1
00:00:09,669 --> 00:00:07,030
the hubble space telescope for its 31st

2
00:00:11,910 --> 00:00:09,679
birthday has captured a glimpse of an

3
00:00:14,390 --> 00:00:11,920
incredible star one of the brightest

4
00:00:17,670 --> 00:00:14,400
stars in our galaxy

5
00:00:21,510 --> 00:00:17,680
this giant luminous blue variable star

6
00:00:23,830 --> 00:00:21,520
known as a.g karenai is huge 70 times

7
00:00:26,870 --> 00:00:23,840
more massive than our sun and shining

8
00:00:29,429 --> 00:00:26,880
with the brilliance of a million suns

9
00:00:31,429 --> 00:00:29,439
the star is surrounded by a glowing halo

10
00:00:33,750 --> 00:00:31,439
of gas and dust

11
00:00:36,389 --> 00:00:33,760
this vast structure was created from

12
00:00:38,229 --> 00:00:36,399
giant eruptions from the star about ten

13
00:00:40,790 --> 00:00:38,239

thousand years ago

14
00:00:43,270 --> 00:00:40,800
creating an expanding shell that is now

15
00:00:45,190 --> 00:00:43,280
nearly five light years across

16
00:00:47,910 --> 00:00:45,200
similar to the distance from our sun to

17
00:00:50,389 --> 00:00:47,920
its nearest neighbor star

18
00:00:53,110 --> 00:00:50,399
the outburst expelled the star's outer

19
00:00:55,990 --> 00:00:53,120
layers blowing out material nearly ten

20
00:00:58,310 --> 00:00:56,000
times the mass of our sun

21
00:01:01,110 --> 00:00:58,320
the nebula around the star from these

22
00:01:03,750 --> 00:01:01,120
ancient eruptions is being impacted by a

23
00:01:05,990 --> 00:01:03,760
powerful wind of charged particles

24
00:01:08,950 --> 00:01:06,000
flowing out from the star at a million

25
00:01:12,390 --> 00:01:08,960
kilometers per hour ten times faster

26
00:01:14,870 --> 00:01:12,400
than the nebula itself is expanding

27
00:01:17,749 --> 00:01:14,880
as this outflowing gas slams into the

28
00:01:20,870 --> 00:01:17,759
slower moving outer nebula it creates a

29
00:01:23,590 --> 00:01:20,880
snowplow effect clearing a cavity around

30
00:01:25,590 --> 00:01:23,600
the star and sculpting structures in the

31
00:01:27,830 --> 00:01:25,600
nebula

32
00:01:30,630 --> 00:01:27,840
searing radiation from the star is

33
00:01:32,789 --> 00:01:30,640
lighting up the nebula as seen by hubble

34
00:01:35,030 --> 00:01:32,799
in both visible light and in the

35
00:01:36,950 --> 00:01:35,040
ultraviolet light that can only be seen

36
00:01:39,990 --> 00:01:36,960
from space

37
00:01:42,230 --> 00:01:40,000
red colors indicate glowing hydrogen gas

38
00:01:44,149 --> 00:01:42,240

laced with nitrogen gas

39
00:01:46,630 --> 00:01:44,159
at the upper left in the image the

40
00:01:48,710 --> 00:01:46,640
diffuse red glow shows a region where

41
00:01:51,590 --> 00:01:48,720
the stellar wind has broken through a

42
00:01:53,590 --> 00:01:51,600
tenuous region of material and swept it

43
00:01:56,469 --> 00:01:53,600
into space

44
00:01:57,510 --> 00:01:56,479
blue features shaped like tadpoles and

45
00:02:00,069 --> 00:01:57,520
bubbles

46
00:02:02,310 --> 00:02:00,079
are dust clumps shaped by the stellar

47
00:02:04,709 --> 00:02:02,320
wind and illuminated by the star's

48
00:02:06,709 --> 00:02:04,719
reflected light

49
00:02:09,910 --> 00:02:06,719
this incredible image from the hubble

50
00:02:12,949 --> 00:02:09,920
space telescope shows how even one star

51
00:02:14,710 --> 00:02:12,959
can be incredibly beautiful and powerful

52
00:02:16,630 --> 00:02:14,720
as it impacts its surrounding

