

This encounter brings up the possibility of a meteor shower on Earth.

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00:03:35,590 --> 00:03:40,248

Meteor showers occur when the Earth passes through the dust left behind by comets -- usually

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00:03:40,248 --> 00:03:43,598

by recurring, short-period comets.

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00:03:43,598 --> 00:03:50,619

Meteor showers from long-period Oort Cloud comets are rare events indeed.

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00:03:50,620 --> 00:03:56,139

There will plenty of opportunity for surprises
as Comet ISON begins to appear in our night

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00:03:56,139 --> 00:03:57,808

sky.

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00:03:57,808 --> 00:04:00,019

But hitting the Earth won't be one of them.