

1. Stradivarius violins, made by the Italian craftsman Antonio Stradivari from  
2. the mid-1600s to the early 1700s, have a legendary reputation for their  
3. unrivalled quality of sound. About 650 of Stradivari's instruments survive  
4. today, and some sell for millions of dollars. But what makes their sound so  
5. phenomenal? Many researchers have argued the answer is the wood from  
6. which they were crafted. It was once believed Stradivari obtained his wood  
7. from old cathedrals and that years of absorbing bell vibrations had resulted in  
8. wood that produced a uniquely rich sound. Later examination of the wood in  
9. Stradivarius violins, however, indicated it is not old enough for this to be true.  
10. Berend Stoel, a radiologist at Leiden University in the Netherlands, has  
11. recently suggested another reason for the violins' superior quality. Stoel used  
12. X-ray computed tomography (CT) scans to compare the density of the wood in  
13. Stradivarius violins to that in modern instruments. He found that the

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24. different manner from the wood used in modern violins.

25. 4. It demonstrated that the wood used by Stradivari had a significantly lower  
26. density than the wood used by his contemporaries.

### Further Questions

27. 1) When were the Stradivarius violins made?

28. *They were made from the mid-1600s to the early 1700s.*

29. 2) Where was it once believed Stradivari obtained his wood?

30. *It was once believed Stradivari obtains his wood from old cathedrals.*

31. 3) How did Stoel compare the density of the wood in in Stradivarius violins to  
32. that in modern instruments?

33. *He used computed tomography (CT) scans to compare the density of the wood  
34. in Stradivarius violins to that in modern instruments.*

35. A theory proposed by tree-ring scientist Henri Grissino-Mayer and  
36. climatologist Lloyd Burckle supports Stoel's findings. One factor that causes  
37. variations in wood density is the rate of tree growth. From 1645 until 1715,  
38. unusually low solar radiation led to colder temperatures throughout Europe.

39. During this period, known as the Maunder Minimum, tree growth slowed to its  
40. lowest level in 500 years. This resulted in wood that was uniformly dense, as  
41. evidenced by narrow growth rings. Grissino-Mayer and Burckle claim that this  
42. would have helped “instill a superior tone and brilliance in violins.” Another  
43. tree-ring scientist, John Topham, argues this theory is inconclusive. He points  
44. out that only a few Stradivarius violins have been analyzed for density, and, in  
45. fact, the wood in other Stradivarius violins does not exhibit the same narrow  
46. growth rings. Furthermore, he notes that although Stradivari’s European  
47. contemporaries used wood that grew during the Maunder Minimum, they still  
48. produced inferior instruments.

49. **(36) One problem John Topham has with Henri Grissino-Mayer and Lloyd  
50. Burckle’s theory is that**

51. 1. Stradivarius violins made from trees that experienced long periods of slow  
52. growth produce a lower-quality sound than other Stradivari violins.
53. 2. Despite establishing a connection between Maunder Minimum and wood

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65. *the wood in other Stradivarius violins does not exhibit the same narrow growth*  
66. *rings).*

67. Biochemist Joseph Nagyvary of Texas A&M University agrees with Topham.  
68. Nagyvary believes the answer lies in the chemistry of the wood Stradivari  
69. used. In 2009, he ran a chemical analysis of fragments from Stradivarius  
70. violins and found the wood contained mineral compounds indicating it had  
71. been chemically treated. He also discovered it was highly porous. He theorizes  
72. the wood was treated with a varnish-like substance to prevent worm  
73. infestation, which weakened the wood’s organic structure. Nagyvary believes  
74. the wood’s porosity gives Stradivarius violins their powerful tone. This  
75. contradicts the widely held belief that stronger wood produces a better sound.  
76. Still, the question arises of why the quality of the violins Stradivari crafted was  
77. never equaled by his apprentices, who carried on his work after his death.  
78. Nagyvary suggests the wood Stradivari used had likely been treated before he  
79. obtained it, and that the secret behind the quality of his violins could easily  
80. have died with him because he probably “did not even know these minerals in

81. his wood were the crucial factor” in creating the instrument’s unique sound.
82. **(37) According to Joseph Nagyvary, what is a possible reason the quality of**  
83. **Stradivari’s violins was never matched?**
84. 1. Stradivari refused to give his apprentices access to the same wood he used  
85. because he did not trust them to apply the proper chemical treatments.
86. 2. Stradivari was unable to pass on the key piece of information regarding what  
87. made his violins so good because he himself was unaware of it.
88. 3. Stradivari was unwilling to reveal the recipe for the varnish he used to protect  
89. his wood because he was not entirely satisfied with its effectiveness.
90. 4. Stradivari’s claim that weaker wood could actually produce higher-quality  
91. instruments was too controversial for other violin makers to accept.
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### Further Questions

92. **6) What did Nagyvary find when he ran a chemical analysis of fragments from**  
93. **Stradivari’s violins?**

94. *He found the wood contained mineral compounds indicating it had been*

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