



EVOLUTION EXISTS, AT LEAST IN MUSICAL INSTRUMENTS

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ABSTRACT

Charles Darwin could have more successfully applied his theory of evolution to the technological development evident in Musical Instruments. Even the modern violin, so apparently similar to that of the 1600s, has actually been largely modified and for reasons similar to those that Darwin wanted to attribute to the origin of the species. Following his logic, what will the Violin of the future be? The new ergonomic violin model developed by the Santa Cecilia Conservatory in Rome may be the answer. Let us consider the concerto for violin and orchestra. From the Baroque era to Mozart, then from Beethoven to Tchaikovsky up to Sibelius and Khachaturian, the solo violinist had to deal with ever increasing acoustic needs that over time have been satisfied by continuous changes and updates in the construction of violins. Even the greatness of the theaters and the way in which the music was written progressively required more and more power and higher quality of sound: will classical lutherie be able to answer? The laboratory of the Lutherie Course of the Santa Cecilia Conservatory in Rome has created a new ergonomic model of violin that was conceived with the express purpose of producing more sound with a richer timbre. We are pleased to present it in this article.

KEYWORDS. Evolution, Lutherie, Violin, Sound, Violin, Music

1 INTRODUCTION

Charles Darwin was a courageous and enterprising but not accurate researcher. In recent years, some scientists have raised serious doubts about the feasibility of his theory of evolution. This is especially true of molecular biologists. In his book *Evolution: A Theory in Crisis*¹, Michael Denton, a researcher in biology, wrote: "The elevation of the status of Darwinian theory to an obvious axiom has had the consequence that the very real problems and objections with which Darwin so laboriously toiled in the Origin have become completely invisible Crucial problems such as the absence of links or the difficulty of predicting intermediate forms are hardly ever discussed, and the creation of even the most complex of adaptations is undoubtedly attributed to natural selection. And he continues: "The absolute supremacy of myth has created a widespread illusion that the theory of evolution was almost proven a hundred years ago. . . Nothing could be further from the truth".

If Darwin had directed his studies in the field of musical instruments he would never have been denied and would have helped us to understand what the trend to follow for the future would be. But this did not happen and we will do this study together.

Over time, composers have written works for ever larger orchestras and have inserted more and more wind instruments, demanding that even stringed instruments produce greater sonic power and greater technical agility. Furthermore, the places used for concerts have also grown in size: the violin which in the seventeenth century was excellent for chamber music (the room, in fact, is only a room) is now invited to perform in huge concert halls for 2000 listeners. Finally, the way in which the Music to Play is written has also changed a lot over time and now contemporary scores look more like surreal paintings in an art gallery and must be played in an innovative way (for example, also with the bow's wood). These needs were met by progressive changes and updates in the construction of the violins: new geometry of the violin neck, new ebony fingerboard, higher bridges, longer f-holes, longer and thicker bass bar, new strings in new materials (before steel and then composite materials), new longer wooden bows with greater pressure capacity on the strings and recently new bows in high quality carbon fiber.

2 THE VIOLIN EVOLUTION

What are the proofs of the evolution that has taken place so far in violins? I know many serious studies on this subject; some are as follows:

- *Acoustic evolution of old Italian violins from Amati to Stradivari* by Hwan-Ching Tai, Yen-Ping Shen, Jer-Horng Lin and

¹ Michael Denton, *Evolution: A Theory in Crisis*, Discovery Institute Ed., Seattle USA 1985



Dai-Ting Chung².

- *The Evolution of the Violin's Sound* by Julia Rothchild³
- *The Evolution of the Violin's Sound and Design* by Meridee Duddleston⁴
- *The Second Revolution in the History of the Violin: A Twentieth-Century Phenomenon* by Elias Dann⁵
- *Imitation, genetic lineages, and time influenced the morphological evolution of the violin* by Chitwood D.⁶
- *History of the Development of the Violin* by Carl David Nyman⁷
- *The Art Behind the Baroque Violin* by Carolyn Goldstein⁸
- *Some Speculations on a Crisis in the History of the Violin* by Kenneth Skeaping⁹.