53
00:02:18,630 --> 00:02:16,640
environment

54
00:02:21,030 --> 00:02:18,640
since hubble orbits above the earth's

55
00:02:23,070 --> 00:02:21,040
atmosphere it can give us a clear

56
00:02:25,830 --> 00:02:23,080
detailed view of this kind of

57
00:02:27,830 --> 00:02:25,840
awe-inspiring beauty and activity in the

58
00:02:30,790 --> 00:02:27,840
universe

59
00:02:33,110 --> 00:02:30,800
for the past 31 years the hubble space

60
00:02:36,710 --> 00:02:33,120
telescope has changed the way we think

61
00:02:38,710 --> 00:02:36,720
of space and our place in the cosmos

62
00:02:42,070 --> 00:02:38,720
hubble has revealed an incredible

63
00:02:44,229 --> 00:02:42,080

diversity of stars and gives us pristine

64
00:02:46,790 --> 00:02:44,239
views into beautiful interstellar

65
00:02:49,430 --> 00:02:46,800
nebulas where new stars and their

66
00:02:51,990 --> 00:02:49,440
surrounding discs of dust and planets

67
00:02:54,390 --> 00:02:52,000
continue to form

68
00:02:56,550 --> 00:02:54,400
looking even deeper into space

69
00:02:59,670 --> 00:02:56,560
hubble makes it possible for us to see

70
00:03:02,309 --> 00:02:59,680
across billions of light years revealing

71
00:03:05,030 --> 00:03:02,319
ancient adolescent galaxies that we can

72
00:03:06,790 --> 00:03:05,040
compare with our own milky way

73
00:03:09,110 --> 00:03:06,800
hubble is even refining our

74
00:03:11,430 --> 00:03:09,120
understanding of the age of the universe

75
00:03:13,430 --> 00:03:11,440
and its rate of expansion

76
00:03:16,390 --> 00:03:13,440
it sees the telltale effects of

77
00:03:18,790 --> 00:03:16,400
mysterious black holes dark matter and

78
00:03:21,190 --> 00:03:18,800
dark energy over time

79
00:03:24,229 --> 00:03:21,200
in the past year alone hubble revealed a

80
00:03:26,229 --> 00:03:24,239
large concentration of small black holes

81
00:03:28,470 --> 00:03:26,239
nestled within the heart of a globular

82
00:03:30,949 --> 00:03:28,480
cluster of stars

83
00:03:34,390 --> 00:03:30,959
it rewound the clock to calculate the

84
00:03:37,190 --> 00:03:34,400
age and sight of a supernova blast

85
00:03:41,670 --> 00:03:37,200
it also detected a possible new second

86
00:03:43,350 --> 00:03:41,680
atmosphere formed on a distant exoplanet

87
00:03:45,589 --> 00:03:43,360
and closer to home

88
00:03:48,630 --> 00:03:45,599

hubble spotted a comet lurking near

89
00:03:50,550 --> 00:03:48,640
jupiter and its trojan asteroids

90
00:03:53,270 --> 00:03:50,560
these are just a handful of hubble's

91
00:03:55,270 --> 00:03:53,280
recent discoveries

92
00:03:57,589 --> 00:03:55,280
hubble remains in excellent technical

93
00:03:59,750 --> 00:03:57,599
health and is expected to continue its

94
00:04:00,789 --> 00:03:59,760
exploration of the universe for years to

95
00:04:04,309 --> 00:04:00,799
come

96
00:04:06,869 --> 00:04:04,319
from 1993 to 2009 there were five

97
00:04:09,589 --> 00:04:06,879
astronaut servicing missions for repairs

98
00:04:11,990 --> 00:04:09,599
and upgrades of the telescope

99
00:04:14,309 --> 00:04:12,000
these along with an ongoing crew of

100
00:04:16,469 --> 00:04:14,319
attentive experts on the ground are

101
00:04:19,509 --> 00:04:16,479
keeping the telescope today at the peak

102
00:04:21,270 --> 00:04:19,519
of its scientific capabilities

103
00:04:24,790 --> 00:04:21,280
you can find out more about the hubble

104
00:04:27,830 --> 00:04:24,800
space telescope at the website nasa.gov