1
00:00:00,300 --> 00:00:04,960
Life and Death of a Planetary System

2
00:00:05,360 --> 00:00:06,440
0 to 100,000 years

3
00:00:06,440 --> 00:00:10,500
How do you make planets? First, you need a star.

4
00:00:12,140 --> 00:00:16,920
A star is born in a cold cloud that collapses into a ball of gas...

5
00:00:17,080 --> 00:00:20,260
with a disk around it that looks like a pancake.

6
00:00:21,880 --> 00:00:23,420
100,000 to 1 million years

7
00:00:23,540 --> 00:00:31,800
As it eats gas and dust from the disk, the baby star brightens and shoots out jets from its poles.

8
00:00:33,920 --> 00:00:35,320
1 million to 10 million years

9
00:00:35,520 --> 00:00:40,380
Baby planets grow from small grains of dust that stick together.

10
00:00:40,440 --> 00:00:44,620
They become bigger as they collide with other small objects.

11
00:00:45,320 --> 00:00:49,160
Childhood for planets involves a lot of crashing into other things.

12
00:00:49,980 --> 00:00:51,520
10 million
to 1 billion years

13

00:00:51,520 --> 00:00:54,740
As teenagers, these planets don’t sit still.

14
00:00:54,740 --> 00:00:58,640
They move around and interact
with one another and kick smaller objects

15
00:00:58,640 --> 00:01:03,880
toward other planets, into the star, or out
of the system.

16
00:01:04,100 --> 00:01:05,880
1 billion to 10 billion years

17
00:01:05,980 --> 00:01:11,520
Middle age for planets is like our solar system today. The planets’ orbits don’t change much anymore.

18
00:01:11,660 --> 00:01:15,980
Our solar system is 4.6 billion
years old.

19
00:01:15,980 --> 00:01:17,320
10 billion to 11 billion years

20
00:01:17,320 --> 00:01:21,440
Stars like our Sun become red giants when they are old.

21
00:01:21,440 --> 00:01:26,160
A red giant’s core gets smaller, but also very hot...

22
00:01:26,380 --> 00:01:32,820
making the star puff up
so much that it can eat the closest planets to it.

23
00:01:37,080 --> 00:01:38,680
11 billion to 13 billion years

24
00:01:38,680 --> 00:01:42,980
The old red giant eventually burns all of the fuel in its core

25
00:01:42,980 --> 00:01:47,580
and blows off its outer gas
layers leaving a dense “white dwarf.”

26
00:01:49,280 --> 00:01:53,320
Our Sun will reach this death about 8 billion years from now.

27
00:01:55,780 --> 00:01:58,640
Only the most massive stars will instead explode,

28
00:01:58,920 --> 00:02:02,160
their violent deaths triggering the births of new stars.

29
00:02:03,620 --> 00:02:05,620
Destruction sparks the creation of new worlds.

30
00:02:05,720 --> 00:02:07,900
Beginning the cycle again.

31
00:02:09,520 --> 00:02:12,180
Learn more about the lives of stars and planets at: exoplanets.nasa.gov/livesofplanets

32
00:02:12,180 --> 00:02:12,900
Visualization Credits: "Pillars of Creation" image from NASA, ESA/Hubble and the Hubble Heritage Team

33
00:02:12,900 --> 00:02:13,520
Star with jets, asteroid and orbit visualizations by NASA's Goddard Scientific Visualization Studio

34
00:02:13,520 --> 00:02:14,080
Planet with ring formation visualization by ESA/Hubble (M. Kornmesser & L. L. Christensen)