3 IS THE MODERN VIOLIN THE BEST IT CAN BE?

Larger orchestras, larger concert halls, differently written and differently performed music: the modern violin is good, but we need a better one. Today it's possible; many researchers have demonstrated this over the last few years and we have also pointed this out in two recent articles: Knowledge and Innovation on Classic Italian Lutherie: A Competitive Education in Market Economy by Massimo de Bonfils¹⁰ and Beyond Stradivari: The New Santa Cecilia Violin - An Essay on Research of the Classic Italian Lutherie by Massimo de Bonfils and Mauro Fabretti¹¹.

Scientists are trying to uncover what makes Stradivarius violins special – but are they Wasting their time? by Bruno Fazenda and Trevor Cox¹² is an excellent article – summarizes several concepts: Stradivari and Guarneri's violins sounded good not because they were from the 18th century and Italian, but because they were well made. Today it is possible to make instruments that can sound even better, has shown by the double-blind experiment conducted in Indianapolis, Paris and New York (see *Million-dollar Strads fall to modern violins in blind 'sound check'* by Adrian Cho¹³). The final confirmation can be read on *Tests challenge whether centuries old violins really are the best ever - Again and again, scientists find, new instruments can sound as good as the famed oldies* by Sid Perkins¹⁴ mainly with its subtitle *Evolution in Action* and with its conclusion 'For young musicians, the message is: "They should be open-minded about using a new violin" instead of an older one, even if was made by someone famous. "A musician should be recognized for how they play, not for the instrument that they're playing.' However, all these experiments do not concern a NEW violin model.

4 LOOKING FOR AN INNOVATIVE VIOLIN WITH BETTER SOUND

Over the centuries, many luthiers have tried to go beyond the iconic Stradivari model, deciding not to copy the great Cremonese master and trying to come up with something new, especially violins and violas; among the many we remember Jean-Baptiste Vuillaume, Hermann Ritter, Thomas Zach, Johannes Matthias Augustus Stroh, François Chanut, Felix Savart, Theophile Villard, Lionel Tertis, Heinrich Dessauer, Alfred Stelzner, Eugen Sprenger, Carleen M. Hutchins, Franz Zeyringer, Otto Erdesz, Giuseppe Virzi, F.A. Saunders, David Rivinus, Marty Kasprzyk, Joseph Curtin, Douglas Martin, Hans Johannsson, Tyler Thackray, Berl Mendenhall and so on. On 2011 also the Lutherie course of our Santa Cecilia Conservatory in Rome, alongside the classical lutherie courses, decided to try their hand at a new model of ergonomic violin with a better sound, richer in harmonics and more powerful.

5 THE NEW SANTA CECILIA VIOLIN MODEL

In Rome, at our Santa Cecilia Conservatory, we teach not only to play an instrument but also Lutherie, String Instruments⁹

² <https://www.pnas.org/content/115/23/5926> - Proceedings of the National Academy of Sciences of the United States of America – June 5, 2018

³ <https://www.yalescientific.org/2015/05/the-evolution-of-the-violins-sound/> - Yale Scientific, May 8, 2015

⁴ <https://www.wrti.org/post/evolution-violins-sound-and-design> - January 2, 2017

⁵ College Music Symposium 17, no. 2 (1977): 64-71 - <http://www.jstor.org/stable/40373889>.

⁶ PLoS ONE (2014) 9(10) - DOI: 10.1371/journal.pone.0109229

⁷ Utah State University, 1975 - <https://digitalcommons.usu.edu/gradreports/750>

⁸ https://surface.syr.edu/honors_capstone - Syracuse University, Spring 5-2016

⁹ The Galpin Society Journal, 8, 3-12. doi:10.2307/842152 - (1955)

¹⁰ Educational Alternatives, ISSN 1314-7277, Volume 15, 2017 - Journal of International Scientific Publications, www.scientific-publications.net, Page 391

¹¹ SIMP - Studia Instrumentorum Musicae Popularis (New Series) VI Serie of the ICTM Study Group On Musical Instruments, Edited by Gisa Jähnichen. Verlag: Logos, Berlin. 2019.

