
NASA
Hubble's
Field Guide to Nebulae

1
00:00:08,230 --> 00:00:06,309
the space between stars holds an array

2
00:00:11,270 --> 00:00:08,240
of vibrant clouds

3
00:00:15,669 --> 00:00:11,280
clouds that command our attention

4
00:00:17,830 --> 00:00:15,679
clouds that create spectacular displays

5
00:00:19,349 --> 00:00:17,840
clouds that seem familiar

6
00:00:21,590 --> 00:00:19,359
tenuous

7
00:00:24,630 --> 00:00:21,600
and fragile

8
00:00:26,310 --> 00:00:24,640
clouds that hold clues to star birth and

9
00:00:28,710 --> 00:00:26,320
death

10
00:00:32,310 --> 00:00:28,720
nasa's hubble space telescope has imaged

11
00:00:35,510 --> 00:00:32,320
hundreds of them in extraordinary detail

12
00:00:37,590 --> 00:00:35,520
these vast swirls of gas and dust get

13
00:00:40,229 --> 00:00:37,600

their name from the latin word nebula

14
00:00:42,869 --> 00:00:40,239
meaning cloud or mist

15
00:00:46,069 --> 00:00:42,879
nebulae is the plural of nebula and they

16
00:00:47,670 --> 00:00:46,079
come in a wide range of shapes sizes and

17
00:00:50,069 --> 00:00:47,680
forms

18
00:00:51,750 --> 00:00:50,079
emission nebulae are some of the most

19
00:00:54,950 --> 00:00:51,760
spectacular

20
00:00:58,630 --> 00:00:54,960
these opaque gleaming clouds of gas and

21
00:01:00,790 --> 00:00:58,640
dust radiate or emit their own light

22
00:01:03,270 --> 00:01:00,800
ultraviolet light from nearby stars

23
00:01:05,990 --> 00:01:03,280
energizes atoms in the cloud

24
00:01:07,590 --> 00:01:06,000
when the excited atoms lose that energy

25
00:01:10,230 --> 00:01:07,600
they release the light that gives

26
00:01:12,230 --> 00:01:10,240
emission nebulae their glow the orion

27
00:01:14,469 --> 00:01:12,240
nebula is one of the most famous

28
00:01:17,910 --> 00:01:14,479
emission nebulae

29
00:01:20,230 --> 00:01:17,920
its core called the trapezium holds four

30
00:01:23,350 --> 00:01:20,240
enormous young stars whose ultraviolet

31
00:01:25,429 --> 00:01:23,360
light powers the region's intense glow

32
00:01:27,830 --> 00:01:25,439
the carina nebula is another vast

33
00:01:29,990 --> 00:01:27,840
emission nebula and star-forming region

34
00:01:32,149 --> 00:01:30,000
in our galaxy

35
00:01:35,190 --> 00:01:32,159
within the nebula is a pillar three

36
00:01:38,069 --> 00:01:35,200
light-years tall dubbed mystic mountain

37
00:01:41,109 --> 00:01:38,079
it cloaks massive young stars some with

38
00:01:43,590 --> 00:01:41,119

jets emerging from the cloud

39
00:01:46,069 --> 00:01:43,600
hubble's infrared view cuts through the

40
00:01:49,670 --> 00:01:46,079
shroud of gas and dust revealing these

41
00:01:53,990 --> 00:01:51,670
reflection nebulae shine by the

42
00:01:56,230 --> 00:01:54,000
reflected or scattered light of nearby

43
00:01:58,310 --> 00:01:56,240
stars

44
00:02:00,389 --> 00:01:58,320
they often have a bluish color because

45
00:02:02,389 --> 00:02:00,399
the dust grains in the clouds scatter

46
00:02:05,270 --> 00:02:02,399
blue light more efficiently than red

47
00:02:11,830 --> 00:02:08,869
not all nebulae shine brightly dark or

48
00:02:14,070 --> 00:02:11,840
absorption nebulae are inky black clouds

49
00:02:16,470 --> 00:02:14,080
of gas and dust that block the light

50
00:02:19,030 --> 00:02:16,480
coming from objects behind them

51
00:02:20,470 --> 00:02:19,040
because they are dark absorption nebulae

52
00:02:22,790 --> 00:02:20,480
are hard to find

53
00:02:27,030 --> 00:02:22,800
we only see them as silhouettes against

54
00:02:32,070 --> 00:02:29,670
most large nebulae are a combination of

55
00:02:34,949 --> 00:02:32,080
emission reflection and absorption

56
00:02:36,949 --> 00:02:34,959
nebulae their dark dust lanes may give

57
00:02:40,869 --> 00:02:36,959
birth to new stars that provide the

58
00:02:43,270 --> 00:02:40,879
light needed to illuminate the cloud

59
00:02:45,270 --> 00:02:43,280
planetary nebulae are a type of emission

60
00:02:48,309 --> 00:02:45,280
nebula powered by a small to

61
00:02:50,630 --> 00:02:48,319
medium-sized dying star

62
00:02:54,070 --> 00:02:50,640
as these stars run out of fuel they

63
00:02:56,790 --> 00:02:54,080

periodically blow off their outer layers

64
00:02:59,350 --> 00:02:56,800
the expelled gas expands outward away

65
00:03:01,110 --> 00:02:59,360
from the star forming a bubble or shell

66
00:03:03,670 --> 00:03:01,120
around the star

67
00:03:06,149 --> 00:03:03,680
sometimes the envelope of debris holds

68
00:03:09,990 --> 00:03:06,159
clumps of dense gas that shine like the

69
00:03:15,110 --> 00:03:13,350
the term planetary nebula is misleading

70
00:03:17,110 --> 00:03:15,120
it comes from late 18th century

71
00:03:19,270 --> 00:03:17,120
astronomers who thought their rounded

72
00:03:21,990 --> 00:03:19,280
shape looked similar to planets and

73
00:03:24,789 --> 00:03:22,000
telescopes of that time

74
00:03:27,030 --> 00:03:24,799
they named them planetary nebulae as a

75
00:03:29,110 --> 00:03:27,040
result

76
00:03:31,830 --> 00:03:29,120
supernova remnants are the diffused

77
00:03:35,030 --> 00:03:31,840
clouds of expanding debris released by a

78
00:03:38,869 --> 00:03:35,040
massive star's death explosion

79
00:03:42,550 --> 00:03:38,879
the cygnus loop is a vast expanding 110

80
00:03:44,630 --> 00:03:42,560
light year wide supernova remnant

81
00:03:48,710 --> 00:03:44,640
it is so large that hubble can only

82
00:03:53,990 --> 00:03:50,789
some supernova remnants emit their light

83
00:03:56,710 --> 00:03:54,000
from a shell of shocked material

84
00:03:58,550 --> 00:03:56,720
others like the crab nebula emit most of

85
00:04:00,470 --> 00:03:58,560
their light from within the expanding

86
00:04:02,949 --> 00:04:00,480
shell

87
00:04:06,390 --> 00:04:02,959
and still other supernova remnants shine

88
00:04:08,949 --> 00:04:06,400

as a combination of the two

89
00:04:10,789 --> 00:04:08,959
nebulae are some of the most resplendent

90
00:04:12,949 --> 00:04:10,799
objects in the universe

91
00:04:14,789 --> 00:04:12,959
and thanks to the hubble space telescope