ISBN 978-3-8325-4988-6, ISSN 2191-5261 - Logos Verlag Berlin GmbH

¹² The Conversation, University of Salford, Manchester -December 19, 2016 - <https://theconversation.com/scientists-are-trying-to-uncover-what-makes-stradivarius-violins-special-but-are-they-wasting-their-time-70604>

¹³ American Association for the Advancement of Science – Science Mag on May 9, 2017

<https://www.sciencemag.org/news/2017/05/million-dollar-strads-fall-modern-violins-blind-sound-check>

¹⁴ December 12, 2019 - Science News for Students - <https://www.sciencenewsforstudents.org.cdn.ampproject.org/v/s/www.sciencenewsforstudents.org/article/tests-challenge-whether-centuries-old-violins-really-are-best-ever>



History and Technology. Our Lutherie course was founded in two thousand eleven and today, the Santa Cecilia Conservatory is the only one 'University-Level' Institute in Italy that organizes a Violin Making Course with a Laboratory. We have two professors and one assistant: me as lutherie history and technology teacher, Maestro Mauro Fabretti - the laboratory teacher, the real father of our new violin - and his assistant Massimo De Notti. Over the years we also worked for a course in *Engineering in musical instruments* in collaboration first with the *La Sapienza* University of Rome then with the *Polytechnic Marche University* of Ancona. Our course deals not only with classical lutherie but also with the experimental one, inspired by concepts and evidences known in the world of Nature, such as the *Fibonacci* sequence that create a geometric spiral, evident in several aspects of Nature (*Observing the geometry of plants, flowers or fruit, it is easy to recognize the presence of recurrent structures and forms*¹⁵). So, we modified the design for the new ergonomic violin following the curve suggested by the Fibonacci sequence. Maestro Fabretti designed the new model project and our staff began to build it following the teacher's precious instructions. Our new violin¹⁶ is easier to play because the ergonomic body helps the playing on higher positions pushing down his left shoulder, moreover we pulled up the right shoulder to recover the cubage of the sound box. For a better sound quality, the player can choice, following the repertory to play, if using one or two or three sound-posts in the same time for a richer timbre. We have a more powerful sound because the sound comes out of 4 harmonic holes. Obviously, we preferred to use a longer and thicker bass-bar for a better transmission of acoustic vibrations. We presented our project *Beyond Stradivari: The New Santa Cecilia Violin Model* at the 22nd Intl. Symposium of Musical Instruments in Lisbon (Portugal, 2019) and we participated also with our study *Modernity from The Past, A New Violin based on Traditional Italian Lutherie and Inspired by Nature* at the *10th International Scientific Meeting for Sound and Musical Instrument Studies* (Gardunha-Castelo Branco, Portugal 2021). We are pleased to say that the International Press has already begun to notice our work starting with the celebrated English review *Strad* (printed¹⁷ and digital¹⁸ editions¹⁹) and so on with articles and news on the main specialized sites in Europe, America and Asia. Our next step will be to involve our Electronic Music Department to make acoustic measurements which will then be compared with those of the "Tuscan" Stradivarius of the Santa Cecilia Academy Museum of Musical Instruments in Rome. This will be the subject of a forthcoming scientific publication.



Photo 1 Massimo de Bonfils and Mauro Fabretti at the St Cecilia Conservatory

¹⁵ *The numbers of nature: the Fibonacci sequence* (News and Events, June 27, 2016) - <http://www.eniscuola.net/en/2016/06/27/the-numbers-of-nature-the-fibonacci-sequence/>

¹⁶ See fig. 1

¹⁷ *Strad*, September 2019 (printed edition)

¹⁸ *Strad*, August 23, 2019 - <https://www.thestrads.com/lutherie/life-out-of-balance/9298.article>

¹⁹ *Strad*, April 5, 2019 - <https://www.thestrads.com/galleries/new-violin-design-to-be-demonstrated-in-lisbon-on-11-april/8786.article>



Photo 2 The laboratory with our students



Photo 3 - A classic lutherie violin built in our Laboratory in 2016



Photo 4 - Violins under construction in our workshop



Photo 5 - Massimo De Notti and Mauro Fabretti in our Laboratory



Photo 6 – The New Violin model Santa Cecilia

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Photos

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